

# TOWN OF BROOKLINE

Department of Public Works  
333 Washington Street  
Brookline, MA 02445-6863

## NOTICE TO CONTRACTORS SPECIFICATIONS

PROPOSAL and CONTRACT AGREEMENT

For

CYPRESS STREET PLAYGROUND

CONTRACT No. PW/20-15

This Proposal To Be Opened And Read:  
**FRIDAY, JUNE 12<sup>TH</sup>, 2020 @ 1:00 PM**



Name of Contractor: \_\_\_\_\_

## SPECIAL NOTICE

*A Pre-Bid Meeting will be held on Tuesday, June 2, 2020 at 11:00 AM. All contractors requesting information shall meet outside at 60 Tappan Street, Brookline, MA, for the Pre-Bid Meeting. A representative of the Departments of Public Works will accompany any Contractor(s) wishing to visit the site.*

The following pages shall be filled out completely at the time of bidding:

Proposal Page P - 1 thru P - 28

Bid security in the amount of 5% of Bid **shall be attached to the outside of the Bid Book** in a sealed envelope.

### THIS CONTRACT SHALL BE SUBMITTED INTACT

Contract No. PW/20-15  
CONTRACT NAME: Cypress Street Playground  
BID DUE: **June 12<sup>th</sup>, 2020 @ 1:00 PM.** Local Time

The following pages shall be filled out completely subsequent to the time of contract award:

Contractor's Certification Page SC – 15

Certificate of Non-Discrimination Page SC-16

Contract Page C-1 thru C-5

**CYPRESS STREET PLAYGROUND  
PW 20-15  
TABLE OF CONTENTS**

---

NOTICE TO CONTRACTORS.....	I-1
LOCUS PLAN.....	L-1
SPECIAL PROVISIONS .....	SP-1 to SP-10
Section 1.00-Definition of Terms .....	SP-1
Section 2.00-Proposal Requirements and Conditions.....	SP-3
Section 3.00-Award and Execution of Contract.....	SP-4
Section 5.00- Control of Work.....	SP-4
Section 6.00-Control of Materials .....	SP-6
Section 7.00-Legal Relations and Responsibility to Public.....	SP-6
Section 8.00-Presecution and Progress.....	SP-10
Section 9.00-Measurement and Payment .....	SP-10
SPECIAL CONDITIONS .....	SC-1 to SC-16
Special Conditions .....	SC-1
Affirmative Action Program for Contractors and Vendors.....	SC-3
Town Policy on Arab League States Boycott Against the State of Israel.....	SC-6
Article 4.4 Fair Employment Practices Relative to Town Contracts.....	SC-7
Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program.....	SC-9
Contractor’s Certification .....	SC-14
Subcontractor’s Certification .....	SC-15
Certification of Non-Discrimination.....	SC-16
WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE.....	SC-17
STATE WAGE RATES.....	SC-18 to SC-54
SCOPE OF WORK.....	SW-1

(See Back of Specification Book for PROPOSAL, found at end of Table of Contents)

**TECHNICAL SPECIFICATIONS:**  
**SECTION TITLE**

**PAGES**

**DIVISION 01: GENERAL REQUIREMENTS**

01 14 00 Special Provisions..... 5

**DIVISION 02: EXISTING CONDITIONS**

02 41 13 Site Demolition..... 6

**DIVISION 03: CONCRETE**

03 05 00 Field Concrete..... 6

03 11 00 Concrete Formwork..... 3

03 21 00 Concrete Reinforcement..... 4

03 30 00 Cast-In-Place Concrete..... 17

03 48 00 Precast Concrete Vault..... 2

**DIVISION 04: STONE ASSEMBLIES**

04 41 00 Granite Block Walls..... 4

**DIVISION 05: METAL FABRICATIONS**

05 50 00 Miscellaneous Metals..... 8

**DIVISION 06: WOOD**

06 10 00 Rough Carpentry..... 4

06 20 00 Finish Carpentry..... 3

**DIVISION 07: SEALANTS**

07 90 00 Sealant for Spray Decks..... 6

**DIVISION 10: INFORMATION SPECIALTIES**

10 14 53 Traffic Signage..... 4

**DIVISION 11: EQUIPMENT**

11 68 13 Play Equipment..... 13

**DIVISION 11:      EQUIPMENT**

12 12 00	Dugout Structure.....	6
12 40 00	Site Furnishings .....	5

**DIVISION 13:      SPECIAL CONSTRUCTION**

13 00 00	Summary of Work for Spray Decks.....	6
13 14 13	Spray Equipment.....	5

**DIVISION 26:      ELECTRICAL**

26 00 50	Electrical Work – General Provisions.....	6
26 00 60	Modify Existing Traffic Signal Control Cabinet.....	2
26 05 19	Low-Voltage Electrical Power Conductors and Cables.....	4
26 05 26	Grounding and Bonding for Electrical Systems .....	6
26 05 33	Electrical Raceways, Boxes, Handholes and Pedestrian Lighting.....	12
26 05 53	Identification for Electrical Systems.....	7
26 24 16	Panelboards.....	7
26 27 13	Electricity Metering .....	3
26 27 26	Wiring Devices .....	6
26 28 16	Enclosed Switches and Circuit Breaker.....	8
26 43 13	Surge Protection and Low -Voltage Electrical Power Circuits .....	5
26 56 58	Sports Lighting System.....	12

**DIVISION 31:      EARTHWORK**

31 00 00	Earthwork.....	11
31 05 19	Geotextile Fabrics.....	2
31 11 00	Clearing and Grubbing.....	2
31 25 00	Erosion and Sedimentation Control.....	4

**DIVISION 32:      EXTERIOR IMPROVEMENTS**

32 12 36	Bituminous Concrete Pavement with Sealcoat.....	7
32 14 00	Porous Precast Concrete Unit Pavers.....	13
32 14 40	Granite Cobblestone Pavers.....	5
32 16 00	Granite Curbing .....	2
32 18 00	Poured-in-Place Rubber Safety Surfacing.....	7
32 18 25	Wood Fibar safety Surfacing .....	5
32 18 28.13	Infield Mix Surfacing.....	3
32 31 13	Chain Link Fence.....	6
32 84 00	Irrigation System.....	32
32 90 00	Root Zone Mix.....	6
32 91 00	Screened Loam Borrow and Topsoil Re-Used .....	5

32 92 19	Seeding.....	9
32 93 00	Trees, Shrubs, Groundcovers, and Landscaping.....	22

**DIVISION 33:        UTILITIES**

33 05 26.13	Tracer Tape .....	2
33 11 13.13	Ductile Iron Pipe and Fittings for Water Mains.....	12
33 11 13.16	Service Connections (Water Services).....	6
33 11 13.31	Polyvinyl Chloride Pressure Pipe and Fittings (Schedule 80).....	7
33 11 13.34	Connections to Existing Water Mains .....	3
33 12 22	Hydrants and Valves .....	8
33 39 13	Precast Manholes and Catch Basins .....	10
33 41 13.22	Corrugated Polyethylene (HDPE) & Polyvinyl Chloride Pipe (PVC) .....	4
33 42 00	Underground Stormwater Chamber System .....	3

**APPENDICES:**

Appendix A-Geotechnical Report

Appendix B-MUSCO Light Pole Base Foundation Design

Appendix C-Environmental Soil Investigations

Appendix D- Soil Particle Size Testing

Appendix E-ASTM F2396-11

**PROPOSAL** ..... P-1 to P-22

AFFIDAVIT.....	P-23
CERTIFICATE OF VOTE.....	P-25
STATEMENT OF BIDDERS QUALIFICATIONS .....	P-26
IF BID IS BY A CORPORATION .....	P-27
IF BID IS B A PARTNERSHIP .....	P-28
IF BID IS BY AN INDIVIDUAL .....	P-29

CONTRACT .....	C-1 to C-2
PERFORMANCE BOND.....	C-3
PAYMENT BOND.....	C-4
STATE TAX CERTIFICATE .....	C-5
COMPTROLLER CERTIFICATE.....	C-6

**TOWN OF BROOKLINE**  
**NOTICE TO CONTRACTORS**

Sealed bids for proposals addressed to the Commissioner of Public Works, Brookline, and endorsed, "**Cypress Street Playground**", **Contract No. PW/20-15**, will be received at the office of the Brookline Department of Public Works, Town Hall, 333 Washington Street, Fourth Floor, Brookline, Massachusetts, until **Friday, June 12, 2020, at 1:00 PM local time**, and at that time will be publicly read in the Fourth Floor Conference Room of the Town Hall. (Due to COVID-19 Concerns, bids will be mailed in or dropped at dropbox in front of Town Hall door. Bids will be read aloud via video conference)

Project specifications, including proposal forms, may be obtained at the Engineering Office, Town Hall, 333 Washington Street, Fourth Floor, Brookline, Massachusetts, on Tuesday **May, 26<sup>th</sup>, 2020**, upon payment of a **NON-REFUNDABLE CHARGE OF FIFTY (\$50.00) DOLLARS. (Project and Bid Docs will be emailed upon receipt of \$50 Fee)**

Bid security in the form of a bid bond or certified check in the amount of 5% of the bid payable to the Town of Brookline is required. Bid security shall not be enclosed with the proposal but shall be delivered separately to the office of the Department of Public Works, attached to the outside of the bid proposal.

The successful bidder shall furnish guarantee bonds in the form of a performance bond and a payment bond, each in the amount equal to 100% of the bid, from a surety company satisfactory to the Town.

Minimum wage rates have been fixed by the Massachusetts Department of Labor and Industries and shall be in conformance with Section 26 through Section 27G of Chapter 149 of the Massachusetts General Laws. The Town is an equal opportunity employer and will require compliance with its Affirmative Action program and with the Affirmative Actions stated in Article 4R.4 of the Town by-law.

A **pre-bid conference** advising bidders of bid conditions and Affirmative Action Guidelines will held outside at 60 Tappan Street, Brookline, on Tuesday, June 2, 2020, at 11:00, AM Local time.

The contract book shall be submitted intact for comparison of bids.

The Commissioner of Public Works reserves the right to reject any or all bids, or to accept any bid, or to defer the start of work operations should he deem it in the best interest of the Town to do so.

Andrew M. Pappastergion  
Commissioner of Public Works



NOT FOR BIDDING

LOCUS MAP

## SPECIAL PROVISIONS

The 1988 edition of "STANDARD SPECIFICATIONS FOR HIGHWAYS, BRIDGES AND WATERWAYS" of the Commonwealth of Massachusetts, Department of Public Works including supplementary specifications, amendments and addenda thereto are incorporated by reference in this Proposal and Contract and are referred to as the "STANDARD SPECIFICATIONS".

The "STANDARD SPECIFICATIONS" are revised by the following special provisions to conform with practices of the Town of Brookline. In case of conflict between these Special Provisions and the aforesaid "STANDARD SPECIFICATIONS", these Special Provisions shall take precedence and shall govern.

The enforcement of the requirements of any of the following Special Provisions shall not be constructed as waiving any of the rights of the Party of the First Part contained in any of the other divisions of the contract.

This contract shall be interpreted in accordance with the laws of the Commonwealth of Massachusetts. All actions, claims and disputes hereunder shall be presented to a court or agency of the Commonwealth of Massachusetts.

### SECTION 1.00

#### DEFINITION OF TERMS

##### 1.01 Definition of Terms (page 3)

The following words, terms, or their pronouns used in the "STANDARD SPECIFICATIONS" shall be understood to mean as follows:

Chief Engineer .....	The Commissioner of Public Works, Town of Brookline
Commissioner, Commissioners and Board of Commissioners.....	The Select Board, Brookline, Massachusetts
Commonwealth.....	The Town of Brookline
Department .....	The Town of Brookline Department of Public Works
Department Secretary .....	Administrative Assistant, Town of Brookline, Department of Public Works

Engineer, Resident Engineer, Research and Materials Engineer .....	The Commissioner of Public Works, Town of Brookline, acting directly or through an authorized representative acting within the scope of the particular duties entrusted to him.
Notice to Contractors.....	The notice published in newspapers or publicly posted within the Town of Brookline announcing the time and place for the opening of bids for work to be done.
Party of the First Part.....	The Town of Brookline acting through its duly authorized officials.
Right of Way.....	That area which has been laid out or acquired for municipal purposes.
Special Provisions.....	The special directions, provisions and requirements prepared to cover proposed work not satisfactorily provided for by the "STANDARD SPECIFICATIONS". These special provisions shall be included within the general term "STANDARD SPECIFICATIONS" and shall be made a part of the contract with the express purpose that they shall prevail over all other specifications.
Specifications.....	The directions, provisions and requirements contained herein and contained in the aforesaid "STANDARD SPECIFICATIONS", together with all written agreements made or to be made pertaining to the method and manner of performing the work of the quantities and qualities of materials to be furnished under the contract.
Supervisor of Fiscal Management .....	Administrative Assistant, Town of Brookline, Department of Public Works.

NOT FOR BIDDING

## SECTION 2.00

### PROPOSAL REQUIREMENTS AND CONDITIONS

#### 2.01 Proposal Forms and Plans (page 7)

##### **B. Issuance of Proposal Forms and Plans**

Revise as follows:

First paragraph - Delete lines 7, 8 and 9 and Add:

that "Approval for Proposal Form" to the Engineering Division, Department of Public Works, 4th Floor, 333 Washington Street, Brookline, Massachusetts, accompanied by cash, bank check, certified check or money order in the amount stated in the "Notice to Contractors" made payable to the Town of Brookline.

#### 2.05 Delivery of Proposals (page 9)

Revise as follows:

Each proposal shall be submitted to the Administrative Assistant of the Department of Public Works, Town of Brookline, sealed in an envelope on which is clearly indicated the contents, including the name of the municipality in which the improvement is to be made, and the name and address of the Bidder.

If forwarded by mail, preferably by registered mail, the above mentioned envelope shall be enclosed in another envelope which shall be addressed to the Administrative Assistant, Town of Brookline, Department of Public Works, Brookline, Massachusetts. Proposals received at the office of the Administrative Assistant after the time for opening of bids designated in the Notice to Contractors will be returned to the bidder unopened.

#### 2.07 Withdrawal of Proposals (page 9)

Revise as follows:

A bidder may withdraw his proposal provided the request in writing is in the hands of the Administrative Assistant of the Department of Public Works, Town of Brookline, by the time set for opening proposals. When such proposal is reached during the opening of the bids it will be returned to the bidder unopened.

## **2.11 Competency of Bidders (page 10)**

Revise as follows:

No contract will be awarded except to responsible bidders capable of performing the class of work contemplated. Before the award of the contract, any bidder may be required to show that he has the necessary facilities, experience, ability and financial resources to perform the work in a satisfactory manner and within the time stipulated. If the contract contains special work of a complicated nature or if it contains items for materials or work experience, he will be required to show proof that he has a satisfactory record of similar work performed or materials furnished under other contracts. A bidder who fails to comply with this requirement will not be considered for award of contract.

### **SECTION 3.00**

#### **AWARD AND EXECUTION OF CONTRACT**

##### **3.05 Execution of Contract (page 11)**

Revise as follows:

The prepared contract and bond forms will be sent with the notification of award to the successful bidder who shall execute and deliver the contract and furnish the surety, in conformity with the stipulations contained in Subsection 3.04, and Subsection 7.05 in the amounts named in the Special Provisions, to the Department within seven (7) calendar days after the date of the award.

The contract shall be in writing and be executed in quadruplicate; one of which shall be retained by the Brookline Select Board, one retained by the Department, and one each delivered to the Comptroller of the Town of Brookline and the contractor.

### **SECTION 5.00**

#### **CONTROL OF WORK**

##### **5.06 Adjacent Contracts (page 17)**

Add the following paragraph:

The Contractor's attention is directed to the fact that work by utility companies, municipal departments and other contractors will be carried on concurrently within and adjacent to the limits of the contract. The said companies, departments and other contractors will require access over the site and the Contractor shall do his work in cooperation with them, in accordance with the stipulations of Subsection 5.06. The attention of the Contractor is also directed to the provisions of General Laws, Chapter 82, Section 40 as amended, no one may excavate in the Commonwealth of Massachusetts except in an emergency without giving 72 hours notice, exclusive of Saturdays, Sundays, and legal holiday's to natural gas pipeline companies, public utility companies, cable television companies, and

municipal utility departments that supply gas, electricity, telephone or cable television service in or to the city or town where the excavation is to be made.

The utility companies have established a public utility underground plant damage prevention system called "Dig Safe" to receive the above mentioned notices of excavation which are then transmitted to member utilities. There is no cost to the excavator. The calls are received over toll free lines (phone number: 1-888-DIG-SAFE or 1-888-322-4844).

**THIS NOTIFICATION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.**

#### **5.07 Construction (Stakes) Staking (page 18)**

Revise as follows:

The Department will furnish base lines, benchmarks and measurements used for payment. The Contractor shall furnish all other engineering work and approved materials required for strict compliance with lines and grades shown on the plans and the contractor shall employ qualified engineering personnel for the purpose.

The Department may check the engineering work of the Contractor as the work progresses and will inform the Contractor of the results of the check. Such notice does not relieve the Contractor of his responsibility for the accuracy of the engineering work.

#### **5.11 Final Acceptance (page 19)**

Revise as follows:

Before any acceptance of the entire project the Engineer will make a complete final inspection of the work done.

If the work or any part thereof is not acceptable to the Engineer at the time of the final inspection, he shall notify the Contractor in writing of the particular defects or parts to be remedied before final acceptance. If the contractor has not arranged, within a period of five (5) days after the date of transmittal of such notice of unacceptance, to complete the work as speedily as described by the Engineer, the Engineer may without further notice and without in any way affecting the contract, make such other arrangements as the contractor may consider necessary to insure the satisfactory completion of the project. The cost of so completing the work shall be deducted from any moneys due or which may become due the Contractor under the contract.

**SECTION 6.00**

**CONTROL OF MATERIALS**

**6.01 Source of Supply and Quality (page 20)**

Add the following paragraph:

Trade names and catalog numbers mentioned on the Plans or in the Special Provisions are used for the purpose of furnishing a brief description of the materials. Similar materials will be accepted if, in the opinion of the Engineer, they are equal in quality and operation to those specifically mentioned. All materials must have the name or trademark of the manufacturer stamped thereon when and where such identification of materials is customary.

**SECTION 7.00**

**LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**

**7.05 Insurance Requirements (page 25)**

The minimum limits of the several kinds of liability insurance required for this contract are listed as follows:

Public liability.....	\$1,000,000 / 2,000,000
Contractor's Protective Liability .....	\$1,000,000 / 2,000,000
Property Damage .....	\$1,000,000 / 2,000,000
Contractor's Protective Property Damage.....	\$1,000,000 / 2,000,000

The Town shall be named "**additional insured**" along with being named as owner and certificates of insurance shall be furnished to both parties. The Contractor shall do reporting of accidents and claims. These policies must contain on their face a notation that they cannot be canceled without at least thirty-(30) day's notice in writing to the Town as owner.

Attention is directed to Section C of said Subsection 7.05 wherein it stipulates that the above insurance shall cover all damages to property whether above or below ground and other pertinent requirements.

**7.09 Public Safety and Convenience (page 27)**

Add the following paragraph:

Reasonably safe and convenient facilities shall be provided by the Contractor for the passage of pedestrians, vehicles and public emergency vehicles through the site of the improvement and to and from land abutting thereon. When the construction work interferes with the use of parking meters, the

Contractor shall notify the Chief of Police of the Town of Brookline prior to beginning any work so affecting the parking meters.

### **7.11 Traffic Officers and Railroad Flagging Service (page 28)**

Revise as follows:

The Contractor shall provide for such regular police officers as the Engineer deems necessary for the direction and control of traffic within the site of the improvement. Application shall be made to the Brookline Police Department for these personnel. Such police officers shall be regular Town police officers and shall wear regulation policemen's uniforms. Upon receipt of a bill for the services of regular police officers, based upon a regular patrolman's rate of pay, the Contractor shall submit the said bill to the Engineer for payment by the Town.

When any of the work operations, required to be done by the Contractor, obstructs the tracks of a railroad or street railway, or in any way endangers the operations of a railroad or railway and the Chief Engineer or other railroad or railway official deems the employment of a flagman or flagmen necessary (Subsection 7.09, Public Safety and Convenience), the Contractor shall apply to the railroad or street railway for this personnel. Upon receipt of a bill for the services of the flagman or flagmen, based upon a regular flagman's rate of pay, the Contractor shall submit the said bill to the Engineer for payment by the Town.

### **7.13 Protection and Restoration of Property (page 29)**

Add the following paragraph:

Whenever it is necessary to interfere with the aforesaid underground structures, the Contractor shall maintain their respective services, and, if necessary for that purpose, shall cause temporary services to be laid. He shall repair all damage done to underground structures and shall leave them in as good condition as they were previous to the beginning of the work. If so directed by the Engineer, permanent changes of locations of said underground structures, not indicated on the plans or in the "STANDARD SPECIFICATIONS", shall be made by the Contractor to meet the requirements of the new construction and its appurtenances and new work shall be added, when necessary, to leave said underground structures in good working order. The cost of such permanent changes not indicated on the plans or in the "STANDARD SPECIFICATIONS" is to be paid for as Extra Work when so ordered in writing by the Engineer.

Whenever it becomes necessary to move or relocate any Postal Collection or Relay Boxes the Contractor shall notify the Postmaster, Boston, Massachusetts at least Forty-eight (48) hours before operations are carried on in the area, at which time the Postal authorities will make arrangements for the proper removal.

#### **7.14 Responsibility for Damage Claims (page 29)**

Revise first paragraph as follows:

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Town of Brookline, its officers, agents, servants, and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the work covered by the contract or failure to comply with the terms and conditions of said contract, provided that such claims, damages, loss or expenses is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage loss or expense is caused in part by a party indemnified hereunder.

Revise third paragraph as follows:

The Select Board may delay the beginning of the work or any part thereof if they shall not have obtained possession of the land in or upon which the same is to be performed, or if for any reason it becomes necessary to do so. The Contractor shall have no claim for damages on account of such delay, but shall be entitled to so much additional time wherein to perform and complete this contract on his part as the Engineer shall certify in writing to be just. Wherever any part of the work covered by this agreement is done in part by or connects with the work of other contracts, the Contractor agrees to perform his work so as to accommodate the work of the other contractors, and to cooperate with such contractors in mutual agreements as to all such work, and no contractor shall have any claim against the Town growing out of the negligence or delay of any other contractor or contractors; but each contractor shall be liable to every other contractor for any such delay or negligence.

#### **7.16 Claims of Contractor for Compensation (page 34)**

Revise as follows:

No person or corporation, other than the signer of the contract as Contractor, now has any interest hereunder, and no claim shall be made or be valid; and neither the Party of the First Part nor any member, agent or employee thereof, shall be liable for, or be held to pay, any money except as provided in Subsections 4.02, 4.03, 4.04, 4.06, 8.12, and 9.02 and Clause 3 of the Contract.

All claims of the Contractor for compensation other than as provided for in the contract on account of any act of omission or commission by the Party of the First Part or its agents must be made in writing to the Engineer within one week after the beginning of any work or the sustaining of any damage on account of such act, such written statement to contain a description of the nature of the work performed or damage sustained; and the Contractor shall, on or before the fifteenth (15) day of the month succeeding that in which such work is performed or damage sustained, file with the Engineer an itemized statement of the details and amount of such work or damage. Unless such statement shall be made as so required, the Contractor's claim for compensation shall be forfeited and invalid, and he shall

not be entitled to payment on account of any such work or damage. The determination of the Engineer shall be final upon all questions as to the amount and value of such work, and the fact and extent of such damage.

The acceptance by the Contractor of the last payment made under the provisions of Subsection 9.05 shall operate as and shall be a release to the Party of the First Part and every member, agent and employee thereof, from all claims and liability to the Contractor for anything done or furnished for, or relating to, the work, or for any act or neglect to the Party of the First Part or any person relating to or affecting the work, except the claim against the Party of the First Part for the remainder, if any there be, of the amount kept or retained as provided in Subsection 7.15.

**7.22 Labor, Lodging, Board, Maximum Hours of Employment, Weekly Payment, Keeping of Payroll Records. (page 37)**

Revise second paragraph as follows:

No laborer, workman, mechanic, foreman and inspector employed by any contractor or subcontractor, or other person, doing or contracting to do the whole or a part of the work contemplated by this contract shall be required or permitted to work more than eight (8) hours in any one day or more than forty-eight (48) hours in any one week, or more than six (6) days in any one week, except in cases of emergency (General Laws, Chapter 149, Section 30).

Subject to the provisions of Subsection 8.03 (Prosecution of Work) no work shall be performed under this contract on a Saturday, Sunday or a legal holiday or on any other day before 7:00 A.M. or after 4:00 P.M., except:

1. In case of emergency, the determination of which shall be made solely by the Engineer; or,
2. On written request by the Contractor and written approval by the Engineer. The Contractor shall be responsible for securing the approval of all bodies or tribunals having jurisdiction or authority relevant to work during restricted hours. The Contractor's written request shall contain a statement that the Contractor agrees to reimburse the Town for wage payments made to the Engineer's representative for overtime employment at normal and/or overtime rates.

Where applicable, the Town shall be reimbursed for wage payments made for such overtime work by deducting such wage payments from periodic pay estimates due to the Contractor under Subsection 9.04.

The written approval of the Engineer permitting work during the restricted hours and days shall not be construed as relieving the Contractor from any responsibility as set forth in Subsection 8.03 or any other provisions in the "STANDARD SPECIFICATIONS".

**SECTION 8.00**

**PROSECUTION AND PROGRESS**

**8.04 Removal or Demolition of Buildings and Land Takings (page 39)**

Delete the word "highway" in the first line.

**8.11 Failure to Complete Work on Time (page 42)**

Schedule of deductions:

Original Contract Amount		Daily Charge
From More Than	To and Including	Per Calendar Day
0	100,000	\$250.00
100,000	500,000	\$375.00
500,000	1,000,000	\$425.00
1,000,000	2,000,000	\$550.00
2,000,000	3,000,000	\$675.00
3,000,000	4,000,000	\$800.00
4,000,000	5,000,000	\$925.00
5,000,000	10,000,000	\$1050.00
10,000,000	15,000,000	\$1175.00
	Over 15,000,000	\$1500.00

**SECTION 9.0**

**MEASUREMENT AND PAYMENT**

**Subsection 9.04 Partial Payments (page 47)**

Revise second paragraph as follows:

There will be a retainage of Ten (10%) percent of the value of all planting items. For all other items of work, there will be a retainage of Five (5%) percent for the first Fifty (50%) percent of the Contract Price excluding planting items.

Add the following paragraph:

The Contractor shall be responsible for the reimbursement to the Town for all wages, computed at standard and/or overtime rate, paid to the Engineer or his authorized agent for employment outside of regular Town working hours for overtime work requested by the Contractor. Such reimbursement shall be made by deducting the various sums, paid by the Town to its employees, from periodic partial pay estimates due the Contractor.

## SPECIAL CONDITIONS

### Required Compliance with Chapter 151B

During the performance of this Contract, the Contractor, for himself, his assignees and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

(1) Compliance with Requirements:

The Contractor will comply with the provisions of Chapter 151B as amended of the non-discrimination Laws of the Commonwealth, which are herein incorporated by reference and made a part of this Contract insofar as applicable to this Contract.

(2) Non-discrimination:

In the performance of work under this Contact, the Contractor shall not discriminate in employment practices or in the selection or retention of sub-contractors or in the procurement of materials or rental of equipment, on the grounds of race, color, religion, national origin, age or sex.

The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representative of the Contractor's commitments under this section, and shall post copies of such notice in conspicuous places available to employees and applicants for employment.

(3) Solicitations for Subcontracts and in the Procurement of Materials and Equipment:

In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract and for the procurement of materials or equipment, each potential sub-contractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination on the grounds of race, color, religion, national origin, age or sex.

(4) Information and Reports:

The Contractor will provide all information and reports required, on orders or instructions issued by the Department of Public Works or the Massachusetts Commission Against Discrimination, and will permit access to his books, records, accounts and other sources of information and facilities as may be determined pertinent by the Massachusetts Commission Against Discrimination to ascertain compliance with such orders or instructions. Where the information required is in the exclusive possession of another who fails or refuses to furnish the required information, the Contractor shall so certify to the Department of Public Works or the Massachusetts Commission against Discrimination, as appropriate, and shall set forth what efforts he has made to obtain the required information.

(5) Sanctions for Non-Compliance:

In the event the Contractor fails to comply with the non-discrimination provisions of this Contract, the Department of Public Works shall impose such contract sanctions as it may determine to be appropriate, including but not limited to:

(a) withholding of payments due the Contractor under this contract until the Contractor complies, and/or

(b) cancellation, termination or suspension of this Contract, in whole or in part.

The Contractor's right of appeal is assured under Section 6 of Chapter 151B of the General Laws of the Commonwealth.

(6) Incorporation of Provisions:

The Contractor shall include the provisions of paragraph (1) through (6) in every subcontract, including the procurement of materials and rentals of equipment. The Contractor shall take such action with respect to subcontracts or procurements as the Department of Public Works may direct as a means of enforcing such provisions, including sanctions for non-compliance, provided however, that in the event the Contractor becomes involved in, or is threatened with litigation with a subcontractor or supplier or union or association as a result of such direction, the Contractor may request the Town of Brookline to enter into such litigation to protect the interests of the Town of Brookline.

**TOWN OF BROOKLINE, MASSACHUSETTS**

**AFFIRMATIVE ACTION PROGRAM FOR CONTRACTORS AND VENDORS**

**FOR BIDS OF \$10,000 OR OVER**

I. PURPOSE

The purpose of the program is to guarantee that contractors\*, wishing to do business with the Town of Brookline, do not discriminate against persons for whom their race, religion, color, sex, national origin, or age have proven to be obstacles to their employment (new or continued) or advancement.

All successful contractors receiving Town contracts for \$10, 000 or more must include written documentation of compliance with its Town's Affirmative Action Program for contractors as stated in Articles 4.4 of the Town's By-Laws (attached.) Such documentation shall be in compliance with the following Affirmative Action statement.

"In connection with the execution of this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, or age. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during their employment, without regard to their race, religion, color, sex, national origin, or age. Such action shall include, but not be limited to, the following:

employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay, or other forms of compensation; and selection for training, including apprenticeship."

\* This includes vendors throughout.

II. COMPLIANCE

The Affirmative Action Program must include evidence of the following:

1. Unless Union agreements prohibit and there is no union Affirmative Action Program acceptable to the Human Relations-Youth Resources Commission, or there is no union, the Contractor must use varied sources of new employees. These sources would include state and private employment services and agencies, minority group organizations such as the Urban League, the National Association for the Advancement of Colored People (NAACP), and other ethnic associations, Action for Boston Community Development, Neighborhood Employment Centers, youth groups, special neighborhood groups, Spanish, Chinese, and other minority language sources (Note - the Brookline Human Relations-Youth Resources Commission maintains an Affirmative Action List which it will make available to any contractor upon receipt of written request). These sources (and others) and applicants from them should constitute the Contractor's Affirmative Action List.

2. Job applications shall be retained and maintained in an Affirmative Action File so that the number of minority persons interviewed who have applied to the Contractor for employment, shall be a matter of record. As job opportunities occur, these applications will be considered in filling the job.

3. All notices for job openings shall contain the phrase "An Affirmative Action Employer."

4. Where feasible, effective human relations components must be included in orientation instructions for all employees, in on-the-job training, in first-line supervisor and foreman training and continuing training (especially including reprimand and the possibility of harassment; Note - United States court decisions hold the employer responsible for such forms of discrimination.) Affirmative action in human relations should be included in all industrial and labor relations matters, including union contract discussion and negotiation.

### III. DOCUMENTATION

1. All successful contractors shall file an Affirmative Action Plan with the Human Relations-Youth Resources Commission within fifteen (15) days after the execution of the contract prior to the first payment after the fifteen day period has expired if they have not received objection from the Human Relations-Youth Resources Commission.

2. Successful contractors receiving contracts for more than \$50,000 shall be required to file in addition to their Affirmative Action Plan (No. 1 above) the following documentation:

a. Affirmative Action compliance reports that the contractor is required to file with the Area Office, U.S. Department of Housing & Urban Development.

b. A copy of the Contractor's notice to each labor union or representative of workers with which he deals, advising them of affirmative action agreement with the Town (Article 4.4, Section 1 c.)

c. A copy of the notice to each potential sub-contractor of supplies wherein is stated the Contractor's affirmative action program.

d. A copy of the Contractor's notice to all employees, especially managers, the personnel director and first-line supervisors communicating his intentions to abide by the Human Relations-Youth Resources Commission's Affirmative Action Statement.

e. Contractors filing EEO-1 Standard Form 100 with the United States Equal Employment Opportunity Commission, or Affirmative Action Compliance Reports under the Department of Labor, Office of Federal Contract Compliance Rules and Regulations Part 60-1. 40, under authority of Presidential Executive Order 11246 (amended 1968) shall include copies of the most recent returns. Copies of the most recent plans under the Governor's Executive Order 74, filed with the Massachusetts Commission Against Discrimination, should also be filed with the Human Relations-Youth Resources Commission.

3. Successful contractors receiving contracts between \$10,000 and \$50,000 may be required, if requested by the Human Relations-Youth Resources Commission, to submit some or all of the applicable documentation listed in paragraph number two above.

### IV. PROCEDURE

The following procedure must be adhered to:

1. The successful contractor will be obliged to return the necessary documentation as previously outlined to the Human-Relations-Youth Resources Commission.
2. Technical assistance in the preparation and implementation of effective Affirmative Action Compliance Programs will be supplied by the Human Relations-Youth Resources Commission, or sources for such assistance recommended, upon request by the Contractor.
3. Giving of Reports: Required documents shall be in the Human Relations-Youth Resources Commission Office within fifteen (15) days after the execution of the contract and prior to the first payment, except when extended by the Human Relations-Youth Resources Commission.

V. REVIEW

The contractor will be subject to periodic review made by the Human Relations-Youth Resources Commission on the basis of these documents and other supplementary information, including field investigation and consultation with other government agencies.

**TOWN OF BROOKLINE, MASSACHUSETTS**  
**NOTICE TO BIDDERS AND CONTRACTORS**  
**TOWN POLICY ON ARAB LEAGUE STATES BOYCOTT**  
**AGAINST THE STATE OF ISRAEL**

The Select Board unanimously voted the following Resolution on July 12, 1976:

**WHEREAS**, the Town of Brookline has established an Affirmative Action Program in accordance with the provisions of Article 4.4 of the Town By-Laws; and

**WHEREAS**, the Arab League States are enforcing a boycott against the sovereign State of Israel, an ally of the United States; and

**WHEREAS**, it is the stated policy of the United States of America to oppose economic sanctions used against our allies; and

**WHEREAS**, the Arab League States are enforcing a secondary boycott against American companies which are trading with or in Israel; and

**WHEREAS**, the Arab League States are enforcing a tertiary boycott which requires American companies to discriminate against other American companies; and

**WHEREAS**, certain Arab States require American companies to discriminate in employment against Jews, blacks and women; and

**WHEREAS**, these practices are contrary and violate the American democratic tradition, morality, and law and the policies of the Town of Brookline, and represent an imposition of foreign discriminatory practices on Americans;

**NOW THEREFORE**, it is hereby resolved as a matter of public policy that the Town of Brookline declares that it will not trade with any company or corporation which practices discrimination against persons because of their friendly relations with our ally, the State of Israel, and it is further hereby

**RESOLVED** that the Purchasing Agent for the Town of Brookline be and the same hereby is requested to inform all contractors with the Town of this non-discriminatory policy and directed to enforce the above policy with respect to all goods, services and commodities purchased by the Town.

## Excerpt from the Bylaws of the Town of Brookline

### ARTICLE 4.4 FAIR EMPLOYMENT PRACTICES RELATIVE TO TOWN CONTRACTS

#### SECTION 4.4.1 CONTRACT PROVISIONS AND REQUIREMENTS

Subject to the exceptions hereinafter stated, all contracts awarded by the Town and all agencies and departments thereof, shall include the following provisions:

During the performance of this Contract, the Contractor, for himself, his assignees and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

- (a) The Contractor will comply with the provisions of Chapter 151B, as amended, of the General Laws of Massachusetts relative to non-discrimination which are incorporated herein by reference and made a part of this Contract.
- (b) In the performance of work under this Contract, the Contractor shall not discriminate in employment practices or in the selection or retention of subcontractors or in the procurement of materials or rental of equipment on the grounds of race, color, religion, gender identity or gender expression, or national origin, or on the grounds of age or sex except when age or sex is a bona fide occupational qualification.

The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representative of the Contractor's commitments under this section, and shall post copies of such notice in conspicuous places available to employees and applicants for employment.

- (c) In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract and for the procurement of materials and equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination on grounds of race, color, religion, gender identity or gender expression, national origin, age or sex, and his obligations to pursue an affirmative course of action as required by paragraph (d).
- (d) The Contractor will pursue an affirmative course of action as required by affirmative action guidelines adopted by the Human Relations Commission in effect on the effective date of the contract, or when calls for proposals are made, whichever is sooner, which are herein incorporated by reference, attached hereto, and made a part of this contract and to the nature and size of his work force, to insure that applicants are sought and employed, and that employees are treated, during their employment, without regard to their race, color, gender identity or gender expression, national origin or ancestry, or religion. No changes in affirmative action guidelines hereinafter adopted by the Commission shall be effective with respect to contracts already in effect, without the express written consent of the contractor.

- (e) In the event the Contractor fails to comply with the foregoing non-discrimination provisions of this Contract, the contracting agency of the Town, upon advice and counsel of the Human Relations Commission, shall impose such contract sanctions as it may determine to be appropriate, including but not limited to:
- (1) Withholding of payment due the Contractor under this contract until the Contractor complies, and/or
  - (2) Cancellation, termination or suspension of this Contract, in whole or in part.

For the purposes of this section the contracting agency of the Town shall accept as proof of noncompliance with the provisions of subsection (a), only final orders or decisions of the Massachusetts Commission Against Discrimination.

- (f) The provisions of this section shall be deemed supplementary to, and not in lieu of, or in substitution for, the provisions of Massachusetts Law relating to non-discrimination, and other applicable Federal, State or Town law, by-law, rule, regulation and directive relative thereto. In the event of a conflict between the provisions of this section and, where inserted or incorporated in this contract, an applicable state or federal law, rule, regulation or directive, the conflicting provisions of the latter shall control.

#### **SECTION 4.4.2 EXEMPTIONS**

The requirements of Section 4.4.1 shall not apply to the following contracts :

- a) Whenever work is to be or has been performed outside the state and no recruitment of workers within the state is involved
- b) Those involving standard commercial supplies or raw materials
- c) When the Contractor is a club exclusively social, or a fraternal association or corporation, if such club, association or corporation is not organized for private profit.
- d) When the Contractor employs fewer than six persons
- e) When the total value of the contract is less than \$10,000.00
- f) Contracts involving joint purchases with the State
- g) Contracts with the Commonwealth for construction of public works
- h) Contracts for financial assistance with a government or governmental agency
- i) Notes and bonds of the Town
- j) Employment by the Town of officers and employees of the Town
- k) Whenever it is deemed necessary or appropriate the Select Board, upon the advise and counsel of the Human Relations Commission, may exempt any contract not covered by the foregoing exemptions from the operation of this By-law in whole or in part.

#### **SECTION 4.4.3 REQUESTS FOR PROPOSALS**

All REQUESTS for proposals for contracts subject to the provisions of this Article shall include a statement notifying all bidders that the contract awarded pursuant to the proposal is subject to the provision of this Article of the By-laws, relating to non-discrimination in employment.

**TOWN OF BROOKLINE**

**SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY**  
**ANTI-DISCRIMINATION AND AFFIRMATIVE**  
**ACTION PROGRAM**

- I For the purposes of this contract, "minority" refers to Asian-Americans, Blacks, Spanish Surnamed Americans, North American Indians, and Cape Verdeans. "Commission" refers to the Massachusetts Commission Against Discrimination. "Town" hereinafter refers to the Town of Brookline.
- II During the performance of this contract, the Contractor and all of (his) Sub-contractors (hereinafter collectively referred to as the Contractor), for himself, his assignees, and successors in interest, agree as follows:
1. In connection with the performance of work under this contract, the contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, or sex. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection of apprenticeship. The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Town setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (M.G.L. Chapter 151B).
  2. In connection with the performance of work under this contract, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion, or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal opportunity in employment for all persons, regardless of race, color, religious creed, national origin, age or sex. A purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Town public construction projects.
- III 1. As part of his obligation of remedial action under the foregoing section, the Contractor shall maintain on this project a not less than 5% ratio of minority employee man hours to total man hours in each job category including but not limited to brick-layers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in Section 44C of Chapter 149 of the Massachusetts General Laws.

2. In the hiring of minority journeyman, apprentices, trainees, and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Town, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the Liaison Committee of the Town.

IV 1. At the discretion of either the Commission or the Town there may be established for the life of this contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering this project, hereinafter called the administering agency, the Town and such other representatives as may be designated by the Town in conjunction with the administering agency.

2. The Contractor (or his agent, if any, designated by him as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

3. The Contractor shall prepare projected manning tables on a quarterly basis. These shall be broken down into projections, by week, or workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Town and Liaison Committee.

4. Records of employment referral orders, prepared by the Contractor, shall be available to the Town and to the Liaison Committee on request.

5. The Contractor shall prepare weekly reports in a form approved by the Town of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each week to the Town and to the Liaison Committee.

V If the Contractor shall use any subcontractor on any work performed under this contract, he shall take affirmative action to negotiate with qualified minority subcontractors. This affirmative action shall cover both pre-bid and post-bid periods. It shall include notification to the Office of Minority Business Assistance (within the Executive Office of Commerce and Development) or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids.

VI In the employment of journeymen, apprentices, trainees and advanced trainees, the Contractor shall give preference, first to citizens of the Commonwealth who have served in the armed forces of the United States in time of war and have been honorably discharged there-from or released from active duty therein, and who are qualified to perform the work to which the employment relates, and secondly, to citizens of the Commonwealth generally, and, if such cannot be obtained in sufficient numbers, then to citizens of the United States.

VII A designee of the Town and a designee of the Liaison Committee shall each have right of access to the construction site.

VIII Compliance with Requirements

The Contractor shall comply with the provisions of Executive Order No. 74, as amended by Executive Order No. 116 dated May 1, 1975, and of Chapter 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this contract.

IX Non-Discrimination

The Contractor, in the performance of all work after award, and prior to completion of the contract work, will not discriminate on grounds of race, color, religious creed, national origin, age or sex in employment practices, in the selection or retention of subcontractors, or in the procurement of materials and rentals of equipment.

X Solicitations for Sub-Contracts, and for the Procurement of Material and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and affirmative action.

XI Bidders Certification Requirement

The following certification statement will be inserted in the bid document just above the bidder's signature, as a substitute for the present bidder certification form:

"The bidder hereby certifies he shall comply with the minority manpower ratio and specific action steps contained in the appendix EEO attached hereto, including compliance with the minority contractor compliance specified in Section V of said appendix. The contractor receiving the award of the contract shall be required to obtain from each of its subcontractors and submit to the contracting or administering agency prior to the performance of any work under said contract a certification by said subcontractor, regardless of tier, that it will comply with the minority manpower ratio and specific affirmative action steps contained in the appendix EEO."

## XII Contractor's Certification

The Contractor's certification form must be signed by all successful low bidder(s) prior to execution by the contracting agency. (See attachment).

## XIII Compliance - Information, Reports and Sanctions

1. The Contractor will provide all information and reports required by the administering agency or the Town on instructions issued by either of them and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the Town to affect the employment of personnel. This provision shall apply only to information pertinent to the Town's supplementary affirmative action contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency or the Town as appropriate and shall set forth what efforts he has made to obtain the information.

2. Whenever the administering agency, the Town, or the Liaison Committee believes the General Contractor or any Subcontractor may not be operating in compliance with the terms of this Section, the Town directly, or through its designated agent, shall conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Section. If the Town or its agent finds the General Contractor or any subcontractor not in compliance, it shall make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Town or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Town shall make a final report of non-compliance, and recommend to the administering agency the imposition of one or more of the sanctions listed below. If, however, the Town believes the General Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations of the Town, the administering agency shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

a. The recovery by the administering agency from the General Contractor of 1/100 of 1% of the contract award price or \$1000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the administering agency from the General Contractor, to be assessed by the General Contractor as a back charge against the Subcontractor, of 1/10 of 1% of the subcontract price, or \$400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply.

b. The suspension of any payment or part thereof due under the contract until such time as the General Contractor or any Subcontractor is able to demonstrate his compliance with the terms of the contract.

c. The termination, or cancellation, of the contract, in whole or in part, unless the General Contractor or any Subcontractor is able to demonstrate within a specified times his compliance with the terms of the contract.

d. The denial to the General Contractor or any Subcontractor of the right to participate in any future contracts awarded by the administering agency for a period of up to three years.

3. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that he is in compliance with this Section, he may request the administering agency, in consultation with the Town, to suspend the sanctions conditionally, pending a final determination by the Town as to whether the Contractor is in compliance. Upon final determination of the Town, the administering agency, based on the recommendation of the Town, shall either lift the sanctions or reimpose them.

4. Sanctions enumerated under Sections XIII-2 shall not be imposed by the administering agency except after an adjudicatory proceeding, as that term is used M.G.L. c. 30A, has been conducted. No investigation by the Town or its agent shall be initiated without prior notice to the Contractor.

#### XIV Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

# CONTRACTOR'S CERTIFICATION

## CONTRACT NO. PW/20-15 Cypress Street Playground

Prior to the execution of this Contract, the contractor must submit the following certification, which is deemed a part of the resulting Contract.

### CONTRACTOR'S CERTIFICATION

\_\_\_\_\_ Certifies that:

1. it intends to use the following listed construction trades in the work under the contract:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_; and

2. will comply with the minority manpower ratio and specific affirmative action steps contained herein; and

3. will obtain from each of its subcontractors and submit to the contracting or administering agency prior to the award of any subcontract under this contract the subcontractor certification required by these bid conditions.

\_\_\_\_\_  
(Signature of Authorized representative of Contractor)

Company Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Tel. No. ( ) \_\_\_\_\_

## SUBCONTRACTOR'S CERTIFICATION

### CONTRACT NO. PW/20-15 Cypress Street Playground

Prior to the award of any subcontract, regardless of tier, the prospective subcontractor must execute and submit to the Prime Contractor the following certification, which will be deemed a part of the resulting subcontract:

### SUBCONTRACTOR'S CERTIFICATION

\_\_\_\_\_ certifies that:

1. it intends to use the following listed construction trades in the work under the subcontract:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_ ; and

2. will comply with the minority manpower ratio and specific affirmative action steps contained herein; and

3. will obtain from each of the subcontractors prior to the award of any subcontract under this subcontract the subcontractor certification required by these bid conditions.

\_\_\_\_\_  
(Signature of authorized representative of subcontractor)

In order to ensure that the said subcontractor's, certification becomes a part of all subcontracts under the prime contract, no subcontract shall be executed until an authorized representative of the Town agency (or agencies) administering this project has determined, in writing, that the said certification has been incorporated in such subcontract, regardless of tier. Any subcontract executed without such written approval shall be void.

Company Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Tel. No. (\_\_\_\_) \_\_\_\_\_

## CERTIFICATE OF NON-DISCRIMINATION

Pursuant to Section 4.5.2 of the General By-laws of the Town of Brookline, the undersigned certifies under the pains and penalties of perjury that it does not discriminate against any individual because of the race, color, religious creed, national origin, sex, gender identity or gender expression, sexual orientation, which shall not include persons whose sexual orientation involves minor children as the sex object, age or ancestry of the individual.

\_\_\_\_\_  
(Name of person signing bid)

\_\_\_\_\_  
(Company)

NOT FOR BIDDING

## WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form is available from the Department of Labor Standards (DLS) at [www.mass.gov/dols/pw](http://www.mass.gov/dols/pw) and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

On a weekly basis, every contractor and subcontractor is required to submit a certified copy of their weekly payroll records to the awarding authority; this includes the payroll forms and the Statement of Compliance form. The certified payroll records must be submitted either by regular mail or by e-mail to the awarding authority. Once collected, the awarding authority is required to preserve those records for three years from the date of completion of the project.

Each such contractor and subcontractor shall furnish weekly and within 15 days after completion of its portion of the work, to the awarding authority directly by first-class mail or e-mail, a statement, executed by the contractor, subcontractor or by any authorized officer thereof who supervised the payment of wages, this form, accompanied by their payroll:

<b>STATEMENT OF COMPLIANCE</b>	
_____, 20_____	
I, _____	_____
(Name of signatory party)	(Title)
do hereby state:	
That I pay or supervise the payment of the persons employed by	
_____	_____
(Contractor, subcontractor or public body)	(Building or project)
and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.	
Signature _____	
Title _____	

05/14



**THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT  
DEPARTMENT OF LABOR STANDARDS**

**Prevailing Wage Rates**

**As determined by the Director under the provisions of the  
Massachusetts General Laws, Chapter 149, Sections 26 to 27H**

CHARLES D. BAKER  
Governor

ROSALIN ACOSTA  
Secretary

MICHAEL FLANAGAN  
Director

KARYN E. POLITO  
Lt. Governor

**Awarding Authority:** Town of Brookline\_Engineering Div  
**Contract Number:** PW/20-15 **City/Town:** BROOKLINE  
**Description of Work:** Cypress Street Playground Ballfields, lighting, irrigation, paving, concrete walkway, plumbing, splash pad, planting, drainage, pavers  
**Job Location:** 89 Cypress Street, Brookline MA 02445

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards (“DLS”) if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F “rental of equipment” contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

**Issue Date:** 05/19/2020

**Wage Request Number:** 20200519-053

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
<b>Construction</b>						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$34.25	\$12.41	\$13.72	\$0.00	\$60.38
	06/01/2020	\$35.15	\$12.41	\$13.72	\$0.00	\$61.28
	08/01/2020	\$35.15	\$12.91	\$13.72	\$0.00	\$61.78
	12/01/2020	\$35.15	\$12.91	\$14.82	\$0.00	\$62.88
	06/01/2021	\$35.95	\$12.91	\$14.82	\$0.00	\$63.68
	08/01/2021	\$35.95	\$13.41	\$14.82	\$0.00	\$64.18
	12/01/2021	\$35.95	\$13.41	\$16.01	\$0.00	\$65.37
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$34.32	\$12.41	\$13.72	\$0.00	\$60.45
	06/01/2020	\$35.22	\$12.41	\$13.72	\$0.00	\$61.35
	08/01/2020	\$35.22	\$12.91	\$13.72	\$0.00	\$61.85
	12/01/2020	\$35.22	\$12.91	\$14.82	\$0.00	\$62.95
	06/01/2021	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	08/01/2021	\$36.02	\$13.41	\$14.82	\$0.00	\$64.25
	12/01/2021	\$36.02	\$13.41	\$16.01	\$0.00	\$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$34.44	\$12.41	\$13.72	\$0.00	\$60.57
	06/01/2020	\$35.34	\$12.41	\$13.72	\$0.00	\$61.47
	08/01/2020	\$35.34	\$12.91	\$13.72	\$0.00	\$61.97
	12/01/2020	\$35.34	\$12.91	\$14.82	\$0.00	\$63.07
	06/01/2021	\$36.14	\$12.91	\$14.82	\$0.00	\$63.87
	08/01/2021	\$36.14	\$13.41	\$14.82	\$0.00	\$64.37
	12/01/2021	\$36.14	\$13.41	\$16.01	\$0.00	\$65.56
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.90	\$8.10	\$16.60	\$0.00	\$64.60
	06/01/2020	\$39.90	\$8.60	\$17.09	\$0.00	\$65.59
	12/01/2020	\$40.88	\$8.60	\$17.09	\$0.00	\$66.57
	06/01/2021	\$41.90	\$8.60	\$17.09	\$0.00	\$67.59
	12/01/2021	\$42.91	\$8.60	\$17.09	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT &amp; FROST INSULATORS LOCAL 6 (BOSTON)</i>	12/01/2019	\$37.00	\$12.50	\$8.85	\$0.00	\$58.35
	06/01/2020	\$38.00	\$12.50	\$8.85	\$0.00	\$59.35
	12/01/2020	\$39.00	\$12.50	\$8.85	\$0.00	\$60.35
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.90	\$8.10	\$16.60	\$0.00	\$64.60
	06/01/2020	\$39.90	\$8.60	\$17.09	\$0.00	\$65.59
	12/01/2020	\$40.88	\$8.60	\$17.09	\$0.00	\$66.57
	06/01/2021	\$41.90	\$8.60	\$17.09	\$0.00	\$67.59
	12/01/2021	\$42.91	\$8.60	\$17.09	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

**Apprentice - BOILERMAKER - Local 29**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
2	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
3	70	\$32.27	\$7.07	\$12.59	\$0.00	\$51.93
4	75	\$34.58	\$7.07	\$13.49	\$0.00	\$55.14
5	80	\$36.88	\$7.07	\$14.38	\$0.00	\$58.33
6	85	\$39.19	\$7.07	\$15.29	\$0.00	\$61.55
7	90	\$41.49	\$7.07	\$16.18	\$0.00	\$64.74
8	95	\$43.80	\$7.07	\$17.09	\$0.00	\$67.96

Notes:

**Apprentice to Journeyworker Ratio:1:4**

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (BOSTON)</i>	02/01/2020	\$54.40	\$10.75	\$21.94	\$0.00	\$87.09
	08/01/2020	\$55.75	\$10.75	\$22.09	\$0.00	\$88.59
	02/01/2021	\$56.39	\$10.75	\$22.09	\$0.00	\$89.23
	08/01/2021	\$57.79	\$10.75	\$22.25	\$0.00	\$90.79
	02/01/2022	\$58.38	\$10.75	\$22.25	\$0.00	\$91.38

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Boston**

**Effective Date - 02/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.20	\$10.75	\$21.94	\$0.00	\$59.89
2	60	\$32.64	\$10.75	\$21.94	\$0.00	\$65.33
3	70	\$38.08	\$10.75	\$21.94	\$0.00	\$70.77
4	80	\$43.52	\$10.75	\$21.94	\$0.00	\$76.21
5	90	\$48.96	\$10.75	\$21.94	\$0.00	\$81.65

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.88	\$10.75	\$22.09	\$0.00	\$60.72
2	60	\$33.45	\$10.75	\$22.09	\$0.00	\$66.29
3	70	\$39.03	\$10.75	\$22.09	\$0.00	\$71.87
4	80	\$44.60	\$10.75	\$22.09	\$0.00	\$77.44
5	90	\$50.18	\$10.75	\$22.09	\$0.00	\$83.02

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

<b>BULLDOZER/GRADER/SCRAPER</b> <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>CAISSON &amp; UNDERPINNING BOTTOM MAN</b> <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2019	\$40.25	\$8.10	\$16.80	\$0.00	\$65.15
	06/01/2020	\$40.30	\$8.60	\$17.24	\$0.00	\$66.14
	12/01/2020	\$41.28	\$8.60	\$17.24	\$0.00	\$67.12
	06/01/2021	\$42.30	\$8.60	\$17.24	\$0.00	\$68.14
	12/01/2021	\$43.31	\$8.60	\$17.24	\$0.00	\$69.15

For apprentice rates see "Apprentice- LABORER"

<b>CAISSON &amp; UNDERPINNING LABORER</b> <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2019	\$39.10	\$8.10	\$16.80	\$0.00	\$64.00
	06/01/2020	\$39.15	\$8.60	\$17.24	\$0.00	\$64.99
	12/01/2020	\$40.13	\$8.60	\$17.24	\$0.00	\$65.97
	06/01/2021	\$41.15	\$8.60	\$17.24	\$0.00	\$66.99
	12/01/2021	\$42.16	\$8.60	\$17.24	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

<b>CAISSON &amp; UNDERPINNING TOP MAN</b> <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2019	\$39.10	\$8.10	\$16.80	\$0.00	\$64.00
	06/01/2020	\$39.15	\$8.60	\$17.24	\$0.00	\$64.99
	12/01/2020	\$40.13	\$8.60	\$17.24	\$0.00	\$65.97
	06/01/2021	\$41.15	\$8.60	\$17.24	\$0.00	\$66.99
	12/01/2021	\$42.16	\$8.60	\$17.24	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

CARPENTER <i>CARPENTERS -ZONE 1 (Metro Boston)</i>	03/01/2020	\$50.64	\$9.40	\$18.95	\$0.00	\$78.99
	09/01/2020	\$51.54	\$9.40	\$18.95	\$0.00	\$79.89
	03/01/2021	\$52.39	\$9.40	\$18.95	\$0.00	\$80.74
	09/01/2021	\$53.29	\$9.40	\$18.95	\$0.00	\$81.64
	03/01/2022	\$54.14	\$9.40	\$18.95	\$0.00	\$82.49
	09/01/2022	\$55.04	\$9.40	\$18.95	\$0.00	\$83.39
	03/01/2023	\$55.89	\$9.40	\$18.95	\$0.00	\$84.24

**Apprentice - CARPENTER - Zone 1 Metro Boston**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.32	\$9.40	\$1.73	\$0.00	\$36.45
2	60	\$30.38	\$9.40	\$1.73	\$0.00	\$41.51
3	70	\$35.45	\$9.40	\$13.76	\$0.00	\$58.61
4	75	\$37.98	\$9.40	\$13.76	\$0.00	\$61.14
5	80	\$40.51	\$9.40	\$15.49	\$0.00	\$65.40
6	80	\$40.51	\$9.40	\$15.49	\$0.00	\$65.40
7	90	\$45.58	\$9.40	\$17.22	\$0.00	\$72.20
8	90	\$45.58	\$9.40	\$17.22	\$0.00	\$72.20

**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.77	\$9.40	\$1.73	\$0.00	\$36.90
2	60	\$30.92	\$9.40	\$1.73	\$0.00	\$42.05
3	70	\$36.08	\$9.40	\$13.76	\$0.00	\$59.24
4	75	\$38.66	\$9.40	\$13.76	\$0.00	\$61.82
5	80	\$41.23	\$9.40	\$15.49	\$0.00	\$66.12
6	80	\$41.23	\$9.40	\$15.49	\$0.00	\$66.12
7	90	\$46.39	\$9.40	\$17.22	\$0.00	\$73.01
8	90	\$46.39	\$9.40	\$17.22	\$0.00	\$73.01

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$33.92/ 3&4 \$40.65/ 5&6 \$60.34/ 7&8 \$67.13

**Apprentice to Journeyworker Ratio:1:5**

CARPENTER WOOD FRAME <i>CARPENTERS -ZONE 1 (Wood Frame)</i>	10/01/2019	\$32.97	\$7.07	\$7.86	\$0.00	\$47.90
--	------------	---------	--------	--------	--------	---------

All Aspects of New Wood Frame Work

**Classification**

**Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate**

**Apprentice - CARPENTER (Wood Frame) - Zone 1**

**Effective Date - 10/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.78	\$7.07	\$0.00	\$0.00	\$26.85
2	60	\$19.78	\$7.07	\$0.00	\$0.00	\$26.85
3	65	\$21.43	\$7.07	\$7.86	\$0.00	\$36.36
4	70	\$23.08	\$7.07	\$7.86	\$0.00	\$38.01
5	75	\$24.73	\$7.07	\$7.86	\$0.00	\$39.66
6	80	\$26.38	\$7.07	\$7.86	\$0.00	\$41.31
7	85	\$28.02	\$7.07	\$7.86	\$0.00	\$42.95
8	90	\$29.67	\$7.07	\$7.86	\$0.00	\$44.60

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$21.91/ 3&4 \$29.95/ 5&6 \$38.01/ 7&8 \$41.31

**Apprentice to Journeyworker Ratio:1:5**

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 (BOSTON)	01/01/2020	\$49.07	\$12.75	\$22.41	\$0.62	\$84.85
---	------------	---------	---------	---------	--------	---------

**Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$12.75	\$15.41	\$0.00	\$52.70
2	60	\$29.44	\$12.75	\$17.41	\$0.62	\$60.22
3	65	\$31.90	\$12.75	\$18.41	\$0.62	\$63.68
4	70	\$34.35	\$12.75	\$19.41	\$0.62	\$67.13
5	75	\$36.80	\$12.75	\$20.41	\$0.62	\$70.58
6	80	\$39.26	\$12.75	\$21.41	\$0.62	\$74.04
7	90	\$44.16	\$12.75	\$22.41	\$0.62	\$79.94

**Notes:**

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

**Apprentice to Journeyworker Ratio:1:3**

CHAIN SAW OPERATOR LABORERS - ZONE 1	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4	12/01/2019	\$49.73	\$12.50	\$15.70	\$0.00	\$77.93
	06/01/2020	\$50.83	\$12.50	\$15.70	\$0.00	\$79.03
	12/01/2020	\$51.98	\$12.50	\$15.70	\$0.00	\$80.18
	06/01/2021	\$53.08	\$12.50	\$15.70	\$0.00	\$81.28
	12/01/2021	\$54.23	\$12.50	\$15.70	\$0.00	\$82.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$32.47	\$12.50	\$15.70	\$0.00	\$60.67
	06/01/2020	\$33.22	\$12.50	\$15.70	\$0.00	\$61.42
	12/01/2020	\$34.00	\$12.50	\$15.70	\$0.00	\$62.20
	06/01/2021	\$34.75	\$12.50	\$15.70	\$0.00	\$62.95
	12/01/2021	\$35.54	\$12.50	\$15.70	\$0.00	\$63.74

For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 1</i>	01/01/2020	\$50.96	\$8.20	\$22.10	\$0.00	\$81.26
	07/01/2020	\$52.06	\$8.20	\$22.10	\$0.00	\$82.36
	01/01/2021	\$53.16	\$8.20	\$22.10	\$0.00	\$83.46

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.48	\$8.20	\$0.00	\$0.00	\$33.68
2	55	\$28.03	\$8.20	\$5.94	\$0.00	\$42.17
3	60	\$30.58	\$8.20	\$6.48	\$0.00	\$45.26
4	65	\$33.12	\$8.20	\$7.02	\$0.00	\$48.34
5	70	\$35.67	\$8.20	\$18.86	\$0.00	\$62.73
6	75	\$38.22	\$8.20	\$19.40	\$0.00	\$65.82
7	80	\$40.77	\$8.20	\$19.94	\$0.00	\$68.91
8	90	\$45.86	\$8.20	\$21.02	\$0.00	\$75.08

**Effective Date - 07/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.20	\$0.00	\$0.00	\$34.23
2	55	\$28.63	\$8.20	\$5.94	\$0.00	\$42.77
3	60	\$31.24	\$8.20	\$6.48	\$0.00	\$45.92
4	65	\$33.84	\$8.20	\$7.02	\$0.00	\$49.06
5	70	\$36.44	\$8.20	\$18.86	\$0.00	\$63.50
6	75	\$39.05	\$8.20	\$19.40	\$0.00	\$66.65
7	80	\$41.65	\$8.20	\$19.94	\$0.00	\$69.79
8	90	\$46.85	\$8.20	\$21.02	\$0.00	\$76.07

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

DEMO: ADZEMAN <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
---	------------	---------	--------	---------	--------	---------

For apprentice rates see "Apprentice- LABORER"

DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$40.30	\$8.10	\$16.60	\$0.00	\$65.00
--	------------	---------	--------	---------	--------	---------

For apprentice rates see "Apprentice- LABORER"

DEMO: BURNERS <i>LABORERS - ZONE 1</i>	12/01/2019	\$40.05	\$8.10	\$16.60	\$0.00	\$64.75
---	------------	---------	--------	---------	--------	---------

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE 1	12/01/2019	\$40.30	\$8.10	\$16.60	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR LABORERS - ZONE 1	12/01/2019	\$40.05	\$8.10	\$16.60	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER LABORERS - ZONE 1	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2019	\$68.52	\$9.90	\$21.15	\$0.00	\$99.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2019	\$73.41	\$9.90	\$21.15	\$0.00	\$104.46
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) ELECTRICIANS LOCAL 103	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN ELECTRICIANS LOCAL 103	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83

**Apprentice - ELECTRICIAN - Local 103**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.40	\$13.00	\$0.64	\$0.00	\$35.04
2	40	\$21.40	\$13.00	\$0.64	\$0.00	\$35.04
3	45	\$24.08	\$13.00	\$14.62	\$0.00	\$51.70
4	45	\$24.08	\$13.00	\$14.62	\$0.00	\$51.70
5	50	\$26.75	\$13.00	\$15.04	\$0.00	\$54.79
6	55	\$29.43	\$13.00	\$15.46	\$0.00	\$57.89
7	60	\$32.10	\$13.00	\$15.87	\$0.00	\$60.97
8	65	\$34.78	\$13.00	\$16.29	\$0.00	\$64.07
9	70	\$37.45	\$13.00	\$16.70	\$0.00	\$67.15
10	75	\$40.13	\$13.00	\$17.12	\$0.00	\$70.25

**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.97	\$13.00	\$0.66	\$0.00	\$35.63
2	40	\$21.97	\$13.00	\$0.66	\$0.00	\$35.63
3	45	\$24.72	\$13.00	\$14.64	\$0.00	\$52.36
4	45	\$24.72	\$13.00	\$14.64	\$0.00	\$52.36
5	50	\$27.47	\$13.00	\$15.06	\$0.00	\$55.53
6	55	\$30.21	\$13.00	\$15.49	\$0.00	\$58.70
7	60	\$32.96	\$13.00	\$15.90	\$0.00	\$61.86
8	65	\$35.70	\$13.00	\$16.32	\$0.00	\$65.02
9	70	\$38.45	\$13.00	\$16.73	\$0.00	\$68.18
10	75	\$41.20	\$13.00	\$17.16	\$0.00	\$71.36

**Notes :**

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

**Apprentice to Journeyworker Ratio:2:3\*\*\***

ELEVATOR CONSTRUCTOR	01/01/2020	\$61.42	\$15.73	\$18.41	\$0.00	\$95.56
ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2021	\$63.47	\$15.88	\$19.31	\$0.00	\$98.66
	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - ELEVATOR CONSTRUCTOR - Local 4**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.71	\$15.73	\$0.00	\$0.00	\$46.44
2	55	\$33.78	\$15.73	\$18.41	\$0.00	\$67.92
3	65	\$39.92	\$15.73	\$18.41	\$0.00	\$74.06
4	70	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
5	80	\$49.14	\$15.73	\$18.41	\$0.00	\$83.28

**Effective Date - 01/01/2021**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.74	\$15.88	\$0.00	\$0.00	\$47.62
2	55	\$34.91	\$15.88	\$19.31	\$0.00	\$70.10
3	65	\$41.26	\$15.88	\$19.31	\$0.00	\$76.45
4	70	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
5	80	\$50.78	\$15.88	\$19.31	\$0.00	\$85.97

**Notes:**

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

**Apprentice to Journeyworker Ratio:1:1**

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2020	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
	01/01/2021	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2020	\$44.73	\$12.50	\$15.70	\$0.00	\$72.93
	11/01/2020	\$45.73	\$12.50	\$15.70	\$0.00	\$73.93
	05/01/2021	\$46.88	\$12.50	\$15.70	\$0.00	\$75.08
	11/01/2021	\$47.88	\$12.50	\$15.70	\$0.00	\$76.08
	05/01/2022	\$49.03	\$12.50	\$15.70	\$0.00	\$77.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2020	\$46.23	\$12.50	\$15.70	\$0.00	\$74.43
	11/01/2020	\$47.24	\$12.50	\$15.70	\$0.00	\$75.44
	05/01/2021	\$48.40	\$12.50	\$15.70	\$0.00	\$76.60
	11/01/2021	\$49.41	\$12.50	\$15.70	\$0.00	\$77.61
	05/01/2022	\$50.57	\$12.50	\$15.70	\$0.00	\$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2020	\$22.64	\$12.50	\$15.70	\$0.00	\$50.84
	11/01/2020	\$23.23	\$12.50	\$15.70	\$0.00	\$51.43
	05/01/2021	\$23.91	\$12.50	\$15.70	\$0.00	\$52.11
	11/01/2021	\$24.51	\$12.50	\$15.70	\$0.00	\$52.71
	05/01/2022	\$25.18	\$12.50	\$15.70	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE <i>LOCAL 103</i> / COMMISSIONING <i>ELECTRICIANS</i>	03/01/2020	\$40.13	\$13.00	\$17.12	\$0.00	\$70.25
	09/01/2020	\$41.20	\$13.00	\$17.16	\$0.00	\$71.36
	03/01/2021	\$42.66	\$13.00	\$17.27	\$0.00	\$72.93
	09/01/2021	\$44.32	\$13.00	\$17.38	\$0.00	\$74.70
	03/01/2022	\$45.83	\$13.00	\$17.49	\$0.00	\$76.32
	09/01/2022	\$47.55	\$13.00	\$17.62	\$0.00	\$78.17
	03/01/2023	\$49.11	\$13.00	\$17.73	\$0.00	\$79.84
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$39.89	\$12.50	\$15.70	\$0.00	\$68.09
	06/01/2020	\$40.80	\$12.50	\$15.70	\$0.00	\$69.00
	12/01/2020	\$41.75	\$12.50	\$15.70	\$0.00	\$69.95
	06/01/2021	\$42.66	\$12.50	\$15.70	\$0.00	\$70.86
	12/01/2021	\$43.61	\$12.50	\$15.70	\$0.00	\$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER <i>LABORERS - ZONE 1</i>	12/01/2019	\$23.50	\$8.10	\$16.60	\$0.00	\$48.20
	06/01/2020	\$23.50	\$8.60	\$17.09	\$0.00	\$49.19
	12/01/2020	\$24.50	\$8.60	\$17.09	\$0.00	\$50.19
	06/01/2021	\$24.50	\$8.60	\$17.09	\$0.00	\$50.19
	12/01/2021	\$24.50	\$8.60	\$17.09	\$0.00	\$50.19
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	03/01/2020	\$47.05	\$9.40	\$19.25	\$0.00	\$75.70
	09/01/2020	\$47.85	\$9.40	\$19.25	\$0.00	\$76.50
	03/01/2021	\$48.65	\$9.40	\$19.25	\$0.00	\$77.30
	09/01/2021	\$49.45	\$9.40	\$19.25	\$0.00	\$78.10
	03/01/2022	\$50.25	\$9.40	\$19.25	\$0.00	\$78.90

**Classification**

**Effective Date   Base Wage   Health   Pension   Supplemental Unemployment   Total Rate**

**Apprentice - FLOORCOVERER - Local 2168 Zone 1**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.53	\$9.40	\$1.79	\$0.00	\$34.72
2	55	\$25.88	\$9.40	\$1.79	\$0.00	\$37.07
3	60	\$28.23	\$9.40	\$13.88	\$0.00	\$51.51
4	65	\$30.58	\$9.40	\$13.88	\$0.00	\$53.86
5	70	\$32.94	\$9.40	\$15.67	\$0.00	\$58.01
6	75	\$35.29	\$9.40	\$15.67	\$0.00	\$60.36
7	80	\$37.64	\$9.40	\$17.46	\$0.00	\$64.50
8	85	\$39.99	\$9.40	\$17.46	\$0.00	\$66.85

**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.93	\$9.40	\$1.79	\$0.00	\$35.12
2	55	\$26.32	\$9.40	\$1.79	\$0.00	\$37.51
3	60	\$28.71	\$9.40	\$13.88	\$0.00	\$51.99
4	65	\$31.10	\$9.40	\$13.88	\$0.00	\$54.38
5	70	\$33.50	\$9.40	\$15.67	\$0.00	\$58.57
6	75	\$35.89	\$9.40	\$15.67	\$0.00	\$60.96
7	80	\$38.28	\$9.40	\$17.46	\$0.00	\$65.14
8	85	\$40.67	\$9.40	\$17.46	\$0.00	\$67.53

**Notes:** Steps are 750 hrs.  
 % After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)  
 Step 1&2 \$32.36/ 3&4 \$38.80/ 5&6 \$58.01/ 7&8 \$64.50

**Apprentice to Journeyworker Ratio:1:1**

<b>FORK LIFT/CHERRY PICKER</b> <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
<b>GENERATOR/LIGHTING PLANT/HEATERS</b> <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$32.47	\$12.50	\$15.70	\$0.00	\$60.67
	06/01/2020	\$33.22	\$12.50	\$15.70	\$0.00	\$61.42
	12/01/2020	\$34.00	\$12.50	\$15.70	\$0.00	\$62.20
	06/01/2021	\$34.75	\$12.50	\$15.70	\$0.00	\$62.95
	12/01/2021	\$35.54	\$12.50	\$15.70	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
<b>GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)</b> <i>GLAZIERS LOCAL 35 (ZONE 1)</i>	01/01/2020	\$46.25	\$8.20	\$22.10	\$0.00	\$76.55
	07/01/2020	\$47.35	\$8.20	\$22.10	\$0.00	\$77.65
	01/01/2021	\$48.45	\$8.20	\$22.10	\$0.00	\$78.75

**Apprentice - GLAZIER - Local 35 Zone 1**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.13	\$8.20	\$0.00	\$0.00	\$31.33
2	55	\$25.44	\$8.20	\$5.94	\$0.00	\$39.58
3	60	\$27.75	\$8.20	\$6.48	\$0.00	\$42.43
4	65	\$30.06	\$8.20	\$7.02	\$0.00	\$45.28
5	70	\$32.38	\$8.20	\$18.86	\$0.00	\$59.44
6	75	\$34.69	\$8.20	\$19.40	\$0.00	\$62.29
7	80	\$37.00	\$8.20	\$19.94	\$0.00	\$65.14
8	90	\$41.63	\$8.20	\$21.02	\$0.00	\$70.85

**Effective Date - 07/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.68	\$8.20	\$0.00	\$0.00	\$31.88
2	55	\$26.04	\$8.20	\$5.94	\$0.00	\$40.18
3	60	\$28.41	\$8.20	\$6.48	\$0.00	\$43.09
4	65	\$30.78	\$8.20	\$7.02	\$0.00	\$46.00
5	70	\$33.15	\$8.20	\$18.86	\$0.00	\$60.21
6	75	\$35.51	\$8.20	\$19.40	\$0.00	\$63.11
7	80	\$37.88	\$8.20	\$19.94	\$0.00	\$66.02
8	90	\$42.62	\$8.20	\$21.02	\$0.00	\$71.84

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

HOISTING ENGINEER/CRANES/GRADALLS	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
OPERATING ENGINEERS LOCAL 4	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43

**Classification**

**Effective Date   Base Wage   Health   Pension   Supplemental Unemployment   Total Rate**

**Apprentice - OPERATING ENGINEERS - Local 4**

**Effective Date - 12/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$26.80	\$12.50	\$0.00	\$0.00	\$39.30
2	60	\$29.24	\$12.50	\$15.70	\$0.00	\$57.44
3	65	\$31.67	\$12.50	\$15.70	\$0.00	\$59.87
4	70	\$34.11	\$12.50	\$15.70	\$0.00	\$62.31
5	75	\$36.55	\$12.50	\$15.70	\$0.00	\$64.75
6	80	\$38.98	\$12.50	\$15.70	\$0.00	\$67.18
7	85	\$41.42	\$12.50	\$15.70	\$0.00	\$69.62
8	90	\$43.86	\$12.50	\$15.70	\$0.00	\$72.06

**Effective Date - 06/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$27.41	\$12.50	\$0.00	\$0.00	\$39.91
2	60	\$29.90	\$12.50	\$15.70	\$0.00	\$58.10
3	65	\$32.39	\$12.50	\$15.70	\$0.00	\$60.59
4	70	\$34.88	\$12.50	\$15.70	\$0.00	\$63.08
5	75	\$37.37	\$12.50	\$15.70	\$0.00	\$65.57
6	80	\$39.86	\$12.50	\$15.70	\$0.00	\$68.06
7	85	\$42.36	\$12.50	\$15.70	\$0.00	\$70.56
8	90	\$44.85	\$12.50	\$15.70	\$0.00	\$73.05

**Notes:**

**Apprentice to Journeyworker Ratio:1:6**

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2020	\$49.36	\$13.35	\$24.12	\$2.61	\$89.44
	08/01/2020	\$50.96	\$13.35	\$24.12	\$2.66	\$91.09
	02/01/2021	\$52.61	\$13.35	\$24.12	\$2.71	\$92.79
	08/01/2021	\$54.36	\$13.35	\$24.12	\$2.76	\$94.59
	02/01/2022	\$56.11	\$13.35	\$24.12	\$2.81	\$96.39

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2020	\$49.36	\$13.35	\$24.12	\$2.61	\$89.44
	08/01/2020	\$50.96	\$13.35	\$24.12	\$2.66	\$91.09
	02/01/2021	\$52.61	\$13.35	\$24.12	\$2.71	\$92.79
	08/01/2021	\$54.36	\$13.35	\$24.12	\$2.76	\$94.59
	02/01/2022	\$56.11	\$13.35	\$24.12	\$2.81	\$96.39
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.19	\$10.95	\$19.74	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.19	\$10.95	\$19.74	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.90	\$8.10	\$16.60	\$0.00	\$64.60
	06/01/2020	\$39.90	\$8.60	\$17.09	\$0.00	\$65.59
	12/01/2020	\$40.88	\$8.60	\$17.09	\$0.00	\$66.57
	06/01/2021	\$41.90	\$8.60	\$17.09	\$0.00	\$67.59
	12/01/2021	\$42.91	\$8.60	\$17.09	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>HEAT &amp; FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2019	\$48.44	\$12.80	\$16.40	\$0.00	\$77.64

**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston**

**Effective Date - 09/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.22	\$12.80	\$11.90	\$0.00	\$48.92
2	60	\$29.06	\$12.80	\$12.80	\$0.00	\$54.66
3	70	\$33.91	\$12.80	\$13.70	\$0.00	\$60.41
4	80	\$38.75	\$12.80	\$14.60	\$0.00	\$66.15

**Notes:**

Steps are 1 year

**Apprentice to Journeyworker Ratio:1:4**

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i>	03/16/2019	\$46.66	\$8.00	\$23.50	\$0.00	\$78.16
---	------------	---------	--------	---------	--------	---------

**Apprentice - IRONWORKER - Local 7 Boston**

**Effective Date - 03/16/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$28.00	\$8.00	\$23.50	\$0.00	\$59.50
2	70	\$32.66	\$8.00	\$23.50	\$0.00	\$64.16
3	75	\$35.00	\$8.00	\$23.50	\$0.00	\$66.50
4	80	\$37.33	\$8.00	\$23.50	\$0.00	\$68.83
5	85	\$39.66	\$8.00	\$23.50	\$0.00	\$71.16
6	90	\$41.99	\$8.00	\$23.50	\$0.00	\$73.49

**Notes:**

\*\* Structural 1:6; Ornamental 1:4

**Apprentice to Journeyworker Ratio:\*\***

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 1	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS - ZONE 1	12/01/2019	\$39.15	\$8.10	\$16.60	\$0.00	\$63.85
	06/01/2020	\$39.15	\$8.60	\$17.09	\$0.00	\$64.84
	12/01/2020	\$40.13	\$8.60	\$17.09	\$0.00	\$65.82
	06/01/2021	\$41.15	\$8.60	\$17.09	\$0.00	\$66.84
	12/01/2021	\$42.16	\$8.60	\$17.09	\$0.00	\$67.85

**Apprentice - LABORER - Zone 1**

**Effective Date - 12/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.49	\$8.10	\$16.60	\$0.00	\$48.19
2	70	\$27.41	\$8.10	\$16.60	\$0.00	\$52.11
3	80	\$31.32	\$8.10	\$16.60	\$0.00	\$56.02
4	90	\$35.24	\$8.10	\$16.60	\$0.00	\$59.94

**Effective Date - 06/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.49	\$8.60	\$17.09	\$0.00	\$49.18
2	70	\$27.41	\$8.60	\$17.09	\$0.00	\$53.10
3	80	\$31.32	\$8.60	\$17.09	\$0.00	\$57.01
4	90	\$35.24	\$8.60	\$17.09	\$0.00	\$60.93

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.15	\$8.10	\$16.60	\$0.00	\$63.85
	06/01/2020	\$39.15	\$8.60	\$17.09	\$0.00	\$64.84
	12/01/2020	\$40.13	\$8.60	\$17.09	\$0.00	\$65.82
	06/01/2021	\$41.15	\$8.60	\$17.09	\$0.00	\$66.84
	12/01/2021	\$42.16	\$8.60	\$17.09	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.15	\$8.10	\$16.60	\$0.00	\$63.85
	06/01/2020	\$39.15	\$8.60	\$17.09	\$0.00	\$64.84
	12/01/2020	\$40.13	\$8.60	\$17.09	\$0.00	\$65.82
	06/01/2021	\$41.15	\$8.60	\$17.09	\$0.00	\$66.84
	12/01/2021	\$42.16	\$8.60	\$17.09	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
	06/01/2020	\$39.30	\$8.60	\$17.09	\$0.00	\$64.99
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.15	\$8.10	\$16.60	\$0.00	\$63.85
	06/01/2020	\$39.15	\$8.60	\$17.09	\$0.00	\$64.84
	12/01/2020	\$40.13	\$8.60	\$17.09	\$0.00	\$65.82
	06/01/2021	\$41.15	\$8.60	\$17.09	\$0.00	\$66.84
	12/01/2021	\$42.16	\$8.60	\$17.09	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.15	\$8.10	\$16.60	\$0.00	\$63.85
	06/01/2020	\$39.15	\$8.60	\$17.09	\$0.00	\$64.84
	12/01/2020	\$40.13	\$8.60	\$17.09	\$0.00	\$65.82
	06/01/2021	\$41.15	\$8.60	\$17.09	\$0.00	\$66.84
	12/01/2021	\$42.16	\$8.60	\$17.09	\$0.00	\$67.85
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	02/01/2020	\$41.49	\$10.75	\$20.12	\$0.00	\$72.36
	08/01/2020	\$42.57	\$10.75	\$20.27	\$0.00	\$73.59
	02/01/2021	\$43.08	\$10.75	\$20.27	\$0.00	\$74.10
	08/01/2021	\$44.20	\$10.75	\$20.43	\$0.00	\$75.38
	02/01/2022	\$44.67	\$10.75	\$20.43	\$0.00	\$75.85

**Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**

**Effective Date - 02/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.75	\$10.75	\$20.12	\$0.00	\$51.62
2	60	\$24.89	\$10.75	\$20.12	\$0.00	\$55.76
3	70	\$29.04	\$10.75	\$20.12	\$0.00	\$59.91
4	80	\$33.19	\$10.75	\$20.12	\$0.00	\$64.06
5	90	\$37.34	\$10.75	\$20.12	\$0.00	\$68.21

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.29	\$10.75	\$20.27	\$0.00	\$52.31
2	60	\$25.54	\$10.75	\$20.27	\$0.00	\$56.56
3	70	\$29.80	\$10.75	\$20.27	\$0.00	\$60.82
4	80	\$34.06	\$10.75	\$20.27	\$0.00	\$65.08
5	90	\$38.31	\$10.75	\$20.27	\$0.00	\$69.33

Notes:

**Apprentice to Journeyworker Ratio:1:3**

MARBLE MASONS, TILELAYERS & TERRAZZO MECH	02/01/2020	\$54.42	\$10.75	\$21.93	\$0.00	\$87.10
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2020	\$55.77	\$10.75	\$22.08	\$0.00	\$88.60
	02/01/2021	\$56.41	\$10.75	\$22.08	\$0.00	\$89.24
	08/01/2021	\$57.81	\$10.75	\$22.24	\$0.00	\$90.80
	02/01/2022	\$58.38	\$10.75	\$22.24	\$0.00	\$91.37

NOT FOR BIDDING

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile**

**Effective Date - 02/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.21	\$10.75	\$21.93	\$0.00	\$59.89
2	60	\$32.65	\$10.75	\$21.93	\$0.00	\$65.33
3	70	\$38.09	\$10.75	\$21.93	\$0.00	\$70.77
4	80	\$43.54	\$10.75	\$21.93	\$0.00	\$76.22
5	90	\$48.98	\$10.75	\$21.93	\$0.00	\$81.66

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.89	\$10.75	\$22.08	\$0.00	\$60.72
2	60	\$33.46	\$10.75	\$22.08	\$0.00	\$66.29
3	70	\$39.04	\$10.75	\$22.08	\$0.00	\$71.87
4	80	\$44.62	\$10.75	\$22.08	\$0.00	\$77.45
5	90	\$50.19	\$10.75	\$22.08	\$0.00	\$83.02

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) <i>MILLWRIGHTS LOCAL 1121 - Zone 2</i>	04/01/2019	\$38.87	\$9.90	\$18.50	\$0.00	\$67.27

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - MILLWRIGHT - Local 1121 Zone 2**

**Effective Date - 04/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$21.38	\$9.90	\$5.31	\$0.00	\$36.59
2	65	\$25.27	\$9.90	\$15.13	\$0.00	\$50.30
3	75	\$29.15	\$9.90	\$16.10	\$0.00	\$55.15
4	85	\$33.04	\$9.90	\$17.06	\$0.00	\$60.00

**Notes:**

Steps are 2,000 hours

**Apprentice to Journeyworker Ratio:1:5**

<b>MORTAR MIXER</b> <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

<b>OILER (OTHER THAN TRUCK CRANES,GRADALLS)</b> <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$23.08	\$12.50	\$15.70	\$0.00	\$51.28
	06/01/2020	\$23.63	\$12.50	\$15.70	\$0.00	\$51.83
	12/01/2020	\$24.20	\$12.50	\$15.70	\$0.00	\$52.40
	06/01/2021	\$24.75	\$12.50	\$15.70	\$0.00	\$52.95
	12/01/2021	\$25.33	\$12.50	\$15.70	\$0.00	\$53.53

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>OILER (TRUCK CRANES, GRADALLS)</b> <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$27.64	\$12.50	\$15.70	\$0.00	\$55.84
	06/01/2020	\$28.29	\$12.50	\$15.70	\$0.00	\$56.49
	12/01/2020	\$28.97	\$12.50	\$15.70	\$0.00	\$57.17
	06/01/2021	\$29.61	\$12.50	\$15.70	\$0.00	\$57.81
	12/01/2021	\$30.29	\$12.50	\$15.70	\$0.00	\$58.49

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>OTHER POWER DRIVEN EQUIPMENT - CLASS II</b> <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<b>PAINTER (BRIDGES/TANKS)</b> <i>PAINTERS LOCAL 35 - ZONE 1</i>	01/01/2020	\$50.96	\$8.20	\$22.10	\$0.00	\$81.26
	07/01/2020	\$52.06	\$8.20	\$22.10	\$0.00	\$82.36
	01/01/2021	\$53.16	\$8.20	\$22.10	\$0.00	\$83.46

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.48	\$8.20	\$0.00	\$0.00	\$33.68
2	55	\$28.03	\$8.20	\$5.94	\$0.00	\$42.17
3	60	\$30.58	\$8.20	\$6.48	\$0.00	\$45.26
4	65	\$33.12	\$8.20	\$7.02	\$0.00	\$48.34
5	70	\$35.67	\$8.20	\$18.86	\$0.00	\$62.73
6	75	\$38.22	\$8.20	\$19.40	\$0.00	\$65.82
7	80	\$40.77	\$8.20	\$19.94	\$0.00	\$68.91
8	90	\$45.86	\$8.20	\$21.02	\$0.00	\$75.08

**Effective Date - 07/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.20	\$0.00	\$0.00	\$34.23
2	55	\$28.63	\$8.20	\$5.94	\$0.00	\$42.77
3	60	\$31.24	\$8.20	\$6.48	\$0.00	\$45.92
4	65	\$33.84	\$8.20	\$7.02	\$0.00	\$49.06
5	70	\$36.44	\$8.20	\$18.86	\$0.00	\$63.50
6	75	\$39.05	\$8.20	\$19.40	\$0.00	\$66.65
7	80	\$41.65	\$8.20	\$19.94	\$0.00	\$69.79
8	90	\$46.85	\$8.20	\$21.02	\$0.00	\$76.07

**Notes:**  
Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2020	\$47.65	\$8.20	\$22.10	\$0.00	\$77.95
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 1	07/01/2020	\$48.75	\$8.20	\$22.10	\$0.00	\$79.05
	01/01/2021	\$49.85	\$8.20	\$22.10	\$0.00	\$80.15

Apprentice - PAINTER Local 35 Zone 1 - Spray/Sandblast - New

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.83	\$8.20	\$0.00	\$0.00	\$32.03
2	55	\$26.21	\$8.20	\$5.94	\$0.00	\$40.35
3	60	\$28.59	\$8.20	\$6.48	\$0.00	\$43.27
4	65	\$30.97	\$8.20	\$7.02	\$0.00	\$46.19
5	70	\$33.36	\$8.20	\$18.86	\$0.00	\$60.42
6	75	\$35.74	\$8.20	\$19.40	\$0.00	\$63.34
7	80	\$38.12	\$8.20	\$19.94	\$0.00	\$66.26
8	90	\$42.89	\$8.20	\$21.02	\$0.00	\$72.11

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.38	\$8.20	\$0.00	\$0.00	\$32.58
2	55	\$26.81	\$8.20	\$5.94	\$0.00	\$40.95
3	60	\$29.25	\$8.20	\$6.48	\$0.00	\$43.93
4	65	\$31.69	\$8.20	\$7.02	\$0.00	\$46.91
5	70	\$34.13	\$8.20	\$18.86	\$0.00	\$61.19
6	75	\$36.56	\$8.20	\$19.40	\$0.00	\$64.16
7	80	\$39.00	\$8.20	\$19.94	\$0.00	\$67.14
8	90	\$43.88	\$8.20	\$21.02	\$0.00	\$73.10

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	01/01/2020	\$45.71	\$8.20	\$22.10	\$0.00	\$76.01
PAINTERS LOCAL 35 - ZONE 1	07/01/2020	\$46.81	\$8.20	\$22.10	\$0.00	\$77.11
	01/01/2021	\$47.91	\$8.20	\$22.10	\$0.00	\$78.21

**Classification**

**Effective Date   Base Wage   Health   Pension   Supplemental Unemployment   Total Rate**

**Apprentice - PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.86	\$8.20	\$0.00	\$0.00	\$31.06
2	55	\$25.14	\$8.20	\$5.94	\$0.00	\$39.28
3	60	\$27.43	\$8.20	\$6.48	\$0.00	\$42.11
4	65	\$29.71	\$8.20	\$7.02	\$0.00	\$44.93
5	70	\$32.00	\$8.20	\$18.86	\$0.00	\$59.06
6	75	\$34.28	\$8.20	\$19.40	\$0.00	\$61.88
7	80	\$36.57	\$8.20	\$19.94	\$0.00	\$64.71
8	90	\$41.14	\$8.20	\$21.02	\$0.00	\$70.36

**Effective Date - 07/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.41	\$8.20	\$0.00	\$0.00	\$31.61
2	55	\$25.75	\$8.20	\$5.94	\$0.00	\$39.89
3	60	\$28.09	\$8.20	\$6.48	\$0.00	\$42.77
4	65	\$30.43	\$8.20	\$7.02	\$0.00	\$45.65
5	70	\$32.77	\$8.20	\$18.86	\$0.00	\$59.83
6	75	\$35.11	\$8.20	\$19.40	\$0.00	\$62.71
7	80	\$37.45	\$8.20	\$19.94	\$0.00	\$65.59
8	90	\$42.13	\$8.20	\$21.02	\$0.00	\$71.35

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (TRAFFIC MARKINGS) LABORERS - ZONE 1	12/01/2019	\$39.15	\$8.10	\$16.60	\$0.00	\$63.85
	06/01/2020	\$39.15	\$8.60	\$17.09	\$0.00	\$64.84
	12/01/2020	\$40.13	\$8.60	\$17.09	\$0.00	\$65.82
	06/01/2021	\$41.15	\$8.60	\$17.09	\$0.00	\$66.84
	12/01/2021	\$42.16	\$8.60	\$17.09	\$0.00	\$67.85
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) *	01/01/2020	\$46.25	\$8.20	\$22.10	\$0.00	\$76.55
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 1	07/01/2020	\$47.35	\$8.20	\$22.10	\$0.00	\$77.65
	01/01/2021	\$48.45	\$8.20	\$22.10	\$0.00	\$78.75

Apprentice - PAINTER - Local 35 Zone 1 - BRUSH NEW

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.13	\$8.20	\$0.00	\$0.00	\$31.33
2	55	\$25.44	\$8.20	\$5.94	\$0.00	\$39.58
3	60	\$27.75	\$8.20	\$6.48	\$0.00	\$42.43
4	65	\$30.06	\$8.20	\$7.02	\$0.00	\$45.28
5	70	\$32.38	\$8.20	\$18.86	\$0.00	\$59.44
6	75	\$34.69	\$8.20	\$19.40	\$0.00	\$62.29
7	80	\$37.00	\$8.20	\$19.94	\$0.00	\$65.14
8	90	\$41.63	\$8.20	\$21.02	\$0.00	\$70.85

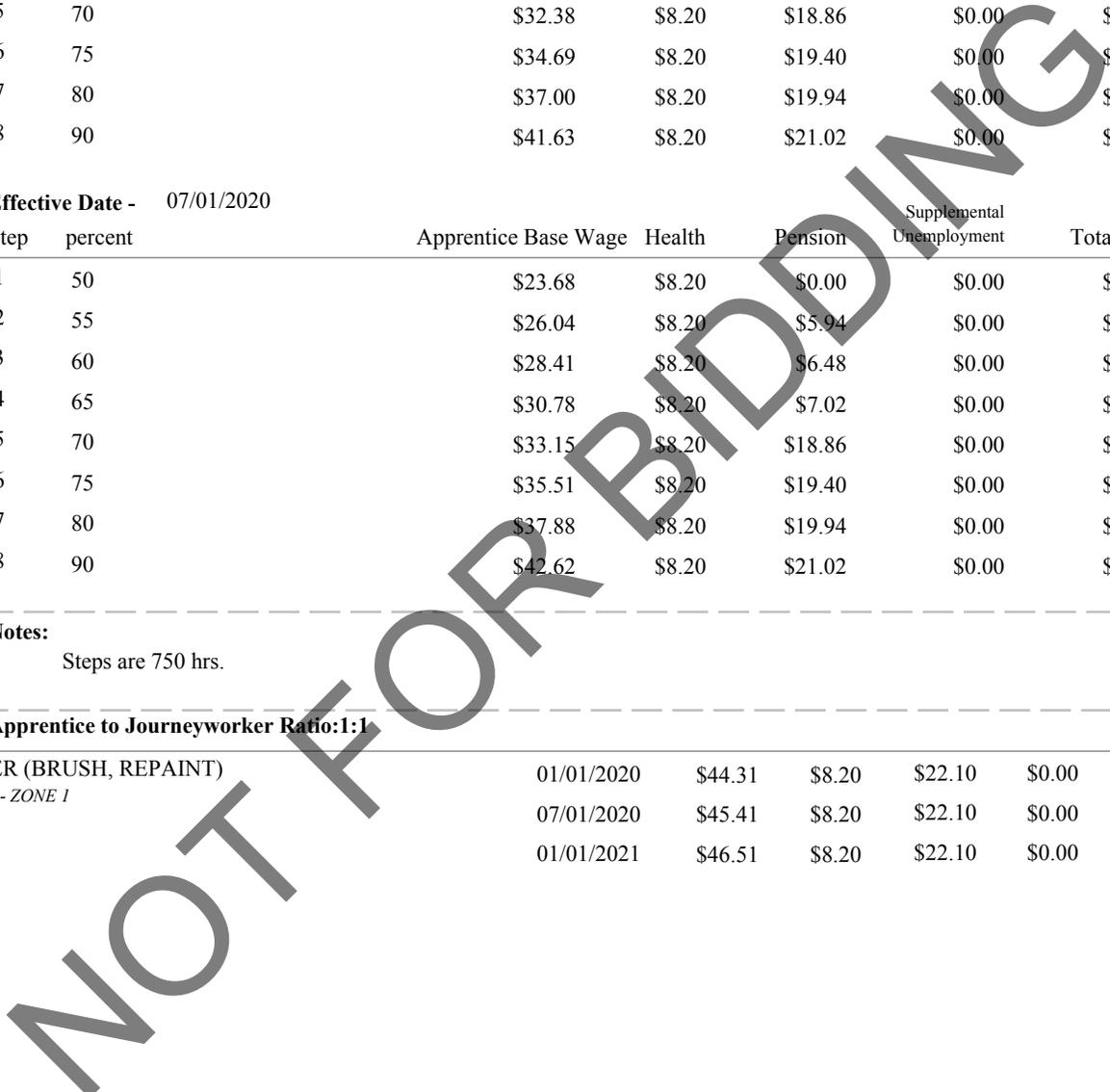
Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.68	\$8.20	\$0.00	\$0.00	\$31.88
2	55	\$26.04	\$8.20	\$5.94	\$0.00	\$40.18
3	60	\$28.41	\$8.20	\$6.48	\$0.00	\$43.09
4	65	\$30.78	\$8.20	\$7.02	\$0.00	\$46.00
5	70	\$33.15	\$8.20	\$18.86	\$0.00	\$60.21
6	75	\$35.51	\$8.20	\$19.40	\$0.00	\$63.11
7	80	\$37.88	\$8.20	\$19.94	\$0.00	\$66.02
8	90	\$42.62	\$8.20	\$21.02	\$0.00	\$71.84

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	01/01/2020	\$44.31	\$8.20	\$22.10	\$0.00	\$74.61
PAINTERS LOCAL 35 - ZONE 1	07/01/2020	\$45.41	\$8.20	\$22.10	\$0.00	\$75.71
	01/01/2021	\$46.51	\$8.20	\$22.10	\$0.00	\$76.81



**Classification**

**Effective Date   Base Wage   Health   Pension   Supplemental Unemployment   Total Rate**

**Apprentice - PAINTER Local 35 Zone 1 - BRUSH REPAINT**

**Effective Date - 01/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.16	\$8.20	\$0.00	\$0.00	\$30.36
2	55	\$24.37	\$8.20	\$5.94	\$0.00	\$38.51
3	60	\$26.59	\$8.20	\$6.48	\$0.00	\$41.27
4	65	\$28.80	\$8.20	\$7.02	\$0.00	\$44.02
5	70	\$31.02	\$8.20	\$18.86	\$0.00	\$58.08
6	75	\$33.23	\$8.20	\$19.40	\$0.00	\$60.83
7	80	\$35.45	\$8.20	\$19.94	\$0.00	\$63.59
8	90	\$39.88	\$8.20	\$21.02	\$0.00	\$69.10

**Effective Date - 07/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.71	\$8.20	\$0.00	\$0.00	\$30.91
2	55	\$24.98	\$8.20	\$5.94	\$0.00	\$39.12
3	60	\$27.25	\$8.20	\$6.48	\$0.00	\$41.93
4	65	\$29.52	\$8.20	\$7.02	\$0.00	\$44.74
5	70	\$31.79	\$8.20	\$18.86	\$0.00	\$58.85
6	75	\$34.06	\$8.20	\$19.40	\$0.00	\$61.66
7	80	\$36.33	\$8.20	\$19.94	\$0.00	\$64.47
8	90	\$40.87	\$8.20	\$21.02	\$0.00	\$70.09

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PANEL & PICKUP TRUCKS DRIVER <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$34.08	\$12.41	\$13.72	\$0.00	\$60.21
	06/01/2020	\$34.98	\$12.41	\$13.72	\$0.00	\$61.11
	08/01/2020	\$34.98	\$12.91	\$13.72	\$0.00	\$61.61
	12/01/2020	\$34.98	\$12.91	\$14.82	\$0.00	\$62.71
	06/01/2021	\$35.78	\$12.91	\$14.82	\$0.00	\$63.51
	08/01/2021	\$35.78	\$13.41	\$14.82	\$0.00	\$64.01
	12/01/2021	\$35.78	\$13.41	\$16.01	\$0.00	\$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i> For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99

**Apprentice - PILE DRIVER - Local 56 Zone 1**

**Effective Date - 08/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.47	\$9.90	\$21.15	\$0.00	\$55.52
2	60	\$29.36	\$9.90	\$21.15	\$0.00	\$60.41
3	70	\$34.26	\$9.90	\$21.15	\$0.00	\$65.31
4	75	\$36.71	\$9.90	\$21.15	\$0.00	\$67.76
5	80	\$39.15	\$9.90	\$21.15	\$0.00	\$70.20
6	80	\$39.15	\$9.90	\$21.15	\$0.00	\$70.20
7	90	\$44.05	\$9.90	\$21.15	\$0.00	\$75.10
8	90	\$44.05	\$9.90	\$21.15	\$0.00	\$75.10

Notes:

**Apprentice to Journeyworker Ratio:1:5**

PIPEFITTER & STEAMFITTER	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
PIPEFITTERS LOCAL 537	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.19	\$10.95	\$19.74	\$0.00	\$89.88

**Apprentice - PIPEFITTER - Local 537**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$22.48	\$10.95	\$8.00	\$0.00	\$41.43
2	45	\$25.29	\$10.95	\$19.74	\$0.00	\$55.98
3	60	\$33.71	\$10.95	\$19.74	\$0.00	\$64.40
4	70	\$39.33	\$10.95	\$19.74	\$0.00	\$70.02
5	80	\$44.95	\$10.95	\$19.74	\$0.00	\$75.64

**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$23.08	\$10.95	\$8.00	\$0.00	\$42.03
2	45	\$25.96	\$10.95	\$19.74	\$0.00	\$56.65
3	60	\$34.61	\$10.95	\$19.74	\$0.00	\$65.30
4	70	\$40.38	\$10.95	\$19.74	\$0.00	\$71.07
5	80	\$46.15	\$10.95	\$19.74	\$0.00	\$76.84

Notes:

\*\* 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.  
Refrig/AC Mechanic \*\*1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

**Apprentice to Journeyworker Ratio:\*\***

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

PLUMBERS & GASFITTERS <i>PLUMBERS &amp; GASFITTERS LOCAL 12</i>	03/01/2020	\$58.69	\$12.07	\$17.26	\$0.00	\$88.02
	09/01/2020	\$60.19	\$12.07	\$17.26	\$0.00	\$89.52
	03/01/2021	\$61.69	\$12.07	\$17.26	\$0.00	\$91.02

**Apprentice - PLUMBER/GASFITTER - Local 12**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$20.54	\$12.07	\$6.24	\$0.00	\$38.85
2	40	\$23.48	\$12.07	\$7.08	\$0.00	\$42.63
3	55	\$32.28	\$12.07	\$9.63	\$0.00	\$53.98
4	65	\$38.15	\$12.07	\$11.33	\$0.00	\$61.55
5	75	\$44.02	\$12.07	\$13.03	\$0.00	\$69.12

**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.07	\$12.07	\$6.24	\$0.00	\$39.38
2	40	\$24.08	\$12.07	\$7.08	\$0.00	\$43.23
3	55	\$33.10	\$12.07	\$9.63	\$0.00	\$54.80
4	65	\$39.12	\$12.07	\$11.33	\$0.00	\$62.52
5	75	\$45.14	\$12.07	\$13.03	\$0.00	\$70.24

**Notes:**

\*\* 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr  
Step4 with lic\$65.32, Step5 with lic\$72.89

**Apprentice to Journeyworker Ratio:\*\***

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	03/01/2020	\$56.19	\$10.95	\$19.74	\$0.00	\$86.88
	09/01/2020	\$57.69	\$10.95	\$19.74	\$0.00	\$88.38
	03/01/2021	\$59.17	\$10.95	\$19.74	\$0.00	\$89.86

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	12/01/2019	\$40.15	\$8.10	\$16.60	\$0.00	\$64.85
	06/01/2020	\$40.15	\$8.60	\$17.09	\$0.00	\$65.84
	12/01/2020	\$41.13	\$8.60	\$17.09	\$0.00	\$66.82
	06/01/2021	\$42.15	\$8.60	\$17.09	\$0.00	\$67.84
	12/01/2021	\$43.16	\$8.60	\$17.09	\$0.00	\$68.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$32.47	\$12.50	\$15.70	\$0.00	\$60.67
	06/01/2020	\$33.22	\$12.50	\$15.70	\$0.00	\$61.42
	12/01/2020	\$34.00	\$12.50	\$15.70	\$0.00	\$62.20
	06/01/2021	\$34.75	\$12.50	\$15.70	\$0.00	\$62.95
	12/01/2021	\$35.54	\$12.50	\$15.70	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012) <i>TEAMSTERS 25 (Metro) - Aggregate</i>	05/01/2020	\$27.90	\$10.41	\$14.12	\$0.00	\$52.43
	08/01/2020	\$27.90	\$10.91	\$14.12	\$0.00	\$52.93
	05/01/2021	\$29.15	\$10.91	\$15.25	\$0.00	\$55.31
	08/01/2021	\$29.15	\$11.41	\$15.25	\$0.00	\$55.81
	05/01/2022	\$30.40	\$11.41	\$15.25	\$0.00	\$57.06
	08/01/2022	\$30.40	\$11.91	\$15.25	\$0.00	\$57.56
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 25 (Metro) - Aggregate</i>	05/01/2020	\$32.91	\$10.41	\$14.12	\$0.00	\$57.44
	08/01/2020	\$32.91	\$10.91	\$14.12	\$0.00	\$57.94
	05/01/2021	\$33.66	\$10.91	\$15.25	\$0.00	\$59.82
	08/01/2021	\$33.66	\$11.41	\$15.25	\$0.00	\$60.32
	05/01/2022	\$34.41	\$11.41	\$15.25	\$0.00	\$61.07
	08/01/2022	\$34.41	\$11.91	\$15.25	\$0.00	\$61.57
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg) <i>ROOFERS LOCAL 33</i>	03/01/2020	\$45.67	\$11.50	\$15.90	\$0.00	\$73.07
	08/01/2020	\$47.10	\$11.50	\$15.90	\$0.00	\$74.50
	02/01/2021	\$48.53	\$11.50	\$15.90	\$0.00	\$75.93
	08/01/2021	\$49.96	\$11.50	\$15.90	\$0.00	\$77.36
	02/01/2022	\$51.39	\$11.50	\$15.90	\$0.00	\$78.79

**Apprentice - ROOFER - Local 33**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.84	\$11.50	\$3.69	\$0.00	\$38.03
2	60	\$27.40	\$11.50	\$15.90	\$0.00	\$54.80
3	65	\$29.69	\$11.50	\$15.90	\$0.00	\$57.09
4	75	\$34.25	\$11.50	\$15.90	\$0.00	\$61.65
5	85	\$38.82	\$11.50	\$15.90	\$0.00	\$66.22

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.55	\$11.50	\$3.69	\$0.00	\$38.74
2	60	\$28.26	\$11.50	\$15.90	\$0.00	\$55.66
3	65	\$30.62	\$11.50	\$15.90	\$0.00	\$58.02
4	75	\$35.33	\$11.50	\$15.90	\$0.00	\$62.73
5	85	\$40.04	\$11.50	\$15.90	\$0.00	\$67.44

**Notes:** \*\* 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1  
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.  
(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

**Apprentice to Journeyworker Ratio:\*\***

ROOFER SLATE / TILE / PRECAST CONCRETE <i>ROOFERS LOCAL 33</i>	03/01/2020	\$45.92	\$11.50	\$15.90	\$0.00	\$73.32
	08/01/2020	\$47.35	\$11.50	\$15.90	\$0.00	\$74.75
	02/01/2021	\$48.78	\$11.50	\$15.90	\$0.00	\$76.18
	08/01/2021	\$50.21	\$11.50	\$15.90	\$0.00	\$77.61
	02/01/2022	\$51.64	\$11.50	\$15.90	\$0.00	\$79.04

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2020	\$49.36	\$13.35	\$24.12	\$2.61	\$89.44
	08/01/2020	\$50.96	\$13.35	\$24.12	\$2.66	\$91.09
	02/01/2021	\$52.61	\$13.35	\$24.12	\$2.71	\$92.79
	08/01/2021	\$54.36	\$13.35	\$24.12	\$2.76	\$94.59
	02/01/2022	\$56.11	\$13.35	\$24.12	\$2.81	\$96.39

**Apprentice - SHEET METAL WORKER - Local 17-A**

**Effective Date - 02/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$20.73	\$13.35	\$5.89	\$0.00	\$39.97
2	42	\$20.73	\$13.35	\$5.89	\$0.00	\$39.97
3	47	\$23.20	\$13.35	\$11.13	\$1.43	\$49.11
4	47	\$23.20	\$13.35	\$11.13	\$1.43	\$49.11
5	52	\$25.67	\$13.35	\$12.08	\$1.53	\$52.63
6	52	\$25.67	\$13.35	\$12.33	\$1.54	\$52.89
7	60	\$29.62	\$13.35	\$13.70	\$1.70	\$58.37
8	65	\$32.08	\$13.35	\$15.15	\$1.80	\$62.38
9	75	\$37.02	\$13.35	\$16.56	\$2.01	\$68.94
10	85	\$41.96	\$13.35	\$17.96	\$2.20	\$75.47

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$21.40	\$13.35	\$5.89	\$0.00	\$40.64
2	42	\$21.40	\$13.35	\$5.89	\$0.00	\$40.64
3	47	\$23.95	\$13.35	\$11.13	\$1.45	\$49.88
4	47	\$23.95	\$13.35	\$11.13	\$1.45	\$49.88
5	52	\$26.50	\$13.35	\$12.08	\$1.56	\$53.49
6	52	\$26.50	\$13.35	\$12.33	\$1.57	\$53.75
7	60	\$30.58	\$13.35	\$13.70	\$1.73	\$59.36
8	65	\$33.12	\$13.35	\$15.15	\$1.85	\$63.47
9	75	\$38.22	\$13.35	\$16.56	\$2.04	\$70.17
10	85	\$43.32	\$13.35	\$17.96	\$2.24	\$76.87

**Notes:**  
Steps are 6 mos.

**Apprentice to Journeyworker Ratio:1:4**

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.54	\$12.41	\$13.72	\$0.00	\$60.67
	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$34.83	\$12.41	\$13.72	\$0.00	\$60.96
	06/01/2020	\$35.73	\$12.41	\$13.72	\$0.00	\$61.86
	08/01/2020	\$35.73	\$12.91	\$13.72	\$0.00	\$62.36
	12/01/2020	\$35.73	\$12.91	\$14.82	\$0.00	\$63.46
	06/01/2021	\$36.53	\$12.91	\$14.82	\$0.00	\$64.26
	08/01/2021	\$36.53	\$13.41	\$14.82	\$0.00	\$64.76
	12/01/2021	\$36.53	\$13.41	\$16.01	\$0.00	\$65.95
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1</i>	03/01/2020	\$60.82	\$9.68	\$20.55	\$0.00	\$91.05
	10/01/2020	\$62.32	\$9.68	\$20.55	\$0.00	\$92.55
	03/01/2021	\$63.82	\$9.68	\$20.55	\$0.00	\$94.05

**Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.29	\$9.68	\$11.61	\$0.00	\$42.58
2	40	\$24.33	\$9.68	\$12.30	\$0.00	\$46.31
3	45	\$27.37	\$9.68	\$12.99	\$0.00	\$50.04
4	50	\$30.41	\$9.68	\$13.73	\$0.00	\$53.82
5	55	\$33.45	\$9.68	\$14.36	\$0.00	\$57.49
6	60	\$36.49	\$9.68	\$15.05	\$0.00	\$61.22
7	65	\$39.53	\$9.68	\$15.74	\$0.00	\$64.95
8	70	\$42.57	\$9.68	\$16.43	\$0.00	\$68.68
9	75	\$45.62	\$9.68	\$17.11	\$0.00	\$72.41
10	80	\$48.66	\$9.68	\$17.80	\$0.00	\$76.14

**Effective Date - 10/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.81	\$9.68	\$11.61	\$0.00	\$43.10
2	40	\$24.93	\$9.68	\$12.30	\$0.00	\$46.91
3	45	\$28.04	\$9.68	\$12.99	\$0.00	\$50.71
4	50	\$31.16	\$9.68	\$13.73	\$0.00	\$54.57
5	55	\$34.28	\$9.68	\$14.36	\$0.00	\$58.32
6	60	\$37.39	\$9.68	\$15.05	\$0.00	\$62.12
7	65	\$40.51	\$9.68	\$15.74	\$0.00	\$65.93
8	70	\$43.62	\$9.68	\$16.43	\$0.00	\$69.73
9	75	\$46.74	\$9.68	\$17.11	\$0.00	\$73.53
10	80	\$49.86	\$9.68	\$17.80	\$0.00	\$77.34

**Notes:** Apprentice entered prior 9/30/10:  
40/45/50/55/60/65/70/75/80/85  
Steps are 850 hours

**Apprentice to Journeyworker Ratio:1:3**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2020	\$40.13	\$13.00	\$17.12	\$0.00	\$70.25
	09/01/2020	\$41.20	\$13.00	\$17.16	\$0.00	\$71.36
	03/01/2021	\$42.66	\$13.00	\$17.27	\$0.00	\$72.93
	09/01/2021	\$44.32	\$13.00	\$17.38	\$0.00	\$74.70
	03/01/2022	\$45.83	\$13.00	\$17.49	\$0.00	\$76.32
	09/01/2022	\$47.55	\$13.00	\$17.62	\$0.00	\$78.17
	03/01/2023	\$49.11	\$13.00	\$17.73	\$0.00	\$79.84

NOT FOR BIDDING

**Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103**

**Effective Date - 03/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.06	\$13.00	\$0.54	\$0.00	\$31.60
2	45	\$18.06	\$13.00	\$0.54	\$0.00	\$31.60
3	50	\$20.07	\$13.00	\$14.00	\$0.00	\$47.07
4	50	\$20.07	\$13.00	\$14.00	\$0.00	\$47.07
5	55	\$22.07	\$13.00	\$14.31	\$0.00	\$49.38
6	60	\$24.08	\$13.00	\$14.62	\$0.00	\$51.70
7	65	\$26.08	\$13.00	\$14.94	\$0.00	\$54.02
8	70	\$28.09	\$13.00	\$15.25	\$0.00	\$56.34
9	75	\$30.10	\$13.00	\$15.56	\$0.00	\$58.66
10	80	\$32.10	\$13.00	\$15.87	\$0.00	\$60.97

**Effective Date - 09/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.54	\$13.00	\$0.57	\$0.00	\$32.11
2	45	\$18.54	\$13.00	\$0.57	\$0.00	\$32.11
3	50	\$20.60	\$13.00	\$14.02	\$0.00	\$47.62
4	50	\$20.60	\$13.00	\$14.02	\$0.00	\$47.62
5	55	\$22.66	\$13.00	\$14.33	\$0.00	\$49.99
6	60	\$24.72	\$13.00	\$14.64	\$0.00	\$52.36
7	65	\$26.78	\$13.00	\$14.96	\$0.00	\$54.74
8	70	\$28.84	\$13.00	\$15.28	\$0.00	\$57.12
9	75	\$30.90	\$13.00	\$15.59	\$0.00	\$59.49
10	80	\$32.96	\$13.00	\$15.90	\$0.00	\$61.86

Notes:

**Apprentice to Journeyworker Ratio:1:1**

TERRAZZO FINISHERS	02/01/2020	\$53.34	\$10.75	\$21.94	\$0.00	\$86.03
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2020	\$54.69	\$10.75	\$22.09	\$0.00	\$87.53
	02/01/2021	\$55.33	\$10.75	\$22.09	\$0.00	\$88.17
	08/01/2021	\$56.73	\$10.75	\$22.25	\$0.00	\$89.73
	02/01/2022	\$57.32	\$10.75	\$22.25	\$0.00	\$90.32

**Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile**

**Effective Date - 02/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.67	\$10.75	\$21.94	\$0.00	\$59.36
2	60	\$32.00	\$10.75	\$21.94	\$0.00	\$64.69
3	70	\$37.34	\$10.75	\$21.94	\$0.00	\$70.03
4	80	\$42.67	\$10.75	\$21.94	\$0.00	\$75.36
5	90	\$48.01	\$10.75	\$21.94	\$0.00	\$80.70

**Effective Date - 08/01/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.35	\$10.75	\$22.09	\$0.00	\$60.19
2	60	\$32.81	\$10.75	\$22.09	\$0.00	\$65.65
3	70	\$38.28	\$10.75	\$22.09	\$0.00	\$71.12
4	80	\$43.75	\$10.75	\$22.09	\$0.00	\$76.59
5	90	\$49.22	\$10.75	\$22.09	\$0.00	\$82.06

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2019	\$40.50	\$8.10	\$16.80	\$0.00	\$65.40
	06/01/2020	\$40.55	\$8.60	\$17.24	\$0.00	\$66.39
	12/01/2020	\$41.53	\$8.60	\$17.24	\$0.00	\$67.37
	06/01/2021	\$42.55	\$8.60	\$17.24	\$0.00	\$68.39
	12/01/2021	\$43.56	\$8.60	\$17.24	\$0.00	\$69.40

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2019	\$39.22	\$8.10	\$16.80	\$0.00	\$64.12
	06/01/2020	\$39.27	\$8.60	\$17.24	\$0.00	\$65.11
	12/01/2020	\$40.25	\$8.60	\$17.24	\$0.00	\$66.09
	06/01/2021	\$41.27	\$8.60	\$17.24	\$0.00	\$67.11
	12/01/2021	\$42.28	\$8.60	\$17.24	\$0.00	\$68.12

For apprentice rates see "Apprentice- LABORER"

TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2019	\$39.10	\$8.10	\$16.80	\$0.00	\$64.00
	06/01/2020	\$39.15	\$8.60	\$17.24	\$0.00	\$64.99
	12/01/2020	\$40.13	\$8.60	\$17.24	\$0.00	\$65.97
	06/01/2021	\$41.15	\$8.60	\$17.24	\$0.00	\$66.99
	12/01/2021	\$42.16	\$8.60	\$17.24	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.23	\$12.50	\$15.70	\$0.00	\$76.43
	06/01/2020	\$49.31	\$12.50	\$15.70	\$0.00	\$77.51
	12/01/2020	\$50.45	\$12.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.54	\$12.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.68	\$12.50	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$35.12	\$12.41	\$13.72	\$0.00	\$61.25
	06/01/2020	\$36.02	\$12.41	\$13.72	\$0.00	\$62.15
	08/01/2020	\$36.02	\$12.91	\$13.72	\$0.00	\$62.65
	12/01/2020	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	06/01/2021	\$36.82	\$12.91	\$14.82	\$0.00	\$64.55
	08/01/2021	\$36.82	\$13.41	\$14.82	\$0.00	\$65.05
	12/01/2021	\$36.82	\$13.41	\$16.01	\$0.00	\$66.24
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2019	\$51.38	\$8.10	\$17.20	\$0.00	\$76.68
	06/01/2020	\$51.38	\$8.60	\$17.69	\$0.00	\$77.67
	12/01/2020	\$52.36	\$8.60	\$17.69	\$0.00	\$78.65
	06/01/2021	\$53.38	\$8.60	\$17.69	\$0.00	\$79.67
	12/01/2021	\$54.39	\$8.60	\$17.69	\$0.00	\$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2019	\$53.38	\$8.10	\$17.20	\$0.00	\$78.68
	06/01/2020	\$53.38	\$8.60	\$17.69	\$0.00	\$79.67
	12/01/2020	\$54.36	\$8.60	\$17.69	\$0.00	\$80.65
	06/01/2021	\$55.38	\$8.60	\$17.69	\$0.00	\$81.67
	12/01/2021	\$56.39	\$8.60	\$17.69	\$0.00	\$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2019	\$43.45	\$8.10	\$17.20	\$0.00	\$68.75
	06/01/2020	\$43.45	\$8.60	\$17.69	\$0.00	\$69.74
	12/01/2020	\$44.43	\$8.60	\$17.69	\$0.00	\$70.72
	06/01/2021	\$45.45	\$8.60	\$17.69	\$0.00	\$71.74
	12/01/2021	\$46.46	\$8.60	\$17.69	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2019	\$45.45	\$8.10	\$17.20	\$0.00	\$70.75
	06/01/2020	\$45.45	\$8.60	\$17.69	\$0.00	\$71.74
	12/01/2020	\$46.43	\$8.60	\$17.69	\$0.00	\$72.72
	06/01/2021	\$47.45	\$8.60	\$17.69	\$0.00	\$73.74
	12/01/2021	\$48.46	\$8.60	\$17.69	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2019	\$34.54	\$12.41	\$13.72	\$0.00	\$60.67
	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2019	\$39.40	\$8.10	\$16.60	\$0.00	\$64.10
	06/01/2020	\$39.40	\$8.60	\$17.09	\$0.00	\$65.09
	12/01/2020	\$40.38	\$8.60	\$17.09	\$0.00	\$66.07
	06/01/2021	\$41.40	\$8.60	\$17.09	\$0.00	\$67.09
	12/01/2021	\$42.41	\$8.60	\$17.09	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2019	\$48.73	\$12.50	\$15.70	\$0.00	\$76.93
	06/01/2020	\$49.83	\$12.50	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.98	\$12.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$52.08	\$12.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$53.23	\$12.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS &amp; GASFITTERS LOCAL 12</i>	03/01/2020	\$58.69	\$12.07	\$17.26	\$0.00	\$88.02
	09/01/2020	\$60.19	\$12.07	\$17.26	\$0.00	\$89.52
	03/01/2021	\$61.69	\$12.07	\$17.26	\$0.00	\$91.02
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
<b>Outside Electrical - East</b>						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$28.83	\$8.75	\$1.86	\$0.00	\$39.44
	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$40.84	\$8.75	\$10.02	\$0.00	\$59.61
	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$33.64	\$8.75	\$9.86	\$0.00	\$52.25
	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$40.84	\$8.75	\$14.10	\$0.00	\$63.69
	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$36.04	\$8.75	\$10.65	\$0.00	\$55.44
	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$21.62	\$8.75	\$1.65	\$0.00	\$32.02
	08/30/2020	\$22.25	\$9.25	\$1.67	\$0.00	\$33.17
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$48.05	\$8.75	\$17.19	\$0.00	\$73.99
	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - LINEMAN (Outside Electrical) - East Local 104**

**Effective Date - 09/01/2019**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$28.83	\$8.75	\$3.36	\$0.00	\$40.94
2	65	\$31.23	\$8.75	\$3.44	\$0.00	\$43.42
3	70	\$33.64	\$8.75	\$3.51	\$0.00	\$45.90
4	75	\$36.04	\$8.75	\$5.08	\$0.00	\$49.87
5	80	\$38.44	\$8.75	\$5.15	\$0.00	\$52.34
6	85	\$40.84	\$8.75	\$5.23	\$0.00	\$54.82
7	90	\$43.25	\$8.75	\$7.30	\$0.00	\$59.30

**Effective Date - 08/30/2020**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

**Notes:**

**Apprentice to Journeyworker Ratio:1:2**

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77

**Additional Apprentice Information:**

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

\*\* Multiple ratios are listed in the comment field.

\*\*\* APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

\*\*\*\* APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

## SCOPE OF WORK

The work involved in **Contract No. PW/20-15, Cypress Street Playground**, includes, but is not necessarily limited to the following:

- Construction fencing and erosion control;
- Site preparation and earthwork;
- Utility work, including drainage, irrigation, plumbing and electrical;
- Pavement and surfacing to include porous pavers, bituminous concrete paving with sealcoating at the basketball courts, cement concrete paving, and resilient surfacing and edging at play areas;
- Cement concrete ramp and stairs;
- Site furnishings, including various types of seating and tables;
- New chain link fencing and new ballfield backstop;
- New play equipment and water play;
- New sports and field lighting; and
- Planting soils and planting of trees, shrubs, seeding and sodding.

Alternates include, but are not necessarily limited to the following:

- Field Seating and Pavement;
- Composite Wood Deck;
- Dugout Structure
- Play House at Playground
- Site Furniture.

The work shall consist of furnishing all labor, equipment, and materials necessary to perform these tasks. **The Contractor must complete all work by November 30, 2021.**

The Commissioner of Public Works reserves the right to either decrease the quantity or eliminate items of work in order to keep the project within the appropriation. The Town will award the Contract to the responsible qualified bidder, as determined by the Commissioner of Public Works, with the lowest base bid.

## SECTION 01 00 00

### SPECIAL PROVISIONS

#### PART 1 - GENERAL

##### PLANS

The Contractor shall furnish "AS BUILT" plans in CAD of the completed project to the Engineer. These "AS BUILT" plans shall be furnished prior to the date of final acceptance. Full compensation for these plans shall be included in the prices bid for the various Contract items of work and no additional compensation will be allowed therefore.

The "AS BUILT" plans will provide a record of constructed improvements for future reference; therefore, partial plan sets will not be accepted. The Contractor may elect to use a combination of reproducible duplicates of the design drawings and revised CAD drawings to provide a complete set of "AS BUILT" plans.

##### WORK SCHEDULE

It is anticipated the majority of the work will be completed during normal daytime working hours, from 7:00 AM to 3:30 PM.

No work that will disrupt travel on the existing roadways and sidewalks (lane closures, lane shifts, trenching, etc.) shall be done from 7:00AM to 9:00AM and from 1:30PM to 3:30PM without permission from the Engineer. The Contractor's work schedule will be impacted by Brookline High School Events and by the Brookline High School and MBTA Station development projects,

##### PUBLIC SAFETY AND CONVENIENCE

The Contractor shall provide necessary access for fire apparatus and other emergency vehicles through the work zones to abutting properties at all times.

Sweeping and cleaning of surfaces beyond the limits of the project required to clean up material caused by spillage or vehicular tracking during the various phases of the work shall be considered as incidental to the work being performed under the Contract and there will be no additional compensation.

##### SCHEDULE OF OPERATIONS

Before starting any work under this Contract, the Contractor shall prepare, and submit to the Engineer for approval, a detailed schedule of operations to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC)

Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's workforce and consultants, and as a critical decision-making tool.

Accordingly, the Contractor shall ensure that its schedules are both accurate and updated as required by the Engineer throughout the life of the project.

**COORDINATION WITH ADJACENT DEVELOPMENT PROJECT AND BROOKLINE HIGH SCHOOL OPERATIONS**

The Brookline High School and MBTA Station development projects adjacent to the project limits will be active during the construction of this Contract.

This Contract includes sidewalk, fencing, utility, landscape, and other miscellaneous improvements adjacent to improvements to be completed during the same time by the Brookline High School Project. Also, the High School and MBTA development projects are proposing various improvements along their respective property frontages and this work extends into and overlaps with work included in this Contract. This overlapping work generally includes sidewalk, curbing, raised crosswalks, street painting, and utility elements.

The Contractor shall attend a meeting with the various development project representatives and the Town of Brookline before the start of construction operations to discuss and coordinate the various work elements and limits.

Also, the Contractor shall continue to coordinate with the Town of Brookline and the project representatives in the field and in advance of specific construction operations to review the various limits of work, overlapping work elements, the need for any temporary surfaces to provide for a safe and passable condition and final surface conditions. The contractor shall be available to resolve problems that arise in the field and shall attend regularly scheduled construction coordination meetings with the High School Renovation Project team and representatives from the Town of Brookline.

All costs associated with coordination with Brookline High School activities, adjacent development projects, and attendance at construction coordination meetings are considered incidental to the project.

**PROVISIONS FOR TRAVEL AND PROSECUTION OF THE WORK**

**ITEM 851**

**TEMPORARY TRAFFIC CONTROL**

**LUMP SUM**

Before starting any work under this Contract, the Contractor shall prepare, and submit to the Engineer for approval, a plan that indicates the traffic routing proposed by the Contractor during the various stages and periods of the work and the temporary barricades, signs, drums and other traffic control devices to be employed during each stage and period of the work to maintain traffic and access to the adjacent sidewalk for commuters using the MBTA station and students at the Brookline High School.

Care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. Traffic control devices required only during working hour operations shall be removed at the end of each working day.

Signs having messages that are irrelevant to normal traffic conditions shall be removed or properly covered at the end of each work period. Signs shall be kept clean at all times and legends shall be distinctive and unmarred.

This work shall include furnishing, installing, positioning, repositioning and maintaining various temporary traffic control devices and procedures in compliance the approved plan and as directed by the engineer.

#### METHOD OF MEASUREMENT

Item 851 Temporary Traffic Control will be measured by LUMP SUM to include all relevant devices and procedures in place throughout the construction period as directed by the Engineer.

#### BASIS OF PAYMENT

Item 851 Temporary Traffic Control will include all labor, materials, equipment, and transportation required to setup, maintain and remove all relevant devices and procedures of traffic control throughout the construction period as directed by the engineer.

#### DISPOSAL OF SURPLUS MATERIALS

Surplus materials obtained from any type of excavation, and not needed for further use as determined by the Engineer, and not wanted by the Town, shall become the property of the Contractor and shall be removed from the site during the construction period and legally disposed of. The removal and disposal of surplus material shall adhere to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

#### DRAINAGE STRUCTURES

Where new pipe and structures shown on the drawings to be connected into an existing drainage structure to remain, the existing structure shall be first cleaned to remove all mud, debris and other material. The existing structure wall shall be carefully and neatly cut to provide the minimum size opening required for the insertion of the new pipe or structure. The proposed pipe end shall be set or cut off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall.

Existing shaped inverts shall be reconstructed as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure.

No separate payment will be made for the cost of connecting new pipes or structures into

existing structures, cleaning and necessary alterations of existing structures, but all costs in connection therewith shall be included in the unit prices bid for the various pipe items.

### **SAWCUTS**

Saw cutting shall be considered incidental to the item to which it is associated. No separate payment will be made for saw cutting hot mix asphalt or cement concrete. Sawcutting locations shall be reviewed and approved in the field by the engineer prior to performing the work.

### **FINE GRADING AND COMPACTING**

Fine grading and compacting of the subgrade, the grading and finishing of all slopes, and the preparation of all areas for topsoil, seed, clay infield, stone, root zone mix, drainage layer, loam, pavements, cement concrete, DGCS, cobblestone, and pavers shall be constructed in accordance with the relevant provisions of Section 170. The cost of fine grading and compacting shall be included in the various contract items and no additional compensation will be provided

Prior to installing the irrigation and drainage layer, the Contractor by means of a laser level on a 30-foot grid shall inspect the graded subbase layer. Based on the inspection of the topological survey, the contractor shall fine grade the subbase suitably-including proper rolling and compaction to achieve a tolerance of 0.5% (2 inches in 30 feet). Submit topographic plan to Engineer for review and approval prior to installing drainage layer.

Prior to installing the root zone mix and clay infield, the drainage layer shall be inspected by the Contractor by means of a laser level on a 30-foot grid pattern. Based on the inspection of the topological survey, the contractor shall fine grade and compact the drainage layer suitably to achieve a tolerance of 0.5% (2 inches in 30 feet). Submit topographic plan to Engineer for review and approval prior to installing root zone mix and clay infield

Prior to seeding, the root zone mix layer and clay infield shall be inspected by the Contractor by means of a laser level on a 20-foot grid pattern. Based on the inspection of the topological survey, the contractor shall fine grade the root zone mix and clay infield-including proper rolling and compaction to achieve a tolerance of 0.5% (1.2 inches in 20 feet). Submit topographic plan to Engineer for review and approval prior to seeding.

### **ARCHITECTURAL ACCESS BOARD TOLERANCES**

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR - Rules and Regulations of the Architectural Access Board (AAB).

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheel chair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

### **CASTINGS**

The Town of Brookline will provide all new water, sewer manhole, and drain manhole castings required for the project. Installation of castings shall be included in the various contract items and no additional compensation will be provided. All existing casting to be removed will be the property of the Town of Brookline.

### **COOPERATION OF THE CONTRACTOR**

The Contractor shall perform their work in cooperation with the Brookline High School Building project in a manner that causes the least interference with the operations of the aforementioned project and shall have no claim for delay that may be due, or result, from said project.

### **PROPERTY BOUNDS**

The Contractor shall exercise due care when working around all property bounds which are to remain. Should any existing bound be in conflict with the proposed work, the bound shall be adjusted by the contractor as directed by the Engineer at no cost to the owner. Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned by the Contractor as directed by the Engineer at no cost to the Owner.

END OF SECTION

## SECTION 02 41 43

### SITE DEMOLITION

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. Work under this Section shall consist of the careful removal, storage for reuse, transportation off-site, or demolition, of all structures and site features encountered or noted to be removed or abandoned to a minimum of three feet below finished grade, and the removal and disposal of all materials not called for to be reused or salvaged, in accordance with the contract drawings, these specifications, and Engineer's requirements. Provide all labor, equipment, materials and transportation necessary to complete the work.
- B. Items plan referenced to be removed and stored shall be carefully removed and stored on site in a manner and location designated by the Engineer for reinstallation later as shown on the plans or as indicated by the Engineer.
- C. Items plan referenced, or as indicated by the Engineer to be removed and disposed of shall be removed from the site and properly and legally disposed of by the Contractor.
- D. Items indicated on the contract drawings or in the specifications to be removed and salvaged, or other items required to be removed by the Engineer, shall be transported to a municipal storage facility, located within the Town confines, and unloaded and stacked as required by the Engineer.
- E. Items indicated on the contract drawings or in the specification to be removed and reset shall be carefully removed and reset in the same location as existing according to the specification and details.
- F. The following scope describes the general work/demolition requirements but not limited to:
  - 1. Tree Removal
  - 2. Cement concrete, brick, gravel and bituminous concrete pavements.
  - 3. Bleachers and other site furnishings and amenities
  - 4. Play area surfacing and all related concrete footings complete.
  - 5. Chain link fencing and backstops and footings complete

6. Drainage structures and pipe
7. Splash Pad and associated water lines
8. Curbing
9. All Lighting (sports and pedestrian), bases, foundations, poles, and associated utility lines complete
10. Play equipment
11. Existing electrical service and cabinet (including utility pole)
12. Other features as indicated on the drawings.
12. Irrigation and electrical system

1.02 PROTECTION:

- A. The Contractor shall assume complete responsibility and liability for the safety and structural integrity of all work and utilities to remain during demolition.
- B. Provide safeguards including, but not limited to, warning signs, barricades, temporary fences, warning lights and other items required for protection of personnel and the general public during performance of all work.
- C. All features related to protection shall be maintained until that work has been completed to the point when such safeguards are no longer required.

1.03 SPECIAL REQUIREMENTS:

- A. The Contractor shall salvage items label to be demolished and transport these to the Owner's Town's Yard unless these are called for to be reused or required by the Engineer to be disposed of.
- B. Install erosion controls to protect adjacent areas from eroded materials likely to drainage ways/systems, downstream of areas disturbed by work activities.
- C. Where items to be demolished are located within or adjacent to pavements to remain, the Contractor shall make provisions to protect that pavement to remain. Cut concrete pavement back to score line and cut bituminous concrete pavement back far enough so as not to allow disturbance to base course materials. Pavements damaged as a result of Contractor activities shall be replaced to the extent determined by the Engineer at no additional cost to the Owner.

1.04 REFERENCES:

- A. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges – latest edition.

PART 2 - PRODUCTS

2.01 BACKFILL:

- A. The Contractor shall provide suitable backfill as specified under Section 31 23 00 of these Specifications, to fill voids left by removal or abandonment of site features, and shall provide all pipe cap ends, mortar, brick and other material needed to cap off or plug pipes of various sizes and kinds.
- B. Suitable materials shall be used as base course fill and topsoil to the depth as specified herein. Restore disturbed areas with similar materials blended to match the line and grades of adjacent surfaces.

2.02 TEMPORARY FENCE:

- A. The work under these Items shall conform to the relevant provisions of section 644 of the MassDOT Standard Specifications.
- B. The work shall include temporary installation of chain link fence around the perimeter of the work limits where shown on the plans, and as required by the Engineer, and as Contractor sees fit to protect work.
- C. Temporary fence shall consist of 6-foot high chain link fence anchored into a base that is both stable and movable to allow access and adjustment as needed. Reclaimed existing fence fabric and materials may be used with the approval of the Engineer. The Contractor shall submit a shop drawing to the Engineer for approval prior to installation.

PART 3 - EXECUTION

3.01 SALVAGEABLE MATERIAL:

- A. Frames, grates and other salvageable material shall be carefully removed to minimize damage and stored for later reuse, transport, or removal from site.

3.02 ABANDONED STRUCTURES:

- A. All inlets and outlets shall be plugged with at least eight (8) inches of brick and mortar masonry. Upper portions of masonry structures shall be removed to a depth of four feet. The bottoms of all structures shall be broken to allow drainage, and the structure shall be filled with suitable backfill material placed in six (6) inch layers and thoroughly compacted at each level.

- B. The Engineer shall review work related to abandoned structures before backfilling. Those items not reviewed before backfilling shall be uncovered and backfill procedures observed, at no expense to the Owner.

### 3.03 ABANDONED PIPES OR CONDUITS:

- A. Plug previously abandoned drainpipes encountered with masonry brick at least eight (8) inches in thickness.
- B. Abandon discontinued water supplies that are encountered during the execution of this contract in accordance with Owner requirements.
- C. Electrical conduits encountered and previously abandoned shall be completely removed.

## PART 4 - COMPENSATION

### 4.01 METHOD OF PAYMENT:

- A. Individual Tree Protection shall be paid for at the contract price per each which price shall be full compensation for furnishing, installing, maintaining, removing and disposing of tree protection materials as shown on the drawings and specified herein.
- B. Tree Protection Fencing shall be paid for at the contract unit price per linear foot which price shall be full compensation for furnishing, maintaining, removing and disposing of tree protection fencing materials as shown on the drawings and specified herein.
- C. Individual Tree Removal (6" DBH or smaller) shall be paid for at the contract price per each which price shall be full compensation for removing and disposing of tree, grinding or stump 24" minimal depth below grade and specified herein.
- D. Individual Tree Removal (6" DBH or larger) shall be paid for at the contract price per each which price shall be full compensation for removing and disposing of tree, grinding or stump 24" minimal depth below grade and specified herein.
- E. Salvage existing deciduous tree (6" DBH or smaller) shall be paid for at the contract price per each which price shall be full compensation for removing, protecting, coordinating with the Town and completing the work in a satisfactory manner
- F. Salvage Existing Items Indicated shall be paid for at the contract price per lump sum which price shall be full compensation for completing the work in a satisfactory manner.
- G. Remove and Dispose of Miscellaneous Equipment shall be paid for at the contract unit price per lump sum which price shall be full compensation for removing and disposing all play equipment, wood timbers, curbing, benches, drinking fountains, signs, light poles, bleaches, utility poles, foundations, pads, electrical cabinet, and miscellaneous items.

- H. Remove and Dispose of Paving, shall be paid for at the contract unit price per lump sum which price shall be full compensation for sawcutting, removing and disposing of all asphalt and cement concrete paving.
- I. Remove and Dispose of chain link backstops, perimeter fencing shall be paid for at the contract unit price per lump sum which price shall be full compensation for removing and disposing all backstops, picket fencing, granite post, concrete posts, wood rail, concrete foundation, all chain link fencing and railing as shown on the plan in a satisfactory manner.
- J. Remove and Replace hydrant structure and water main line water connection shall be paid for at the contract unit price per each which price shall be full compensation for completing the work as show on the drawing and as directed by the Engineer in a satisfactory manner and according to Brookline Water Division specifications.
- K. Remove and Rest existing Irrigation backflow preventer from manhole to cabinet on concrete pad shall be paid for at the contract unit price per each which shall be full compensation for completing the work in a satisfactory manner.
- L. Excavation to Design Subgrade shall be paid for at the contract unit price per lump sum which price shall include excavating to the design subgrade, placing excavated materials as fill and disposing of any surplus excavated material. This work will include fine grading and compacting all areas as directed by the engineer.
- M. Stripping and stockpiling existing topsoil conform to the relevant provisions of MassDOT Standard Specifications Section 120 and the following:
1. Prior to the start of work, the Contractor shall be directed by the Engineer and Town Arborist or Tree Warden as to the areas to be stripped, the methods used, and the depths of removal in order to protect existing trees.
  2. The work shall consist of stripping by mechanical rake or by hand the existing vegetation present on all grassed areas indicated on the Drawings as directed by Engineer. The stripping shall remove vegetation only and any existing loam to a depth of twelve inches where possible, as determined by the Engineer.
  3. Material to be stockpiled on-site shall be stored in a location to be approved by the Engineer, and the sequence of the work shall be managed to minimize damage to any surface materials in the storage area. Topsoil shall not be stockpiled where it could damage existing turf or tree routes, and any surface materials damaged as a result of the operations shall be repaired at no cost to the Owner.
  4. Work under this item shall be paid for at the contract unit price per cubic yard, which price shall include all labor, equipment, and incidentals necessary to complete the work as specified.

N. Striping and removing the infield mix shall conform to the relevant provisions of MassDOT Standard Specifications Section 120 and the following:

1. The work shall consist of stripping the existing infield mix to a depth of 12 inches where possible, as determined by the Engineer. Material to be removed and disposed of off-site.
2. Work under this item shall be paid for by the cubic yard price, which price shall include all labor, equipment, and incidentals necessary to complete the work in a satisfactory manner.

O. Construction entrance pad shall be 1 ½” crushed stone installed to a depth of 6” and be placed on filter fabric at the locations and to the dimensions shown on the drawings and as directed by the engineer. This pad shall be measured and paid by the contract unit price each which price shall include all labor, equipment, and incidentals necessary to complete the work as specified. Contractor will also be responsible for removing the pad under this payment item.

P. 72” Chain Link Fence and Gates (temporary) shall be measured and paid by the linear foot. Contractor shall furnish and install construction fencing including all bases. Contractor shall maintain fencing in good condition and check the perimeter of the site at the end of each work day to ensure security is intact.

#### 4.02 PAYMENT ITEMS

102.51	Individual Tree Protection	Each
102.52	Tree Protection Fencing	Linear Foot
105.40	Tree Removal (6” DBH or smaller)	Each
105.50	Tree Removal (6” DBH or larger)	Each
105.60	Salvage Existing Deciduous Tree (6” DBH or smaller)	Each
120.10	Salvage Existing Items Indicated	Lump Sum
120.20	Remove and Dispose of Miscellaneous Equipment	Lump Sum
120.30	Remove and Dispose of Paving	Lump Sum
102.40	Remove and Dispose of Chain Link Backstops, Perimeter Fencing	Lump Sum
120.60	Remove and Reset Existing Irrigation Backflow Preventer	Each
120.70	Remove and Dispose of Engineered Wood Chip Surfacing	Lump Sum
123.00	Excavate to Design Subgrade	Lump Sum
125.00	Strip and Stockpile Existing Topsoil	Cubic Yard
126.00	Strip and Remove Infield Mix	Cubic Yard
130.10	Construction Entrance Pad	Each
644.10	72” Chain Link Fence and Gates (temporary)	Linear Foot

END OF SECTION

SECTION 03 05 00

FIELD CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers concrete and all related items necessary to place and finish the concrete work.
- B. Concrete thrust, and anchor blocks, to be provided at all water main bends, tees, plugs and wyes and at other locations required by the Engineer shall be installed in accordance with the details shown on the drawings and as specified in this section.
- C. Concrete encasement for piping with shallow cover and for encasement of telephone, and electrical duct bank when specified shall be installed in accordance with the details shown on the drawings and as specified in this section.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 32 16 00, CURBING
- C. Section 32 31 13, CHAIN LINK FENCE
- D. Section 32 31 19, METAL PICKET FENCE
- B. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS

1.03 REFERENCES:

- A. The following standards form a part of this specification:

	American Concrete Institute (ACI)
ACI 304	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
ACI 305	Recommended Practice for Hot Weather Concreting
ACI 306	Recommended Practice for Cold Weather Concreting
ACI SP-66	ACI Detailing Manual

ACI 318	Building Code Requirements for Reinforced Concrete American Society for Testing and Materials (ASTM)
ASTM A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C33	Concrete Aggregates
ASTM C94	Ready-Mixed Concrete
ASTM C143	Test for Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C260	Air Entraining Admixtures for Concrete
ASTM C494	Chemical Admixtures for Concrete

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

PART 2 - PRODUCTS

2.01 CONCRETE:

- A. All concrete reinforced or non-reinforced shall have a 28-day compressive strength of 4000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.
- B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.
- C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Engineer.
- D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

Reinforcing as shown on the plans or as required by the Engineer, shall conform to ACI 318 and ASTM A615 and shall be detailed in accordance with ACI SP-66. All Steel reinforcing bars shall be grade 60.

2.03 CEMENT:

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.04 AGGREGATES

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Maximum size aggregate shall be 3/4-inch.

2.05 ADMIXTURES:

- A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.
- B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.
- C. Water reducing agent shall be WRDA, as manufactured by W.R. Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.
- D. Water reducing agent-retarder shall be "Daratard," as manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.06 WATER:

- A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.07 CONCRETE FORMS:

- A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide hand-rubbed, smooth concrete surfaces free of bug holes, form ties and other imperfections without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.

- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.
- C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.
- D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete

### PART 3 - EXECUTION

#### 3.01 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.
- B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.
- C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

#### 3.02 THRUST AND ANCHOR BLOCKS:

- A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.
- B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

#### 3.03 FILL CONCRETE:

- A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.

- B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set.
- C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.04 CONCRETE PLACING DURING COLD WEATHER:

- A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40°F, or is expected to fall to below 40°F, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.
- B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

3.05 CONCRETE PLACING DURING HOT WEATHER:

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing, shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.
- B. During periods of excessively hot weather (90°F or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement, will not be acceptable, and will be rejected.

3.06 FIELD QUALITY CONTROL:

- A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

- B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.
- C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. The bid price for field concrete and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.
- B. The bid price shall be included all work necessary to perform the required work of specifications sections but not limited to:
  - a. 32 16 00, Curbing
  - b. 32 31 13, Chain Link Fence
  - c. 32 31 19, Metal Picket Fence
  - d. 33 11 13.13, Ductile Iron Pipe and Fittings

##### 4.02 PAYMENT ITEMS

- A. The bid price for all field concrete related work shall be included in unit bid pricing but not limited to items, 120.50, 256.10, 501, 20, 644.10, 644.20, 644.30, 644.40, 644.50, , 644.60, 685.10, and 685.20 and all other incidental work necessary for final completion of the items as specified.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

1.02 RELATED WORK:

- A. Section 01 45 23, STRUCTURAL TESTS AND INSPECTIONS
- C. Section 03 21 00, CONCRETE REINFORCEMENT
- D. Section 03 30 00, CAST-IN-PLACE CONCRETE
- E. Section 03 35 19, INTEGRALLY COLORED CONCRETE

1.03 REFERENCES:

The following standards form a part of this specification:

- AMERICAN CONCRETE INSTITUTE (ACI)
  - ACI 301 Standard Specifications for Structural Concrete
  - ACI 347 Recommended Practices for Concrete Formwork
- U.S. ARMY CORPS OF ENGINEERS (CE)
  - CE 03300 Cast-in-Place Concrete

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.
- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.
- C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.

- D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

PART 3 - EXECUTION

3.01 PREPARATION:

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

3.02 CONSTRUCTION:

- A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.
- B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.
- C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.
- D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners, and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

3.03 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

<u>Forms for</u>	<u>Day-Degree*</u>
Slabs	500
Walls and vertical surfaces	200

\* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg F are not to be considered in determining Day-Degree.

- B. Where walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg. F in accordance with American Concrete Institute standards.
- C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.
- D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. The bid price for concrete formwork and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.
- B. The bid price shall be included within the work necessary to perform the required work of specifications sections but not limited to:
  - a. 03 30 00, Cast-In-Place Concrete

##### 4.02 PAYMENT ITEMS

- A. The bid price for all field concrete related work shall be included in unit bid pricing but not limited to item 701.01, 701.02, 701.03, 701.04, 701.05, 701.06, 701.07, 701.10, 901.10, 901.20, 901.30, 901.04, 901.60, and 901.7 and all other incidental work necessary for final completion of the items as specified.

END OF SECTION

SECTION 03 21 00

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

1.02 RELATED WORK:

- A. Section 03 11 00, CONCRETE FORMWORK
- B. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.03 SYSTEM DESCRIPTION:

Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the design drawings or modified herein.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include grade of steel used as well as splice lengths.
- B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Engineer.
- C. When fiber reinforcement is used, contractor shall submit manufacturer's data confirming that material meets the specification.

1.05 REFERENCES:

- A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 318 Building Code Requirements for Concrete

ACI 347 Recommended Practice for Concrete Formwork

ACI 350 Environmental Engineering Concrete Structures

American Society for Testing and Materials (ASTM)

ASTM	A185	Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
ASTM	A497	Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
ASTM	A615	Deformed Billet-Steel Bars for Concrete Reinforcement
ASTM	A775	Epoxy-coated Reinforcing Steel Bars
ASTM	A884	Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

AWS	12.1	Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction
-----	------	--

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A775 epoxy-coated bars are specified.
- B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497. Gauge and spacing of wires shall be as indicated on the drawings.
- C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.
- D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.
- E. Any bar showing cracks after bending shall be discarded.
- F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

2.02 FIBER REINFORCEMENT

When called for on the drawings, concrete engineered reinforcing fibers shall be polypropylene, collated, fibrillated fibers from Fibermesh Co., 4019 Industry Drive, Chattanooga, TN; Forta Corporation, One Hundred Forta Drive, Grove City, PA; or approved equal. Only fibers designed and manufactured specifically for use in concrete from virgin polypropylene and so certified by the manufacturer shall be acceptable.

### PART 3 - EXECUTION

#### 3.01 STEEL INSTALLATION:

- A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.
- B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for, and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.
- C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
- D. Metal supports shall be of types that will not penetrate the surface of formwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.
- E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.
- F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

#### 3.02 FIBER INSTALLATION:

- A. Fibermesh fibers shall be used in concrete as indicated on the drawings or as specified and in strict accordance with the manufacturer's recommendations as to type and amount. The fiber manufacturer or approved distributor shall provide the services of a qualified employee for pre-job meeting and initial job start up.

### PART 4 – COMPENSATION

#### 4.01 METHOD OF PAYMENT

- A. The bid price for concrete formwork and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.
- B. The bid price shall be included within the work necessary to perform the required work of specifications sections but not limited to:
  - a. 03 30 00, Cast-In-Place Concrete

#### 4.02 PAYMENT ITEMS

- A. The bid price for all field concrete related work shall be included in unit bid pricing but not limited to items 701.01, 701.03, 701.04, 701.05, 701.06, 701.06, 901.10, 901.20, 901.30, 901.40, 901.50, 901.60, and 901.70 and all other incidental work necessary for final completion of the items as specified.

END OF SECTION

NOT FOR BIDDING

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all concrete and all related items necessary to place and finish the concrete work.

1.02 RELATED WORK:

- A. Section 03 11 00, CONCRETE FORMWORK
- B. Section 03 21 00, CONCRETE REINFORCEMENT
- C. Section 07 92 00, JOINT PROTECTION
- D. Section 09 90 00, PAINTING
- E. Section 31 00 00, EARTHWORK
- F. Items furnished under other Sections and installed under this Section include, but are not limited to:

Items embedded in concrete, including anchors, sleeves, drains, castings, frames for hatches, railings, and other miscellaneous metals.

1.03 REFERENCES:

- A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

- ACI 301 Structural Concrete for Buildings
- ACI 302 Recommended Practice for Concrete Floor and Slab Construction
- ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete
- ACI 305 Recommended Practice for Hot Weather Concreting
- ACI 306 Recommended Practice for Cold Weather Concreting

- ACI 318 Building Code Requirements for Reinforced Concrete
- ACI 347 Recommended Practice for Concrete Formwork
- ACI 350 Code Requirements for Environmental Engineering Concrete Structures

American Society for Testing and Materials (ASTM)

- ASTM C33 Concrete Aggregates
- ASTM C39 Compressive Strength of Cylindrical Concrete Specimens
- ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
- ASTM C94 Ready-Mixed Concrete
- ASTM C143 Standard Method for Slumps of Portland Cement Concrete
- ASTM C150 Portland Cement
- ASTM C171 Sheet Materials for Curing Concrete
- ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C260 Air-Entraining Admixtures for Concrete
- ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C494 Chemical Admixtures for Concrete
- ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23  
SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Shop drawings of the materials specified herein.

- B. Statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the contract.
- C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.
- D. PART 2 - PRODUCTS

2.01 CONCRETE:

- A. Concrete shall be formed, placed on an approved base, properly finished and cured by experienced concrete finishers under the inspection of the Department of Public Works.
- B. Concrete shall be "Class D" (4,000 p.s.i.) in accordance with Section M4.02.00 of the "Standard Specifications for Highways and Bridges" of the Massachusetts Highway Department with 610 lbs. of portland cement, maximum aggregate size of ¾" and 0.20 gallons of Carbo Jet Dispersed Carbon Black or 2.0 pounds of Lamp Black color admixture per cubic yard of concrete with 6% ± 1% entrained air in place.
- C. Concrete slump shall not exceed five (5) inches.
- D. Thickness of concrete sidewalks shall be four (4) inches and six (6) inches at driveways.
- E. Concrete walks shall be **non-reinforced**.
- F. Control joints shall be straight, 3/8-inch-wide, and to a depth equal to one-quarter of the finished depth. Spacing of control joints will depend on the width of the sidewalk and shall form square or nearly square panels.
- G. The concrete shall be screeded and darried or bull floated (not to excess). A proper waiting period shall be allowed for settlement and bleeding before final finishing. A transverse soft broom finish is required.
- H. Concrete shall be sprayed in two directions with an adequate amount of impervious membrane curing compound according to Subsection 476.71C of the "Standard Specifications for Highways and Bridges".
- I. Expansion joints shall consist of 3/8" thick rigid fiber expansion joint filler and shall be to the **full** depth and width of the concrete slab. Expansion joints shall be placed at vertical and/or horizontal direction changes, where pavement thickness changes, at each end of tree pits, around all poles, and around existing structures as directed. Expansion joints shall be spaced at 30-foot intervals maximum except as otherwise ordered.
- J. Bond breaking material shall be used where concrete is placed against foundations, walls, etc.

- K. All concrete walk layout and design shall be reviewed with the Engineering Division representatives well in advance of construction and shall be inspected by this Division during construction. Air tests and strength cylinders may be taken by the Division to verify proper materials and compliance with the specifications.
- L. All equipment, materials and tools shall be on the job before placing concrete.
- M. All Concrete sidewalks, driveways, curb ramps, detectable warning panels and crosswalks shall be installed in accordance with the most recent **Massachusetts Architectural Access Board (A.A.B.) and A.D.A. Accessibility Guidelines**. In case of a conflict, the more stringent requirement shall be followed.
- N. Detectable Warning Panels shall be installed at every curb ramp. The Detectable Warning Panels shall be cast-in-place type, natural in color and made of CAST IRON as manufactured by East Jordan Iron Works and Neenah Foundry or Approved Equal.

Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used shall be the 4,000 psi mix.

TABLE

Minimum Comp. Strength at 28 days (psi)	Maximum Water/Cement ratio (gallons per bag of cement)*	Cement Factor: 94 lb. Bags per cubic yard minimum**
4000	0.48 (5.6)	6.5

\* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

\*\* These are minimum amounts; increase as necessary to meet mix requirements.

- B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.
- C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.
- D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for 1-1/2-inch aggregate and 4

to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.

- E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.
- F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8-inches. Any concrete having a slump greater than 4-inches (8-inches with superplasticizer) shall be promptly removed from the site.
- G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.
- H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

#### 2.02 CEMENT:

- A. The cement shall be an approved brand of American manufactured Portland Cement, Type IIA conforming to ASTM C150. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of contract. Only one color of cement, all the same manufacture, shall be used for the work.
- B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

#### 2.03 ADMIXTURES:

- A. Air entraining agent shall be in accordance with ASTM C260.
- B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.
- C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.
- D. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

#### 2.04 AGGREGATES:

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33.

C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.

D. The following designated sizes of aggregate shall be the maximum employed in concrete.

2-inch for mass concrete

1½-inch for reinforced sections 18-inch and over in thickness

¾-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.05 WATER:

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.06 GROUT:

Grout shall be mixed in the proportions of one-part Portland Cement to 2 parts sand, by volume. Only enough water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

2.07 CURING MATERIALS:

A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.

B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM C171.

2.08 JOINT FILLER:

1. Prefomed joint filler strip shall conform to ASTM D1751 or D1752, having a thickness as indicated on the drawings.

2. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

2.09 JOINT SEALANT:

Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type II (hardness: 35-45 Shore A).

PART 3 - EXECUTION

### 3.01 GENERAL:

Under no circumstances shall concrete that has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

### 3.02 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.
- B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft<sup>2</sup>\*hr\*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance under slab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.
- C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.
- D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.
- E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.
- F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.
- G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper

shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

### 3.03 MIXING:

- A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Engineer.
- B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.
- C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.
- D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

### 3.04 INSTALLATION/APPLICATION/ERECTION:

- A. Placing
  - 1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.
  - 2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.
  - 3. Segregation of the concrete shall be prevented during handling; should any segregation occur; the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of

placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.

4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.
5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.
6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.
7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.
8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.
9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.

10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

#### B. Concrete Placing During Cold Weather

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.
2. The temperature of concrete surfaces shall not be permitted to drop below 50°F. for at least 7 days after placement of the concrete.
3. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

#### C. Concrete Placing During Hot Weather

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.
2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.
3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

#### D. Pipes and Embedded Metals

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.
2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.

3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.
4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.
5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.
6. Inserts required for hanging mechanical and electrical items shall be provided and installed in the forms under the mechanical and electrical sections of the specification.
7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of 1: 1-1/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.
8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. Curing

1. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.
2. Curing procedure shall be continued for at least 7 days.
  - a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.
  - b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.
  - c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. Bracing and Supports

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.
2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.
3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

G. Removing Forms and Supports

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of days-degrees or attained 50 percent strength. (Day-degrees equals the total of number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

<u>Location</u>	<u>Day-Degrees</u>
Slabs	500
Walls	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and enough strength to support safely its own weight and the construction loads upon it.

H. Patching

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly imbedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Set, both by Master Builders, Inc., Cleveland, Ohio, or approved equal.
2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Embeco by Master

Builders, Inc.; Ironite by Fox Industries, Madison, IL; or approved equal) as an additive in the proportions listed below:

Material	Small Patches		Large Formed Patches	
	Volumes	Weights	Volumes	Weights
Cement	1.0	1.0	1.0	1.0
Metal Aggregate	0.15	0.25	0.2	0.33
Sand	1.5	1.5	1.5	1.0
Pea Gravel	--	--	1.5	1.5

I. Finishing of Formed Surfaces

1. All concrete that is to be left exposed to view shall be scraped, rubbed to remove projecting imperfections, fill bug holes, form ties and other imperfections left by voids in the forms.
2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl 60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.
4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.
5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.
6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.
7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

L. Testing

1. The Contractor shall provide all field testing and inspection services and shall pay for all such services. The Engineer shall approve the testing laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Engineer as soon as they are available.
  - a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in 780 CMR R1 in the MA State Building Code. The State Board of Building Regulations and Standards shall license them.
2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.
3. The Contractor shall advise the Engineer of his readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.
4. A minimum of four standard compression test cylinders shall be made and tested for each 100 cubic yards or fraction thereof for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28-day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; such tests will be at the Contractor's expense.
5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f_c$ , and no individual strength test (average of two cylinders) result falls below the specified strength  $f_c$  by more than 500 psi.
6. In the event the average compressive strength of the two 28-day cylinders does not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

M. Failure to Meet Requirements

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with

further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.

2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.
3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.
4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.
5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.
6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

$$D \text{ equals } 0.001 (L \times L)/t$$

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.
1. All work that does not meet the ADA and AAB standards shall be replaced by the Contractor with no additional cost to the Department of Public Works.

2. Detectable Warning Panels meeting all applicable ADA and MA AAB regulations shall be installed at every wheelchair ramp location. The Detectable Warning Panels shall be cast-in-place type, natural in color and made of **CAST IRON**.
3. Temporary Detectable Warning Panels shall be used and installed as directed by the engineer during construction. These will be removed when new sidewalks have been completed.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid unit price for item 701.01, 701.02, 701.03, 701.04, 701.05, 701.06, 701.07, 701.10, 901.10, 901.20, 901.30, 901.40, 901.05, 901.60, and 901.70 shall be full compensation for all saw cutting, excavation, materials, reinforcement, samples, curing, formwork, base materials, geotextile fabric, drainage stone, compacting, finishing, equipment, tools and all other incidental work necessary for final completion of the items as specified and as directed by the Engineer.
- B. Concrete Pavement located adjacent to the porous precast paving shall be installed on the compacted No 57 base stone and No 2 uniformly graded, washed angular (see sheet L8.03 detail 4). This work will be measured and paid for under item 701.02, per square yard, which price will include all excavation and stone backfill.
- C. If subsequent testing on hardened concrete by the Department of Public Works shows that the concrete does not meet the specification requirements, the Contractor shall in addition to being responsible to replace any material or workmanship which is rejected, shall also be responsible for the cost of testing.
- D. The Contractor shall be responsible to protect the newly poured concrete surface against vandalism and marking or defacing, and must replace any concrete flatwork which, in the opinion of the Engineer, are excessively marked or defaced without any additional compensation.
- E. The Contractor shall be required to provide safe and convenient access to all residences, and businesses during construction operations.

4.02 PAYMENT ITEMS

701.01	Reinforced Cement Concrete Slabs for, Trash/Recycling Containers Cabinets, and Transformers	Square Yard
701.02	Cement Concrete Sidewalks	Square Yard
701.03	Cement Concrete Wheelchair Ramp	Square Yard
701.04	Reinforced Concrete Slab at Playground Hillside	Square Yard
701.05	Reinforced Cement Concrete Pad at Dugouts (12")	Square Yard
701.06	Reinforced Cement Concrete Spray Deck (8")	Square Yard
701.07	Concrete curb at PIP rubber surfacing	Linear Foot

701.10	Cast Iron Detectable Warning Panels	Square Feet
901.10	Poured-In-Place Terrace Seating at Basketball Court	Lump Sum
901.20	Poured-In-Place Concrete Seat Walls	Linear Foot
901.30	Two Riser Reinforced Cement Concrete Stairs at Splash Pad	Lump Sum
901.40	Poured-In-Place Concrete Retaining Wall @ ADA Ramp	Linear Foot
901.50	Poured-in-Placed Concrete Retaining Walls at Play Ramps (3 Locations)	Lump Sum
901.60	Reinforced Concrete Stairs (with Platform)	Lump Sum

Bid Alternate 1

901.70	Poured-In-Place Terrace Seating at Soccer Field	Lump Sum
--------	---	----------

END OF SECTION

NOT FOR BIDDING

SECTION 03 48 00

PRECAST CONCRETE VAULTS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of the spray deck vault.

1.02 RELATED WORK:

- A. Section 07 90 00, SEALANTS FOR SPRAY DECKS
- B. Section 13 00 00, SUMMARY OF WORK FOR SPRAY DECKS
- C. Section 22 51 00, SPRAY DECK EQUIPMENT
- D. Section 31 00 00, EARTHWORK

1.03 SUBMITTALS:

In accordance with requirements of General Specifications, submit the following:

- A. Six sets of shop drawings of the materials of this section shall be submitted to the Engineer for review.
- B. Vault drawings shall be stamped by a Registered Massachusetts Professional Engineer. They shall display that they are designed to withstand hydraulic uplift.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Filter Vault: The filter vault shall be a precast concrete structure with the minimum interior dimensions of 5'-7" by 3'-4" and a 3'-0" interior height. The vault shall allow for a hatch as shown on the drawings. The vault with the exception of the cover shall be a monolithic structure. The lid shall incorporate a curb as shown on the drawings. Precast Concrete Vault tank shall have an H-20 minimum load rating.
- B. The tank shall be constructed of 5,000 psi concrete, shall have a minimum wall thickness of 6-inches, and shall be coated with a bituminous coating on the exterior of the structure, except in the areas of the tank where the door and stair system shall be attached.

- C. The holding tank shall be constructed to meet or exceed a design loading class of AASHTO HS20-44.
- D. A riser section with a 3'-0" by 4'-0" opening for the vault tank hatch. Tank hatch shall be an aluminum hatch with stainless steel frame and hardware as specified on the contract plans. Hatches shall extend from the top slab of the vault tank finished flush with the ground elevation, as indicated on the drawings. Riser sections seams shall be water tight. Hatch covers shall be Model JDAL manufactured by Bilco, or approved equal. Providing 300 LB/SF Live Load Rating, and able to receive 1" concrete topping on the cover.
- E. All penetrations shall be sealed with a Link Seal, or approved equal. All penetrations shall have a mechanical seal.
- F. All joints shall be sealed in accordance with caulking found in Specification Section 07 90 00 SEALANT FOR SPRAY DECKS.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. The vault, access hatch, manifold, valves, supports and appurtenances shall be installed in accordance with the manufacturer's instructions, as detailed on the drawings, and in accordance with local and state codes.
- B. Penetrations shall be coordinated by the Contractor.

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT:

- A. Spray Deck Vault with Hatch will be paid for by the contract unit price lump sum complete in place which price shall be full compensation for all labor, materials, manifold, piping, valves, excavation, and backfill to install the splash deck vault in conformance with the drawings and specifications.

4.02 PAYMENT ITEMS:

347.40	Spray Deck Vault with Hatch	Lump Sum
--------	-----------------------------	----------

END OF SECTION

SECTION 04 41 00

GRANITE BLOCK WALLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

- A. The work of this Section shall consist of placing granite blocks as shown on the Drawings and as directed by the Engineer.

The work includes, but is not limited to, the following boulder types:

1. Granite Blocks
2. Masonry Wall Engraved Lettering

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 03 05 00, FIELD CONCRETE
2. Section 31 00 00, EARTHWORK
- 3.

1.04 EXAMINATION OF CONDITIONS

- A. 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 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 extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.
- B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Owner's Representative's knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

1.05 SCHEDULING

- A. The Contractor shall submit to the Owner's Representative, for approval by the Owner, a progress schedule for all work as specified herein.

## 1.06 QUALITY ASSURANCE

- A. Materials and methods of construction shall comply with the following standards:
  - 1. ASTM: American Society for Testing and Materials
  - 2. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications). AASHTO or AASHO
  - 3. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.
- B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.
- C. Layout: After staking out the work, and before beginning final construction, obtain the Engineer's approval for layout. Contractor shall make adjustments as determined by the Engineer. The Engineer may make adjustments to layout as is required to meet existing and proposed conditions without additional cost to the contract price.

## 1.07 SUBMITTALS

- A. Contractor shall submit six (6) samples of granite blocks samples, minimum size of 6-inch x 6-inch x 6-inch of all proposed granite blocks shall be submitted to the Engineer for review. Samples shall represent the full range of the color variation, texture and finish that can be expected in the finish work to be approved by the Engineer. Identify the quarry and fabricator (if different) for all of the granite features specified herein.
- B. Shop Drawings shall show all granite block dimensions and identify the individual blocks required to complete the work at the playground, splash pad, and seatwalls designated on the drawings. No final sizing or finishing of granite blocks shall be done until the shop drawings for that part of the work have been approved.
- C. Mock-Up: Construct two (2) sample section of blocks walls on dense graded crushed stone setting bed at locations as required by the Engineer. Each sample area shall encompass approximately twenty-five (25) square foot face of blocks and be located by the Engineer. The Engineer must approve the quality of workmanship before permanent granite blocks construction is started. If the samples are not approved, the Contractor shall provide additional mock-ups, as required, at no cost to the Owner until an approved sample is obtained. The approved mock-up shall become the standard for granite blocks throughout the entire job. The sample blocks may be constructed on a location becoming part of the final site stack block element and shall remain undisturbed completed in its entirety.

## PART 2 - MATERIALS

### 2.01 GRANITE BLOCKS

- A. Granite blocks shall be quarried, "Corinthian" granite, blue gray in color, with pink, tan and green highlights with medium to coarse grain. Finish shall be natural split face with broken edge.
- B. Approximately two (2) weeks prior to anticipated installation, the Contractor shall notify the Engineer to field select each boulder to be placed. The Contractor shall coordinate with the Engineer such that she/he is present while blocks are set. Granite blocks shall be of an approved size and shape with dimensions as noted below in the amounts shown on the drawings:
1. Rectangular block dimensions vary in length, width and height. The range of dimensions shall be:  
  
Length: 24-inch to 72-inch  
Width: 24-inch to 30-inch  
Height: 30-inch to 48-inch
- C. The Contractor should expect to handle each stone a minimum of three times:
- To move from current location into classification piles,  
To mock-up in final location to ensure fit  
To install in final location.
- In most cases it is expected that steps two and three are combined and fitting can be done in place, but the Contractor must be aware the project calls for dealing with blocks that will need to be carefully placed for best fit.
- D. Blocks shall contain no sharp corners or angular projections, to a fifteen (15) degree angle maximum, and shall be field approved by the Engineer.
- E. The Contractor shall notify the Engineer when site preparation is complete. Spacing and location of the boulders shall be as shown on the plans or as required by the Engineer. Preliminary placement of boulders shall be "dry" (without visible mortar). The Contractor shall make adjustments in the block placement as required by the Engineer. After the arrangement of boulders is approved by the Engineer, the Contractor shall set the blocks into grade on a compacted dense graded crushed stone base as necessary to set the boulders in a stable position and to prevent future removal or displacement of the boulders.
- F. Granite Blocks for Splash Pad Elements shall be blocks of similar description as above, except these blocks shall be cored to accommodate piping and splash pad elements as shown on the splash pad drawings.

## 2.02 ENGRAVED LETTERING

- A. All engraving shall be done by skilled Stone Carvers in a correct and artistic manner, in strict accordance with the spirit and intent of the approved shop drawing, or from models furnished or approved by the Engineer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. The Contractor is responsible for installing them in their final location in accordance with the Contract Drawings.
- B. The installer shall examine all work and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The bid price for Granite Block Wall shall be full compensation for all work required to procure, deliver, fit and final placement of all materials including equipment, tools and all other incidental work necessary for final completion of the items as specified.
- B. The bid price for Granite Block for Splash Pad Elements shall be full compensation for all work required to procure, deliver, fit and final placement of all materials including equipment, tools and all other incidental work necessary for final completion of the items as specified. This shall also include coring block to accommodate splash pad elements.
- C. The bid price for Granite Block Wall Engraved Lettering shall be full compensation for all work required to engrave wall as show on the drawings, including equipment, tools and all other incidental work necessary for final completion of the items as specified.

### 4.02 PAYMENT ITEMS

685.10	Granite Block Wall	Cubic Yard
685.20	Granite Block for Splash Pad Elements	EA
685.30	Granite Block Wall Engraved Lettering	Lump Sum

END OF SECTION

## SECTION 05 50 00

### MISCELLANEOUS METALS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section of the specification covers all miscellaneous metal items required for the work, except as specified elsewhere.
- B. All miscellaneous metalwork shall be fabricated as detailed or approved and shall be installed complete with all necessary anchors, anchor bolts, eye bolts, guides, bolts and other accessories.
- C. In general, site and shop fabricated items are included under this section, and factory fabricated items excluded. This section includes but is not limited to: railings and posts, fasteners, plates and all other site or shop fabricated metal items.

##### A.02 RELATED WORK:

- A. SECTION 03 05 00, FIELD CONCRETE
- B. SECTION 03 30 00, CAST-IN-PLACE CONCRETE

##### 1.03 QUALITY ASSURANCE:

- A. The drawings show the character and extent of the work required, but do not attempt to show all methods, materials, and details of construction, fastening, etc. Supplementary parts customarily necessary to complete an item, though such parts are not definitely shown or specified, shall be included as part of the item.
- B. Details of construction of the various items shall be submitted on the shop drawings. High quality construction with a neat, finished, and workmanlike appearance will be required.
- C. The size and spacing of screws, connectors, anchors, and similar items, and the size and dimensions of metal items stated herein shall apply in general; specific sizes and spacing of fasteners and dimensions of metal items listed on the drawings shall take precedence.
- D. Items supplied hereunder which are required to be built into the concrete, masonry, etc., shall be delivered to the site at locations as required by the Engineer, and as required by the overall construction schedule.
- E. Manufacturers of other products comparable in quality and type to those specified will be acceptable if satisfactory data on past performance and other required information is furnished by the Contractor, and if approved by the Engineer.

- G. Contractor shall submit an affidavit to Engineer that materials used are protected from or will not be subject to galvanic action.

1.04 REFERENCES:

- A. The following standards from a part of these specifications, and indicate the minimum standards required:

American Institute of Steel Construction (AISC)

AISC Specification for Structural Steel Buildings

American Society for Testing and Materials (ASTM)

ASTM A36 Structural Steel

ASTM A53 Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless

ASTM A123 Zinc (Hot-Dip-Galvanized) Coatings on Iron and Steel Products

ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A239 Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron or Steel Articles

ASTM A307 Carbon Steel Externally and Internally Threaded Standard Fasteners

ASTM A366 Steel, Carbon, Cold-Rolled Sheet, Commercial Quality

ASTM A525 Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements

ASTM A569 Steel Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality

ASTM B221 Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes

ASTM B308 Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded

ASTM C478 Precast Reinforced Concrete Manhole Sections

American Welding Society (AWS)

AWS D1.1 Structural Welding Code Steel

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Before fabricating or assembling any aluminum or stainless steel items, samples indicating full range of finish, color, and texture to be supplied shall be submitted to the Engineer for review.
- B. Shop drawings for all metalwork included in this section shall be submitted to the Engineer for review.
- C. The shop drawings shall be complete and checked, showing sizes, layout, method of assembly, fastenings, anchorage or connection with other work, finish, and coatings, etc. Shop drawings for aluminum work shall indicate alloys, temper and finish to be used.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. STEEL:

- 1. Materials, fabrication, and erection of miscellaneous steel sections shall conform to the applicable requirements of the AISC Specification.
- 2. Steel shapes, plates and bars shall conform to ASTM A36.
- 3. Steel pipe shall conform to ASTM A53.
- 4. Stainless steel shall be Type 304 unless otherwise indicated or specified.

B. FASTENERS:

- 1. Metalwork shall be complete, with all bolts, anchors, plates, washers, clamps, screws, studs and other such devices for proper securing and anchoring. Where positions of anchorages can be predetermined, they shall be shop-installed on the item; otherwise the material or equipment to be fastened shall be expansion bolted, toggle bolted, screwed, or otherwise fastened as shown on the drawings or called for herein.
- 2. Bolts and nuts for general anchorage and for miscellaneous ferrous metal assemblies and fasteners shall be galvanized, unfinished bolts conforming to ASTM A307 unless otherwise noted on the drawings.

3. Expansion bolts for use in concrete and masonry shall be of one manufacturer and shall be approved. Bolts shall be Kwik Bolt concrete anchors manufactured by Hilti Corp.; Trubolt+ manufactured by Red Head Concrete Anchoring Specialists; Wej-it manufactured by Wej-it Fastening Systems; or an approved equal product.
4. The centerline of expansion shields shall not be closer than 3-inches to the edge of any concrete in which they are placed.
5. Material for fasteners shall match or be galvanically compatible with the materials fastened. Washers, nuts and other accessories shall match the bolts.
6. Where the specific type, material, size and spacing of fasteners has not been called for on the drawings or in specifications, the fasteners proposed by the Contractor shall be reviewed by the Engineer. If, in the opinion of the Engineer, they are not in accordance with good safety practices, the contractor shall revise and resubmit appropriate fasteners.

C. STAINLESS STEEL RAILINGS:

1. Railings shall be in accordance with OSHA and the Commonwealth of Massachusetts Architectural Access Board (MAAB) standards and be capable of withstanding a load of 200 pounds applied at any point, in any direction on the top rail. Unless otherwise indicated on the drawings, pipe rail posts shall be 1-1/2-inch OD type 304 welded steel pipe. Interior reinforcement shall be provided in posts and/or rails as required to resist the 200-pound load.
2. Bends in pipe shall be made with manufactured elbows. Rail ends which are not continuous with posts or bolted to the wall shall have self-return to the post and ground surface. Mid-rail posts shall be approximately 6 feet on centers, or as noted on the drawings.
3. Connections shall be welded, with welds ground smooth. Railings shall be fabricated in panels, which are as long as can be conveniently handled, to eliminate as much field welding as possible.

D. ANCHORING CEMENT

1. Cement for anchoring posts in sleeves embedded in concrete stairs, walls or ramps shall be "SUPER POR-ROK", as manufactured by Hallemite (Lehn and Fink Industrial Products Division of Sterling Drugs, Inc.), Montvale, New Jersey, or approved equal.

PART 3 - EXECUTION

3.01 GALVANIZING:

A. Hot-Dip Galvanizing:

1. Provide a coating for iron and steel fabrication applied by the hot-dip process. The galvanizing bath shall contain .05-.09% nickel. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A-123 for fabricated products and ASTM A-153 for hardware. Provide thickness of galvanizing specified in referenced standards. Provide coating by Duncan galvanizing or approved equal.

B. Factory-Applied Primer Over Hot-Dip Galvanizing:

1. Provide a factory-applied polyamide epoxy coating primer, 2.0 mils dry film thickness minimum. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations or mechanically abrade to create a uniform surface profile of 1.0 – 2.0 mils, and as recommended by coating manufacturer. Provide primer coating by Duncan Galvanizing, Tnemec Co. or approved equal.

C. Factory – Or Field-Applied Architectural Finish Over Primer And Hot-Dip Galvanizing:

1. Provide a factory- or field-applied polyurethane color coating, 2.5 mils dry film thickness minimum. Apply coating at the galvanizer's plant or coating shop, immediately after application of the prime coat, in a controlled environment meeting applicable regulations, and as recommended by the coating manufacturer. Provide finish coating by Duncan Galvanizing, Tnemec Co. or approved equal.

D. The Contractor shall be responsible for determining if any fabricated items are not suitable to be hot-dip galvanized and shall notify the Engineer in writing.

E. Surfaces of metal to be galvanized shall be free from all dirt, grease, rust and moisture. Burrs and sharp projections shall be removed from edges, holes, etc., before galvanizing. Fabricated items shall be galvanized after fabrication.

3.02 WELDING OF STEEL:

Welding of steel shall be done in accordance with the AWS Code. Welds shall be continuous along entire line of contact, except where plug or tack welding is noted. Exposed welds shall be ground smooth.

3.04 FABRICATION AND ERECTION:

- A. Metalwork shall be complete, with all necessary bolts, nuts, washers, anchors, plates, fastenings, and other fittings. To the extent possible, holes for attachment of blocking, clip angles, etc. shall be shop punched. Where shop punching is impracticable, holes shall be field drilled. Burned holes will not be permitted.

- B. Material shall be straight, accurately fabricated with joints neatly framed, square, and welded.
- C. Metalwork to receive hardware shall have all cutouts and attachments accurately made using the hardware itself or templates where necessary.
- D. Metalwork shall be accurately set and secured in position, with lines plumb and level and surfaces flush and square, or as otherwise required to conform to the structure as shown on the drawings.
- E. Wherever possible, all metalwork shall be built into the cast in place concrete work and shall have sufficient anchors, well- fastened.

### 3.05 WORK PROTECTION:

- A. Aluminum surfaces, which after erection are to be in contact with wood or treated wood, shall be given a heavy brush coat of aluminum-pigmented bituminous paint or two (2) coats of aluminum metal paint.
- B. Aluminum surfaces, which after erection are to be in contact with concrete, shall be given a heavy brush coat of alkali-resistant bituminous paint.
- C. Aluminum surfaces which after erection are to be in contact with dissimilar metals, other than zinc or stainless steel, shall receive a heavy brush coat of zinc chromate primer, followed by two (2) coats of aluminum metal and masonry paint, or shall receive a heavy brush coat of alkali-resistant bituminous paint.
- D. Aluminum surfaces which are to be exposed to the weather, including anodized surfaces, shall receive two sprayed-on shop coats of water-white methacrylate lacquer, capable of withstanding the action of lime mortar for at least one week in an atmosphere of 100 percent humidity at room temperature. Surfaces shall be perfectly clean and dry before lacquering.
- E. Prior to the application of any of the above coatings, any and all areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as required so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected.
- F. Before application of any coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances such as paint, lacquer, tape, moisture, or other material, which might interfere with the adhesion of the coating to be applied. All metals shall be left in a clean condition. Cleaning methods shall employ steam, mild soaps, mild detergents, or solvents such as kerosene, or naphtha. Lacquered surfaces may be cleaned with a mineral solvent or turpentine. Thorough rinsing with clean water and drying with clean, soft cloths shall follow any of the above cleaning methods. No other cleaning method may be used without the specific permission of the Engineer.

- G. After suitable cleaning, all metalwork shall be given an approved shop coating of methacrylate lacquer to protect the surface from stain. The protective coating of lacquer on all metalwork worn off due to handling or erection shall be replaced by a new coating of lacquer of the same type.
- H. During construction, precautions shall be taken to prevent damage to the metal work from splashing or the accumulation of paint, concrete, mortar, or other similar materials, or from staining adjacent surfaces during cleaning operations. Any staining or damage that does occur shall be immediately and completely removed.
- I. Each piece of metal in transit and in storage shall be individually wrapped with a non-scratching material, with the joints securely sealed. Wrapping shall completely cover and protect each item. Storage shall be out of the weather, protected from moisture, and with adequate ventilation.

### 3.06 PAINTING:

- A. Ferrous metals of this section, except for galvanized or stainless steel shall be shop primed in accordance with the following:
  - 1. Submerged service components shall be sandblasted clean in accordance with SSPC-SP-10, Near White, immediately prior to priming.
  - 2. Non-submerged service components shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.
  - 3. Shop primer, except as otherwise noted, shall be one spray applied coat with dry film thickness of 3.5 to 4.5 mils of Tnemec 66 Boston Gray Primer by Tnemec Co.; or Aquapun by PPG, Inc; or approved equal.
  - 4. Portions of ferrous metals to be embedded in concrete or masonry shall be given a heavy brush coat of alkali resistant bituminous paint.
  - 5. Scratches or abrasions in the shop coat and areas at field welds, bolts, nuts and other unpainted areas shall be touched up after erection with the paint specified for the shop coat. Cold galvanized paint shall be used for touch up of galvanized surfaces. Paint shall be one of the following; Sealube Co., ZRC; Galvicon Corp., Galvicon; Stanley Chemical Div., Zinc Shield; Duncan Galvanizing Corp., ZIRP; or an approved equal.
  - 6. Shop and field prime paint systems shall be compatible with finish coat.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for items 660.10 will be made at the respective unit price and be measured by the linear foot along the center line of stair and/ or ramp in which the handrail is to be complete in place, which price shall constitute full compensation for furnishing and installing the handrail, including coring, excavation, anchoring, hardware and for furnishing any equipment and/or other materials required.

4.02 PAYMENT ITEMS

660.10	Stainless Steel Handrail	Linear Foot
--------	--------------------------	-------------

END OF SECTION

NOT FOR BIDDING

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers tools, equipment, labor, and materials necessary to perform rough carpentry work complete and miscellaneous carpentry items not specified elsewhere including fasteners and supports.
- B. Nails, screws, bolts, anchors, brackets, and other hardware for fastening and securing items provided under this section of the specification shall be furnished under this section.

1.02 RELATED WORK:

- A. Section 03 05 00, FIELD CONCRETE
- B. Section 03 30 00, CAST-IN-PLACE CONCRETE
- C. Section 06 20 00, FINISH CARPENTRY
- D. Section 09 90 00, PAINTING
- E. Section 31 50 00, SUPPORT OF EXCAVATION

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 00, SUBMITTALS, SUBMIT THE FOLLOWING:

Certificates of wood treatment upon delivery of treated wood product. Treated wood product shall bear appropriate American Wood Preservers Bureau (AWPB) quality mark.

1.04 DELIVERY:

Lumber, plywood, and other wood material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness, and extreme changes of temperature and humidity at all times.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

#### A. LUMBER:

1. The grades of all materials under this section shall be defined by the rules of the recognized associations of lumber manufacturers producing the material specified, but the maximum defects and blemishes permissible in any specified grades shall not exceed the limitations of the American Lumber Standards.
2. Framing Lumber for joists, beams rim joists, and sleepers shall be # 1 Pressure Treated Southern Yellow Pine dimensional lumber, ground contact treated per American Wood Protection Association Standards. All lumber shall be sized as indicated on the drawings. All lumber shall be furnished to the site inclusive of its plastic end lumber grading tag. Wood shall be rated for Ground Contact/ Fresh Water-General Use (UC4A) as designated by the American Wood Protection Association (AWPA) per the APWA U1 Standard. Preservative utilized for pressure treating shall be as recommended by AWPA and shall meet minimum retention requirements based on anticipated use.
3. Other materials not specifically listed shall be of an accepted grade dictated by good practice.

#### B. SELF-ADHESIVE JOIST TAPE

1. The top side of all beams and joists shall be protected by utilizing self-adhesive joist barrier tape, a malleable polyurethane water resistant lumber flashing material utilizing a rubberized asphaltic mastic adhesive. All top surfaces of beams and joists shall be covered prior to installing decking.

#### C. JOIST HANGERS:

1. Joist Hangers shall be utilized to hang all joists in the deck. Joist hangers shall be 18 gauge steel and shall be galvanized with ZMAX galvanization. Joist hangers shall be installed per manufacturer's instructions with galvanized joist hanger nails or joist hanger screws.

#### D. FASTENERS:

1. All fasteners utilized for framing shall be coated fasteners specifically intended for use with pressure treated lumber.

#### E. HELICAL FOUNDATION SUPPORT SYSTEM FOR COMPOSITE WOOD DECK

1. Composite Wood Deck shall be supported by a helical pier system as indicated on the drawings.

2. Helical Foundation Support System shall be a system manufactured for support of a ground based decking system. System shall be by one manufacturer of all associated components.
3. Helical foundation support system shall consist of helical piers, helical plates and helical brackets to support deck beams.
4. Helical foundation support system shall be capable of supporting the composite wood deck as indicated on the drawings. Contractor shall furnish shop drawings by helical foundation support system manufacturer or by a Professional Engineer indicating all necessary components. Actual number and depth of helical piers shall be determined by the manufacturer based on load and soils conditions. Soil conditions are as represented in the geotechnical report in the appendix.
5. Contractor shall furnish all associated hardware not supplied by the helical foundation support system manufacturer to attached deck beams to the helical support system brackets. All fasteners shall be hot dipped galvanized per ASTM A-153.
6. Contractor shall assume 6'-0" helical pier depth (from bottom of timber beam to the bottom of pier. Actual depths shall be as determined by the helical pier design. Anchors shall be installed to meet the specified installation requirements to provide an allowable capacity of 4.5 kips +/- 0.5 kips. The owners representative shall observe installation of helical piers to confirm piers are installed to required embedment depths and capacities.

### PART 3 - EXECUTION

#### 3.01 DECK CONSTRUCTION:

- A. Work shall be erected plumb, true and square.
- B. Connection to helical pier foundation system shall be made using fasteners as specified by the helical pier system manufacturer.
- C. Deck frame shall be constructed as shown on the drawings.
- B. Cut ends of lumber previously treated with preservative specified shall be brushcoated with the same material.
- C. Wood members for benches shall be fastened to masonry with masonry nails, power-driven fasteners, or bolts in expansion shields, except where otherwise indicated.
- D. Minimum length of nails shall be twice the thickness of wood being fastened.

- E. Furring, blocking, nailers, and similar items shall be provided wherever required for the support, proper erection, fastening, or installation of carpentry or other materials, and as shown on the drawings.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. The bid price for rough carpentry and the requirements set herein shall be full compensations for all work including hauling and disposal of materials, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified. Installation of deck foundation and framing shall include excavation and installation of dense graded crushed stone base.
- B. The bid price shall be included all work necessary to perform the required work of specifications sections but not limited to:
  - a. 03 05 00, Field Concrete
  - b. 03 40 00. Cast-In-Place Concrete
  - c. 06 20 00, Finish Carpentry

##### 4.02 PAYMENT ITEMS

- A. The bid price for all rough carpentry related shall be included in unit bid pricing but not limited to items, 707.10, 707.20, 707.30, 701.04, and all other incidental work necessary for final completion of these items as specified.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section of the specification covers furnishing tools, equipment, labor and materials necessary to perform finish carpentry work complete, and miscellaneous carpentry items not specified elsewhere including fasteners and supports. Provide all finish carpentry and millwork indicated on the drawings and as specified herein, including but not limited to:

1. Composite Wood Bench Seat Top
2. Composite Wood Bench Back
3. Composite Wood Deck

- B. Metal fasteners, plates, brackets, and accessories connected directly into woodwork shall be a part of this section of the specification. Nails, screws, bolts, anchors, brackets, and other similar hardware for fastening and securing woodwork and other items provided under this section of the specification shall be furnished under this section.

1.02 RELATED WORK:

- A. Section 03 30 00, Cast-In-Place Concrete  
Section 06 10 00, Rough Carpentry

1.03 SUBMITTALS: SUBMIT THE FOLLOWING:

- A. Manufacturer's literature of the materials of this section.
- B. Three (3) sets of samples of composite wood shall be submitted to the Engineer for selection of colors.
- C. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress. Allow for field cutting and fitting where taking field measurements before fabrication is not possible.
- D. Mock-Up: Contractor shall provide at least two (2) fully finished representative samples of each material that is to be installed in the finished condition. Showing full range of cuts, fasteners, and variations expected. Provide sample of 25 square feet minimum.

1.04 DELIVERY AND STORAGE:

Finish carpentry material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness and extreme changes of temperature and humidity always. Composite wood and other material shall be completely wrapped as required to prevent injury during shipment and storage. Finish materials shall not be delivered until the installation is ready and all concrete and other "wet" work has been completed and allowed to become thoroughly dry.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The grades of all materials under this section shall be defined by the rules of the recognized associations of lumber manufacturers producing the material specified, but the maximum defects and blemishes permissible in any specified grades shall not exceed the limitations of the American Lumber Standards. Materials not specifically listed shall be of an accepted grade dictated by good practice.
- B. Composite lumber shall be manufactured by:
1. Trex Company Inc., 160 Exeter Drive, Winchester, VA 22606, 1-800-289-8739, [www.trex.com](http://www.trex.com).
  2. Timber Tech, An AZEK Company, 1330 W. Fulton Street Suite #350, Chicago, IL 60607, 1-877-275-2395, [www.timbertech.com](http://www.timbertech.com)
  3. Fiberon composite decking, 181 Random Drive, New London NC, 28127, 1-8000573-8841, [www.fiberondecking.com](http://www.fiberondecking.com)
  4. Or approved equal.
- C. For bidding purposes composite decking lumber shall be Trex Transcends Decking 1" square Board. Fascia Boards shall be 1" x 8" Fascia from the Trex Transcend collection. Contractor shall assume one color will be utilized for the composite wood deck and a different color will be used for the composite wood benches. Final color to be submitted for approval by the Engineer prior to installation. Contractor is responsible to furnish all stock as well as fasteners required for installation.
- C. Composite lumber shall bear the grade and trademark association under whose rules it is produced and mark of where it was produced. Finish carpentry and millwork, in general, shall be of sound stock without defect in a color chosen by the Engineer.

Section 100	Lumber
Section 300	Trim

- D. Wood shall be solid stock, in commercial long lengths.

PART 3 - EXECUTION

3.01 CONSTRUCTION:

- A. Work shall be erected plumb, true and square. Finish work shall be accurately mitered or butted to meet in straight hairline joints, in accordance with the best commercial practice.
- B. All exterior trim shall be fully back primed prior to installation. Prime cut edges after installation and prior to application of additional wood members.
- C. Finish fasteners shall be used on all exposed trim. stainless steel, tamer resistant screws shall be used on all exterior finish work.
- D. Minimum length of fasteners shall be twice the thickness of wood being fastened. screw heads in finished work shall be sunk neatly resulting hole filled with putty.
- E. Exposed surfaces of woodwork shall be machine sanded to an even, smooth surface, free of defects, blemishes, machine or tool marks, abrasions, dirt, smudges, or raised grain. Adequate protection shall be provided as necessary to prevent damage or staining of carpentry items.
- F. Woodwork abutting masonry or other finish materials shall be scribed and fitted as tightly to abutting material as is possible without damaging it.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for items 707.10, 707.20 and 707.30 will be made at the respective unit price, complete in place, which price shall constitute full compensation for furnishing and installing the wood bench seat top, seat back or wood deck, including any equipment and/or materials required.

4.02 PAYMENT ITEMS

707.10	Composite Wood Bench Seat Top	Square Foot
707.20	Composite Wood Bench Back	Linear Feet
707.30	Composite Wood Deck	Square Feet

END OF SECTION

SECTION 07 90 00

SEALANTS FOR SPRAY DECK

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Furnish all materials, equipment, labor and services required for all caulking, and sealants.
- B. Include joint preparation, sealants, joint backup, and primers.
- C. Sealants are required on all expansion joints where spray deck expansion joints are found. All joints within the spray deck and surrounding dry deck area.

1.02 RELATED WORK:

- A. The related work shall be performed under other Sections:
  - 1. Section 03 30 00, CAST IN PLACE CONCRETE
  - 2. Section 13 00 00, SUMMARY OF WORK FOR SPRAY DECKS
  - 3. Section 13 14 13, SPRAY EQUIPMENT

1.03 QUALITY ASSURANCE:

- A. Materials used in fulfilling the requirements of this Section shall be suitable for each intended use and shall be of the type specified for each category. Materials shall be applied under temperatures required for each type in accordance with the manufacturer's recommendations.
- B. In addition to other requirements, compounds shall contain no acid or ingredients that will affect masonry, corrode metal, or have injurious effects on paint.
- C. Use proper materials specified herein for each location where drawings call for sealants.
- D. Submit manufacturer's certification of compliance with these specifications for each material. (Acceptable for use in Spray Decks.)

1.04 SUBMITTALS:

In accordance with requirements of General Specifications, submit the following:

- A. Six sets of manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.

#### 1.05 SAMPLES:

- A. Submit samples of all products listed in Part 2 - PRODUCTS.
- B. Sealant samples shall be 3-inch strips joining wood, metal or hardboard. Joint backup sample shall be 6-inches long, ½-inch or greater in diameter. Foam sealant shall also be 6-inches long.
- C. Submit manufacturer's product description, performance and test data on all materials, for Engineer's review.
- D. Colors of all materials shall be as selected by Landscape Architect.

#### 1.06 DELIVERY, STORAGE AND HANDLING:

- A. Each container shall bear an unbroken seal, test number and label of the manufacturer upon delivery at the site. Unlabeled materials will be rejected and shall be removed from the site and replaced with approved-labeled materials at no additional cost to the Owner.
- B. Deliver materials to site and install work under this Section in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.

#### 1.07 GUARANTEES:

- A. Attention is directed to provisions of the GENERAL CONDITIONS regarding guarantees and warranties for work under this Contract.
- B. Manufacturers shall provide their standard guarantees for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities which manufacturers and Contractor may have by law or by other provisions for the Contract Documents.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

##### A. Sealants

1. Sealants shall be non-staining materials conforming to the requirements of United States of America Standards Institute "Standard Specification for Polysulfide-Base Sealing Compounds for the Building Trade", USA 116.1. Compound shall be Class

A (self-leveling), or Class B (non-sag), as applicable in each case for the joint to be caulked. Color of sealant shall match as closely as possible the color of the surrounding materials, and when used adjacent to masonry work the compound shall match the color of the mortar in the masonry joints. Precise color shall in all cases be subject to the approval of the Engineer.

- a). Dow Corning Corporation: 790
- b.) Pecora Coproration: 890 NST
- c). Tremco Incorporated: Spectrem 1
- d). or approved equal

## 2.02 JOINT – SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.03 SPRAY DECK JOINT CAULKING

- A. The product specified herein is to establish minimum acceptable quality. Product shall be resistant to chlorides, and shall come in various colors:
  1. Tough, elastic, rubber-like seal.
  2. Remains flexible with expansion and contraction of building component without adhe under suitable design conditions.
  3. Stays resilient within a wide temperature range.
  4. Excellent resistance to water, oils, grease, most solvents, mild acids and alkalis.
  5. Tenacious adhesion to concrete, metal, wood, glass, stone, ceramic and masonry surf; typically without the need for priming.
  6. Effective under constant immersion or saturated conditions, when suitably primed.

7. USDA acceptance (NS grade only).

B. APPROVED MANUFACTURES:

1. Sika
2. Euclid
3. Pecora
4. Approved Equal

C. Joint primer shall be for concrete or as recommended by the caulking manufacturer.

2.04 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealants to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Surfaces to receive sealants shall be clean, dry and free of oil, dust and loose particles.
- B. Before starting work, inspect all surfaces to receive sealant work and report in writing to the Engineer any surfaces that are not suitable for application of such materials.
- C. Unsuitable surfaces shall be corrected before work begins. Commencement of material application to any surface shall constitute acceptance of that surface as proper to receive the work. Subsequent defects in work shall be corrected under this Section without additional cost to the Owner.

### 3.02 PREPARATION FOR SEALANTS:

- A. Notify the proper trades of locations where adequate rabbets for sealant have not been provided; all such rabbets shall be prepared by cutting and cleaning out material to the minimum depth required and by grinding to the minimum width by the appropriate trade.
- B. Wire brush full depth of joints in concrete, masonry, mortar and plaster as required to obtain a firm, clean surface. Clean metal surfaces with wire brush where required to remove scale and other deposits and wipe clean with a mild, non-staining solvent. Clean other surfaces by methods approved by the sealant manufacturer. Where joint has been mortar-filled, rake out existing mortar  $3\frac{3}{4}$ -inches deep.
  - 1. Prime surfaces to receive sealing compounds where recommended by manufacturer in accordance with manufacturer's printed instructions.
- C. Install continuous lengths of joint backing material in proper size, shape, and depth. Except where otherwise specified or recommended by manufacturer, depths of joints not exceeding  $\frac{1}{2}$ -inch in width shall be approximately the same as the width. Depth of joints exceeding  $\frac{1}{2}$ -inch in width shall be approximately  $\frac{1}{2}$  the width of the joint. No sealed joint shall be less than  $\frac{1}{4}$ -inch deep.
- D. Install joint backup in all exterior joints in excess of  $\frac{5}{8}$ -inch depth, and in all interior joints requiring backup, placing the bead in the joint in a manner that will assure constant sealant material depth. Set bead into joint continuously by slightly stretching during placement to permit compression against sides of joint without surface wrinkles or buckles.
- E. Waterproof membrane shall be installed on clean concrete surface and membrane drain shall be protected from being plugged or covered with material.

### 3.03 SEALANT APPLICATION:

- A. Apply sealant only to clean, dry surfaces, and only when the ambient temperature is within manufacturer's recommended range.
- B. Application shall be in strict accordance with manufacturer's printed instructions.
- C. Apply gun grade sealants with sealant guns of type approved by sealant manufacturer using nozzles sized to fit into joints and drive material with sufficient pressure to fill all voids. Install sealants in continuous, uninterrupted, full-length beads. Superficial pointing of joints with a thin bead of compound will not be acceptable.

- D. Apply pouring grade sealant at horizontal and deck joints in accordance with manufacturer's recommendations over joint backing. Joints shall be continuously filled, level and smooth.
- E. Neatly point and tool all finished joints, concave, uniformly smooth and free of wrinkles, waves, sag lines, and other imperfections. Keep outer edge of sealant 1/8-inch back from face of surrounding material. Remove masking tape immediately after tooling but before sealant has set.
- F. Provide sealant at exterior saddles and thresholds not sealed under another Section. Set same in a full bed of exterior sealant not less than 3/8-inch thick. Clean off excess compound after installing.
- G. Surfaces of all materials adjoining sealant joints shall be fully protected and be kept clean and free of smears of compound or other soiling due to sealant application. Use non-staining masking tape as required.

#### 3.04 PROTECTION AND CLEANING:

- A. Clean all surfaces of adjacent surfaces, which have been marked or soiled by the work of this Section, removing all excess materials there from. Use only cleaning materials and solvents that will not damage the surfaces in any way.
- B. Remove all debris and rubbish as the work progresses, and legally dispose of same.
- C. At completion of work, do final cleaning, leaving the work and adjacent surfaces in a clean and neat condition.

### PART 4 - COMPENSATION

#### 4.01 METHOD OF MEASUREMENT:

- A. The bid price for spray deck sealant will be paid under item 730.10 –Spray Deck and shall constitute full compensation for furnishing and installing the spray deck sealant and for furnishing any equipment and/or materials required.

#### 4.02 PAYMENT ITEMS:

- A. The bid price for all sealant's for spray deck related work shall be included in unit bid pricing but not limited to items, 730.10 and all other incidental work necessary for final completion of the items as specified.

END OF SECTION

## SECTION 32 17 23

### TRAFFIC SIGN SUPPORTS

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including the General and Supplementary Conditions and Division 0 – Bidding Documents, Contract Forms, and Conditions of the Contract and Division 1 – General Requirements, apply to the work of this Section.
- B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specification sections and other Contract Documents.

##### 1.1 REFERENCES

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

##### 1.2 WORK INCLUDED

- A. This work shall consist of the careful removal of signs, attached hardware and supports and installing Town galvanized post anchors at locations shown on the plans and as directed by the Engineer.

##### 1.3 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:

- Section 03 05 00, Field Concrete
- Section 03 30 00, Cast-in-Place Concrete

##### 1.4 STANDARDS

- A. The following standards including all current amendments form a part of these Specifications:

- 1. American Society for Testing and Materials (ASTM):

- |      |  |
|------|--|
| A36  | Structural Steel   |
| A53  | Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless                                |
| A120 | Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses |
| A307 | Carbon Steel Externally and Internally Threaded Standard Fasteners                                 |
| A325 | High Strength Bolts for Structural Steel Joints  |
| A500 | Cold Formed Welded and Seamless Carbon Steel Structural Tubing Rounds and Shapes                   |
2. American Welding Society (AWS):
    - D1.1 Structural Welding Code
  3. Steel Structures Painting Council (SSPC):
    - SSPC Surface Preparation Specifications

## 1.5 SAMPLES AND SUBMITTALS

- A. At least thirty days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with requirements this specification. Do not order materials until Engineer's approval of samples, certifications or test results have been attained. Delivered materials shall closely match the approved samples.
  1. Shop Drawings: Submit detailed shop drawings for each item required to be fabricated or installed under work of this Section. Include plans, sections, and details as required to show completely materials, layout, jointing, clearances and connections for all items required. Shop drawings for handrails at stairs and at other site conditions requiring accurate dimensional relationships to as-built construction shall be prepared following a review and confirmation of as-built measurements and conditions for areas scheduled to receive miscellaneous metal items. Submit shop drawings for the following:
    - a. Signage and posts
  2. Material Samples: Submit samples for each material for the following:
    - a. Railing tube material and finishes – submit one (1) sample
    - b. Sheet metal material and finishes – submit three (3) samples of finishes for brushed stainless steel per manufacturer's recommendation and Owner's direction.
  3. Manufacturer's Literature: Submit three (3) copies each of manufacturer's material descriptions and installation instructions for the following:

- a. Non-shrink cement grout,
  - b. Sealant.
4. Finishing Schedule: Submit a complete schedule outlining all items to be color finished under work of this Section together with a breakdown of surface preparation techniques and primer and color finish materials to be applied.

## PART 2 - PRODUCTS

### 2.1 SIGNS

- A. The signs shall be provided by the Town of Brookline Department of Public Works maintenance facility or as directed by the Engineer, and any signs and posts damaged or lost either directly or indirectly as a result of the Contractor's operations shall be replaced by the Contractor at his own expense. The Contractor shall coordinate the removal of signs and posts with the Department by notifying the Department prior to and at the completion of the above work.

### 2.2 POSTS

- A. The contractor shall locate and or furnish and install all sign posts included in the plans. Shop drawings for each sign post type will be produced for review, comment and approval prior to final manufacturing.
- B. 2 ¼" Galvanized Post Anchors and 2" DI galvanized Iron Pipe (Parking meter Post) will be supplied to the Contractor, by the Town, which shall be installed during the placing of concrete sidewalks, in tree lawn areas and/or cored into existing sidewalks and tree lawns. All Anchors shall be set six (6) inches above finished grade. All Posts shall be 3 feet above finished Grade

### 2.3 MISCELLANEOUS HARDWARE

- A. Miscellaneous stainless steel hardware as required for the project shall be 18-8 stainless steel (AISI Type 304).
- B. Bolts: 3/8" Dia. SS Kwik Bolt II Expansion Anchor – Countersunk Version by HILTI Inc., PO Box 21148, Tulsa, OK, 74121

## PART 3 - EXECUTION

### 3.1 POSTS

- A. Fabricate and install steel sign posts in conformance to details, and approved shop drawings. Measure on-site conditions to receive posts prior to preparing shop

drawings.

- A. At sidewalks, pavements and at other locations as directed, install posts within cored holes. Grout posts to within one-half inch (1/2") of top surface and provide a sealant joint to finished grade. Sealant color to be approved by Engineer.
- B. All anchoring systems employed shall be vandal-proof.

3.2 TOUCH-UP OF SURFACES

- A. After erection, all scratches or abrasions in the color galvanized surface shall be repaired or replaced to the satisfaction of the Engineer.

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. The cost of excavating, removing, disposing of old posts, transporting and stacking signs, installing new anchors, labor, materials, equipment and incidental work necessary to complete the work shall be included in the contract unit price under the respective payment item. No separate payment will be made for cement concrete walk surface, gravel or sawcutting the existing sidewalk surface to accommodate the signpost installation/removal or backfilling the old post location, but all costs in connection therewith shall be included in the contract bid price.

4.02 PAYMENT ITEMS:

874.4	Traffic Sign Removed and Stacked	Each
878	Install Town Furnished Galvanized Post / Anchors	Each

END OF SECTION

SECTION 11 68 13

PLAYGROUND EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The Contractor is responsible for preparing all base materials, sub-grades in all playground areas as well as adjacent site features. The playground equipment shall be as noted on the plans and herein or approved equal.
- B. Refer to Appendix for manufacturer's data.

1.02 SUBMITTALS

- A. In accordance with Section 01 33 23, SUBMITTALS, submit manufacturer's specification and detail sheets for all materials to be utilized under this section, prior to ordering, furnishing and/or installing the play equipment as required by this contract.

1.02 REFERENCE STANDARDS AND SPECIFICATIONS

- A. Playground equipment design, layout, and installation shall comply with the following standards and guidelines as applicable.
  - 1. CPSC - Consumer Product Safety Commission Guidelines for Playground Safety, latest edition.
  - 2. ASTM - American Society for Testing and Materials, Designation: F 1487, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use, latest edition.
  - 3. ANSI - American National Standards Institute.
  - 4. AASHTO - American Association of State Highway and Transportation Officials (tests of specifications).
  - 5. MAAB - Massachusetts Architectural Access Board

1.03 BASIS OF DESIGN

- A. All references to products by manufacturer, trade names or performance specifications stated as "or equal" shall be as determined by the Engineer and the Town, per MGL c30 s.39M, part (b).

<https://malegislature.gov/Laws/GeneralLaws/PartI/TitleIII/Chapter30/Section39M>

1. After a reasonable investigation, the Town has not identified 3 manufacturers that can meet the following specifications for play equipment due the nature of the field of manufacturers, and the specific design and custom layout of this playground. Therefore, for sound reasons in the public interest, the following material specifications listed below are being used for all items in this section as the Basis of Design.

2. Alternate manufacturers for items will be considered per MGL c.30 s.39M part (b), provided that they substantially conform to the specifications in the sole judgement of the Town, and provide equal quality, durability, appearance, strength, and design.

### 1.03 SHOP DRAWINGS

- A. Prior to ordering, furnishing and/or installing the play equipment as required by the Contract Documents, the following shall be submitted to the Project Representative for review and approval:
1. Certified product data, shop and fabrication drawings showing all important details of construction and dimensions showing the equipment, arrangement, footing spacing and lengths. Shop drawings shall stipulate and certify to compliance with all CPSC and ASTM standards and guidelines as applicable.
  2. Descriptive literature and technical specifications for all play equipment installations.
  3. Warranty certificates for all applicable play equipment features, components, hardware, finishes and other applicable items.
  4. In the event that it is impossible to conform to certain details of this specification due to differing manufacturing techniques or conventions, submit complete summary of all non-compliant components or elements.

### 1.04 SAMPLES:

- A. Submit the following samples in accordance with the provisions of the GENERAL CONDITIONS.
1. Submit samples and descriptive literature of all items specified in this Section, including treatments, finishes, colors, and test information.

### 1.05 QUALIFICATIONS:

- A. Installer shall have a minimum of five (5) years' experience with a minimum of fifteen (15) playground installations. References will be required.

1.06 INSPECTIONS:

- A. The Contractor shall have the play equipment inspected by a manufacturer's representative. The representative shall certify that the play equipment was installed in accordance with the manufacturer's instructions.
- B. The Contractor is responsible for securing a Certified Playground Safety Inspector (CPSI) to ensure ASTM and CPSC compliance. The Inspector shall certify that the play area meets all safety standards and applicable codes. The Inspector shall also insure the equipment is installed to meet all required safety height requirements as installed. A certificate of compliance shall be issued to the Owner prior to final inspection

PART 2 - MATERIALS

2.01 PLAYGROUND EQUIPMENT:

- C. Play Equipment shall be manufactured by Landscape Structures Inc. (LSI) as represented by M.E. Obrien and Sons, Medfield, MA as represented by Brian Iafolla, 508-359-4200, [BrianIafolla@obrienandsons.com](mailto:BrianIafolla@obrienandsons.com), or approved equal.
  - A. Manufacturing time for this project will be approximately 10 weeks from the time of accepted shop drawings.
  - B. Play equipment shall be as follows:

**PlayBooster® and Evos® (5-12 years)**

PHASE-1 Direct Bury Mixed Material

QTY	NO.	DESCRIPTION
<b>PlayBooster®</b>		
<b>Bridges &amp; Ramps</b>		
2	120325A	Ramp Berm Exit Plate Concrete Wall
<b>Climbers W/Steelx Handholds</b>		
1	148437B	Corkscrew SteelX Handholds 64"Dk DB
<b>Custom</b>		
1	CP004762	STEELX SPIRAL CLIMBER FOR 64" DECK, No Configurable Colors
1	CP001996	UPCHARGE FOR ADDITIONAL CLAMP COLOR, No Configurable Colors
1	CP015422	123" ARCH BRIDGE W/BARRIERS, RPL ACCENTS & SWIGGLKNOTS BELOW, Angled RPL Accents; SwiggleKnots below one end of bridge
1	CP015416	12'-5" OC PORTAL CLIMBER FOR 12" DK DIFF, 72" dk to 60"dk. Includes Steelx Handholds.
1	CP015418	12'-5" OC RAMP W-BARRIERS & WAVY BELT CLIMBER BELOW, Belt climber suspended and anchored under bridge.
1	CP015414	12'5" RAMP W/BARRIERS & ANGLED RPL ACCENTS, 42" OC wide with 12" rise. Angled RPL Accent on each barrier.
1	CP006184	2 POST ROPE PULL FOR 6FT ELEVATION HILL - 2 COLOR POLY, Approximately 12'-6" long in plan. Includes clamps, 5 roto knots, and two posts. 2 std poly colors
1	CP015428	24" DK DIFF RPL INFILL W-RAIL STEP, Tendertuff Rail. *Note: Quote hand support separately
9	CP013847	240" STEEL ROOF POST FOR 120" DECK., 44" bury
1	CP015437	42" X 42" OC VERTICAL NET CLIMB BELOW DK, Used below 104" minimum dks only. 2 belt landings.
2	CP009403	42" X 42" UNDER-DECK SQUARE NET W BELTING, Under deck net w belt squares. Mount at 16 - 24" height. Only use under 72" deck or higher.
1	CP015411	48" DK NET LADDER, Includes Steelx Handholds.

- 1 CP015421 72" DK NET LADDER, Includes Steelx Handholds.
- 1 CP015419 72" DK WHOOSH WINDER FOR LONG SIDE OF 90\* TRIDECK,  
Steelx Infill Panels
- 1 CP004990 96" CHIMNEY CLIMBER W STEELX HANDHOLDS, Black cables
- 1 CP015433 ANGLED WIRE BARRIER W/RPL ACCENTS (RH), Approx 41"  
overall height. Below roof/above slide per layout.
- 1 CP000427A DTR PB SteelX 32" Deck-Deck Vertical Ladder
- 1 CP000495A DTR PB SteelX Handhold Panel Left
- 1 CP000469A DTR PB SteelX Handhold Panel Right
- 1 CP000424A DTR PB SteelX RH 3/4 Barrier
- 1 CP000413A DTR PB SteelX Vertical Ladder 32" Deck
- 1 CP013426 ROPE PULL CLIMBER FOR 3' ELEVATION CHANGE,  
Approximately 6' - 9" long in plan. Includes clamps, 3 roto knots and 2  
post
- 1 CP015427 SET OF 2 ANGLED POSTS FOR CANTILEVER DECKS, per layout  
for Cypress
- 2 CP014898 SET OF STEELX HANDHOLD PANELS, with left side prosheild  
handloop
- 1 CP015425 STEEL PERFORATED ANGLED ROOF (TRAPEZOID SHAPE)FOR  
CANTILEVER, Will cover 4 square & 3 tridecks (cantilevered). Per  
layout. Includes post extensions. \*Note: 9 qty. 8" taller (for dk height)  
Roof Posts required, not included.
- 1 CP015434 TALL ANGLED TOWER WIRE BARRIER W/BUBBLE PANEL &  
RPL, Approx 84" tall. Angled RPL Accents. Permalene Panel
- 1 CP015430 TALL ANGLED TOWER WIRE BARRIER W/COLOR SPLASH  
PANEL & RPL, Approx 84" tall. Angled RPL Accents. Permalene  
Panel
- 1 CP015429 TALL ANGLED TOWER WIRE BARRIER W/MARBLE PANEL &  
RPL, Approx 92" tall. Angled RPL Accents. Permalene Panel
- 1 CP015431 TALL ANGLED WIRE INFILL W-OPENING FOR TELESCOPE &  
RPL, To be used above wire barrier w-telescope. Approx 45i Tall.

1	CP015399	WIRE BARRIER W-ANGLED RPL ACCENTS
1	CP015413	WIRE BARRIER W-FUN MIRROR PANEL, Permalene Panel
1	CP015439	WIRE BARRIER W-IMAGINATION TABLE PANEL AND RPL ACCENTS, Angled RPL Accents
1	CP015396	WIRE BARRIER W-STEERING WHEEL & ANGLED RPL ACCENTS (RH)
1	CP015412	WIRE BARRIER W-TELESCOPE & ANGLED RPL ACCENTS
1	CP002034	WIRE BARRIER W-TELESCOPE

#### Decks

5	122197A	90* Triangular Tenderdeck
4	111607A	Deck Clamp Lowering Kit
12	121948A	Kick Plate 8"Rise
2	111230A	Square Deck Corner
6	111229A	Square Deck Extension
3	111228A	Square Tenderdeck
9	111231A	Triangular Tenderdeck
2	119646A	Tri-Deck Extension
2	121949A	Tri-Deck Kick Plate 8"Rise

#### Main Structures

1	185338B	10' Tower TurboTwister w/1 View
---	---------	---------------------------------

#### Motion & More Fun

1	166809A	E-Pod Seat
1	120901A	Grab Bar
5	111275A	Handloop Assembly
1	111362A	Talk Tube 40' Tubing Kit PB
1	111363A	Talk Tube At Grade Mounted DB Only
1	111363I	Talk Tube Deck Mounted 72"Dk DB Only

#### Overhead Events

1	193170A	LolliLadder w/2 E-Pods
---	---------	------------------------

#### Posts

1	111404G	100"Alum Post DB
1	111405A	106"Alum Flush Post w/Standard Cap DB
1	111404F	108"Alum Post DB
5	111404E	116"Alum Post DB
3	111404D	124"Alum Post DB
1	111404C	132"Alum Post DB

7	111404B	140" Alum Post DB
6	111404A	148" Alum Post DB
1	111404Z	182" Steel Post DB (44" Bury)
1	111404I	84" Alum Post DB
2	111404H	92" Alum Post DB
1	111405B	98" Alum Flush Post w/Standard Cap DB

**Slides**

1	148435B	Firepole SteelX Handholds 56"Dk DB
---	---------	---------------------------------------

**Evos®**

**Custom**

1	CP013427	BOW LADDER® CONNECTOR TO ATTACH TO CUSTOM ARC NET, from 6" deck height. Includes ball clamps, (2) E-Pods® and (1) 72" noodle post. For use with CP015410 (NOT included).
---	----------	--

**Freestanding Play**

**Custom**

1	CP015410	DOUBLE ARC NET CLIMBER, Uses two hemisphere arcs with new net config w swiggliknots. Used on flat elevation.
2	CP001299A	DTR IND Recycled Board Oak Leaf Wobble Pod DB
1	CP014903	HILLSIDE HALF ARCH TWISTING ROPE CLIMBER., 1 sections plus tensioners at both ends. Modified to fit site topography.
4	CP001443	SET OF 10 HILLSIDE CLIMBING HANDGRIPS, Set of ten Tri-Handhold Handgrips with mating steel plate for SM embedment into concrete. Surfacing thickness to be 2i., No Configurable Colors
6	CP001153	SINGLE HILL LOOP, 36"OC
1	CP001071	UPCHARGE FOR ADDITIONAL POST COLOR, No Configurable Colors

**Signs**

1	182503C	Welcome Sign (LSI Provided) Ages 5-12 years Direct Bury
---	---------	--

**PlayBooster® and Weevos® (2-5 years)**

PHASE-1 Direct Bury Aluminum

QTY	NO.	DESCRIPTION
-----	-----	-------------

**PlayBooster®****Bridges & Ramps**

2	120325A	Ramp Berm Exit Plate Concrete Wall
---	---------	---------------------------------------

**Custom**

1	CP015395	123" RAMP W/BARRIERS W 2 CIRCULAR PNL OPENINGS & RPL ACCENT, 42" OC wide with 8" rise. Angled RPL Accent on each barrier. *Note: panels NOT included. Select from Sensory Play Center options and quote as separate, standard panel part.
2	CP015388	12'5" RAMP W/BARRIERS W 2 CIRCULAR PNL OPENINGS & RPL ACCENT, 42" OC wide with 12" rise. Angled RPL Accent on each barrier. *Note: panels NOT included. Select from Sensory Play Center options and quote as separate, standard panel part., No Configurable Colors
1	CP015401	32"-40 COZY CLIMBER W-TALLER WIRE HH W/RPL ACCENTS, RPL angled Accents on each handhold. Handholds to be 8" taller than std
1	CP009777	36" DK CURVED TRANSFER MODULE 2-5, steelx barriers- ages 2-5. Steps to have 6" increments. No RPL.
1	CP015382	40" STEELX CONICAL CLIMBER™ W/MOBIUS GRIPS & WIRE HH, Wire Barrier handholds Set w/RPL accents
1	CP015400	40" STEP LADDER W-WIRE HH W/RPL ACCENTS, RPL angled Accents on each handhold
1	CP015406	84" X 84" RPL CLUBHOUSE #1, Includes Angled Roof; all posts; supports; framework; large open doorway; Picnic table; Porthole open window; 2-Store fronts;
1	CP015408	84" X 84" RPL CLUBHOUSE #2, Includes Angled Roof; all posts; supports; framework; wire barrier w-binoculars; seat; marble panel; crawl thru; flippy blocks
1	CP015409	84" X 84" RPL CLUBHOUSE #3, Includes Angled Roof; all posts; supports; framework; flippy number block game; crawl thru; seat
1	CP015403	ANGLED WIRE BARRIER W/RPL ACCENTS (LH), Approx 65" overall height. Below roof/above climber HH per layout.
1	CP015402	ANGLED WIRE BARRIER W/RPL ACCENTS (RH), Approx 65" overall height. Below roof/above climber HH per layout.

- 1 CP000380A DTR PB 30" Wide S/S Slide w/SteelX Hood 32"-40" Deck
- 1 CP015387 RH 3/4 BARRIER W/ANGLED RPL, Tendertuff Frame
- 1 CP015378 SET OF MINI-TRIDECKS & ANGLED WIRE BARRIER W/RPL ACCENTS, 2 mini-trideck steps with kickplate per layout. Angled Wire Barrier included
- 1 CP015404 STEEL PERFORATED ANGLED ROOF (TRAPEZOID SHAPE), Will cover 4 square & 3 tridecks (or half hex shape decks). Per layout. Includes post extensions. \*Note: 9 qty. 8" taller (for dk height) Roof Posts required, not included.
- 1 CP009334 SWIGGLY STIX W PB CLAMPS. 96" OC
- 1 CP015398 WIRE BARRIER HANDHOLDS SET W/RPL ACCENTS & 1-HANDLOOP, RPL angled Accents on each handhold
- 1 CP015377 WIRE BARRIER HANDHOLDS SET W/RPL ACCENTS, RPL angled Accents on each handhold
- 1 CP015399 WIRE BARRIER W-ANGLED RPL ACCENTS
- 1 CP015386 WIRE BARRIER W-BALL MAZE PANEL AND RPL ACCENTS, Angled RPL Accents. Permalene Panel
- 2 CP015384 WIRE BARRIER W-BUBBLE PANEL AND RPL ACCENTS, Angled RPL Accents. Permalene Ring around Bubble
- 1 CP015379 WIRE BARRIER W-PERISCOPE & ANGLED RPL ACCENTS
- 1 CP015385 WIRE BARRIER W-RAIN SOUND PANEL AND RPL ACCENTS, Angled RPL Accents. Permalene Panel
- 1 CP015397 WIRE BARRIER W-STEERING WHEEL & ANGLED RPL ACCENTS (LH)
- 1 CP015396 WIRE BARRIER W-STEERING WHEEL & ANGLED RPL ACCENTS (RH)

### Decks

- 3 188857A 3-sided Extension Deck
- 1 111525A Kick Panel For 24"Rise
- 1 121948B Kick Plate 16"Rise
- 4 121948A Kick Plate 8"Rise
- 1 111230A Square Deck Corner
- 4 111229A Square Deck Extension
- 3 111228A Square Tenderdeck
- 2 111231A Triangular Tenderdeck

1	119646A	Tri-Deck Extension
<b>Motion &amp; More Fun</b>		
2	166809A	E-Pod Seat
1	120901A	Grab Bar
3	111275A	Handloop Assembly
1	111362A	Talk Tube 40' Tubing Kit PB
1	111363A	Talk Tube At Grade Mounted DB Only
1	111363B	Talk Tube Deck Mounted 16"Dk DB Only
<b>Posts</b>		
3	111404G	100"Alum Post DB
4	111404F	108"Alum Post DB
7	111404E	116"Alum Post DB
9	111403D	158"Alum Post For Roof DB
1	111405H	50"Alum Flush Post w/Standard Cap DB
2	111405G	58"Alum Flush Post w/Standard Cap DB
1	111405E	74"Alum Flush Post w/Standard Cap DB
2	111404J	76"Alum Post DB
4	111404H	92"Alum Post DB
<b>Slides</b>		
1	123333A	Rollerslide 40"Dk DB
<b>Freestanding Play</b>		
<b>Climbers</b>		
3	158997A	Pod Climber 10" DB
1	120711A	Pod Climber 16" DB
<b>Custom</b>		
1	CP013460	CIRCULAR MIRROR PANEL INSERT, for use with sensory wall or ramps with circular play panels openings. Price is only for panel insert. Note: this has permalene for use with sensory wall or ramps with circular play panels openings. Price is only for panel insert. Note: this has permalene
1	CP014940	RECY BOARD OAK LEAF STATIONARY POD, Approx 48" x 30" x 24" high. Mink and Cedar boards.
1	CP002065	RECY BOARD OAK LEAF STATIONARY POD, Approx 48" x 30" x 16" high. Mink and Cedar boards.
2	CP001195	SINGLE SEAT SINGLE POST SWING ADDITIONAL BAY 90"OC, NEW STYLE 5" OD swing beam shortened. No seat or chain.
<b>Sensory Play</b>		
2	168102A	Alphamaze and Labyrinth Panel
1	177715A	Color Splash Panel
1	168662A	Marble Panel
1	168104A	Optigear Panel

## Signs

1	182503A	Welcome Sign (LSI Provided) Ages 2-5 years Direct Bury
---	---------	---

## Swings

4	174018A	Belt Seat ProGuard Chains for 8' Beam Height
2	176038A	Full Bucket Seat ProGuard Chains for 8' Beam Height
1	218671C	Molded Bucket Seat (2-5 yrs) w/Harness ProGuard Chains for 8' Beam Height
1	177351A	Molded Bucket Seat (5-12 yrs) w/Harness ProGuard Chains for 8' Beam Height
2	177332A	Single Post Swing Frame 8' Beam Height Only
1	177333A	Single Post Swing Frame Additional Bay 8' Beam Height Only

### 2.02 RESILIENT SAFETY SURFACE:

- A. The resilient safety surface shall meet the requirements as specified in Section 32 18 00-Poured-in-Place Rubber Safety Surfacing and Section 32 18 25-Wood Fibar Safety Surfacing of the Specifications.

### 2.03 CAST IN PLACE CONCRETE:

- A. Concrete for the footings will be cast in place cement concrete as specified in Section 03 30 00 of the Specifications. Top of concrete footings shall be twelve (12) inches minimum below finished grade.

### 2.04 MAINTENANCE KIT:

- A. The Contractor shall provide the Town with a maintenance kit that is to include twenty (20) replacement hardware covers / caps for each play structure, any special tools required for replacement of parts, one (1) gallon of graffiti removal / cleaning solutions as recommended by the manufacturer, one (1) gallon of touch-up paint for each color of painted metal, a manual that includes all installation and maintenance instruction provided by the manufacturer.

- B. All maintenance parts are to be delivered to the Owner.

## PART 3 – EXECUTION

- 3.01 The Contractor shall assemble the specified equipment under the supervision of an approved Supervisor according to the manufacturer's instructions, the contract drawings

and these Specifications.

- 3.02 The Contractor shall locate the structures to the lines and grades specified in the drawings in these Specifications and according to the specifications of the manufacturer of the equipment. Adjust all equipment to suit site gradients; no sloping platforms, tracks, or members intended to be horizontal shall be accepted.
- 3.03 The excavation for the footings shall be done as specified in Section 31 00 00 of these Specifications and according to the Contract Drawing details.
- 3.04 The equipment shall be located and brought to the heights as shown in the drawings and as recommended by the manufacturer with vertical and horizontal members set plumb and then braced to be held in place.
- 3.05 The concrete shall be poured around the supporting pieces of the equipment to the grades detailed. The concrete shall be poured and cured according to Section 03300 of these Specifications. Slope tops of footings to drain; set bottom of vertical members into gravel base to ensure drainage; do not encase bottom in concrete.
- 3.06 After the specified cure period of the concrete has passed the bracing may be removed.
- 3.07 The fills and surfaces shall then be placed and brought to the grades shown in the Contract Drawings and in accordance with Section 31 00 00 of these Specifications.

#### PART 4 - GUARANTEE AND ACCEPTANCE/LIABILITY

- 4.01 All operating parts and structural elements of the play equipment and safety surface shall be guaranteed against failure or defect during normal use and operation for the entire warranty period as established by the manufacturer.
- 4.02 Any defective elements shall be replaced in part or whole by the Contractor at no cost to the Owner.
- 4.03 The Contractor and the manufacturer shall hold the Owner and Owner's Representative harmless from any and all damages or liability resulting from negligent acts and omissions on the part of the Contractor or manufacturer, or resulting from defective parts, or improperly assembled equipment. Contractor shall provide secure storage for all equipment on job site.
- 4.04 The Contractor is responsible for securing a Certified Playground Safety Inspector to ensure ASTM and SPSC compliance. A certificate of compliance will be issued to the Owner prior to final inspection.

PART 5 - COMPENSATION

5.01 METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

- A. Playground Structures will be paid for by the contract lump sum price complete in place which price shall be full compensation for all labor and materials, excavation and backfill and concrete foundations to install completely. Certification from the manufacturer's representative that all the playground structures features were installed and operating correctly will be required prior to final payment.

5.02 PAYMENT ITEMS:

720.10 Playground Structures Lump Sum

END OF SECTION

NOT FOR BIDDING

## SECTION 12 12 00

### DUGOUT STRUCTURE

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Contractor to furnish a precast utility structure. Structure to be delivered pre-assembled and placed on prepared stone foundation in accordance with manufacturer's recommendations. Structure may also be field assembled on a poured-in-place foundation pad or precast concrete floor panel in accordance with manufacturer's recommendations.

##### 1.02 REFERENCES

- A. The Aluminum Association – Aluminum Design Manual 2010
- B. American Welding Society – AWS Standard D1.1-102 & D1.2-08
- C. ASCE 7 2010 Minimum Design Loads for Buildings and Other Structures
- D. ASTM B 209 Specification for Aluminum and Aluminum Alloy - Sheet and Plate
- E. ASTM B221 Specification for Aluminum and Aluminum Alloy – Extruded Bars, Rods, Wire, Profiles, and Tubes
- F. Americans with Disabilities Act of 1990 (ADA)
- G. Buy America 49 USC 5323(j)(1) and 49 CFR Part 661
- H. NASA Atmospheric Science Data Center - Monthly Averaged Insolation (sun-hours) Incident on a Horizontal Surface 22-year Average, and Minimum and Maximum Difference from Monthly Averaged Insolation
- I. OSHA Nationally Recognized Testing Laboratory Certification

##### 1.03 DESIGN REQUIREMENTS

- A. Shelters shall be engineered to meet or exceed all applicable wind, snow and seismic loads.
- B. Shelters shall be designed and manufactured in full compliance with local building codes.
- C. Design shall be modular to ensure consistent fit and reduced kit of parts.
- D. Design shall include opportunity for agency branding through choice of color, logo placement or other means.

##### 1.04 SUBMITTALS

- A. Manufacturer's product brochures and specifications.
- B. Manufacturer's top-level shelter design drawings. Include elevations and connection details, as necessary.
- C. Signed and sealed structural engineering design documents for state of shelter installation, as necessary.
- D. Samples of shelter finish as necessary.
- E. Manufacturer's shelter installation instructions.
- F. Manufacturer's warranty documentation.
- G. Quality Assurance Certificate of Compliance

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 10 years' experience in design and fabrication of transit shelters.
- B. Manufacturer shall be a Clark County Approved Fabricator or equivalent certified by a third-party agency to meet or exceed International Accreditation Service (IAS), International Building Code, and American Institute of Steel Construction (AISC) quality fabrication standards.

#### 1.06 WARRANTY

- A. Limited Lifetime Structural Warranty on shelter and components.
- B. Material finish warranted against defects for a period of one year.
- C. Manufacturer shall maintain inventory of replacement parts for ten years after delivery of shelter.

#### 1.07 AMERICANS WITH DISABILITIES ACT (ADA)

- A. As designed, shelters shall be 100% complaint with ADA provisions, and related Federal guidelines, and shall remain compliant if installed per manufacturer instructions.

### PART 2 - PRODUCT

#### 2.01 MANUFACTURER

1. Shelters shall be Signature Sunset series Model 35900-00 as manufactured by Tolar Manufacturing Company, Inc.
2. An approved equivalent.

## 2.02 MATERIALS

1. All structural aluminum components shall be minimum 6063-T5 alloy, unless otherwise noted.
2. All aluminum extrusions shall be custom designs.
3. Components shall be sized to comply with the load requirement for the project and shall not be less than the dimensions shown on specific plans.

## 2.03 FABRICATION

1. All holes shall be drilled or punched.
2. Aluminum welding shall conform to AWS Standard D1. 2-08. Electrodes shall conform to AWS/SFA 5.10 Class ER4043.
3. All welding shall be done at Tolar Manufacturing Company, Inc. facility. No on-site welding is performed.
4. All welding must be performed by AWS Certified welders.

## 2.04 SIZES

1. Standard Depth: 8' nominal
2. Standard Lengths: 24' nominal
3. Nominal dimensions based on roof perimeter size (drip line)
4. Custom dimensions available to meet aesthetic or other design criteria

## 2.05 COLUMNS/POSTS

1. Posts shall be fabricated of all extruded aluminum material.
  - a. Aluminum shall be 6063-T6 with minimum thickness of 1/8".
2. Six (6) posts shall support the roof assembly and configured to provide full and half wall width footprint.
3. Posts shall be 4.5" diameter Tolar Sunset multi-channel aluminum extrusion design.
  - a. Channels shall utilize gasketing to seat and capture wall glazing.
  - b. Unused channels shall be concealed by matching extruded snap-in material.
4. For surface mounting, posts utilize adjustable shoes internally telescoped into

posts.

- a. Shoes shall be 5/8" aluminum plate and minimum 9" in diameter
- b. Shoes shall include four (4) anchor holes to support installation of 1/2" x 8" stainless steel expansion anchors.
- c. Shoes shall be fabricated using 18" x 2" x 1/4" aluminum tube to provide a minimum of 12" height adjustment for anchoring and leveling the shelter on a suitable concrete pad.

a. ROOF ASSEMBLY

- i. Roof assembly shall include a single rear roof beam fabricated from 4.5" diameter Tolar Sunset multi-channel aluminum extruded tube.
  1. Aluminum shall be 6063-T6 with minimum thickness of 1/8".
    2. Extrusion shall contain integrated gasketing channels to support rear wall and roof framing
    3. Unused channels are concealed with matching extruded aluminum snap-in material.
  - ii. Rafters shall be fabricated from 1/2" aluminum plate and conform to roof radius design.
    1. Rafters are fabricated with eight (8) 1/4 x 20 x 1 1/4" self-clinching studs on top surface for securing roof panels.
    2. Rafters shall be slotted to roof beam channel and welded to rear beam.
    3. A single aluminum tube shall be welded to the lower front surface of rafters in order to form a single, unwelded roof structure utilizing no mechanical fasteners.
  - iii. Roof structure shall provide 7' minimum clear height.
  - iv. Roof structure designs include:
    1. Radius Curved Style
  - v. Roof beams and rafters are pre-drilled during fabrication for field installation. No drilling shall be performed in the field.
  - vi. Roof panels materials shall be of the following types to meet aesthetic or other design criteria:
    1. 1/8" aluminum sheet panel

2. Roof panels are secured to the roof rafters with extruded and gasketed aluminum pressure ribs secured by ¼” flanged hex nut above a flat washer with a neoprene seal. No silicone sealers shall be used.
- b. WALLS
    - i. Shelter shall have no wall panels, using open front, rear and end wall design as shown.
  - c. FASTENERS
    - i. All Fasteners shall be stainless steel.
    - ii. All fasteners in roof assembly, posts and walls shall be concealed by extruded snap-in material.
    - iii. Exposed fasteners shall be tamper-proof.
    - iv. Ground attachment anchors shall be sized to meet wind load requirements and shall be Hilti Kwik Bolt TZ anchors in conformance with ICC-ESR-1917.
    - v. No self-tapping screws in tension shall be used in assembly of shelter components.
  - d. FINISH
    - i. Shelters are finished in Super Durable baked powder coat enamel finish, with 4-5 mil final thickness.
    - ii. Finish color selected from standard TCI RAL color chart. Custom colors available upon request.
    - iii. Super Durable powder coat finish meets ASTM D3359-02 Standard Test Method for Measuring Adhesion by Tape.
    - iv. Super Durable powder coat finish meets ASTM D4752-10 Standard Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub

### PART 3 -EXECUTION

#### 1.01 SHIPPING AND STORAGE

- a. Shelters are packaged and crated for delivery in knockdown and unassembled condition.
- b. Delivery and unloading requires client supplied pallet jack or forklift.
- c. Store crated shelters in clean, dry, and level area.
- d. Do not store in direct contact with sun or rain.
- e. Do not stack crates.

#### 2.01 INSTALLATION

- a. Manufacturer provides all necessary installation hardware.

- b. Manufacturer provides complete detailed installation instructions.
- c. Surface installation requires level concrete pad of appropriate size and thickness as specified by shelter design.

3.01 MAINTENANCE

- a. Shelters shall be cleaned routinely with wet sponge or non-abrasive cloth using mild household detergents and rinsed with water. Light power washing may be used to remove dust and dirt from finish surfaces.
- b. No chemical solvents are to be used in cleaning of shelters.

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

- A. Dugout Structures will be paid for by the contract price for each complete installation in place which price shall be full compensation for all labor and materials, to install completely. Concrete pads for dugouts are covered separately under Item # 701.05.

4.02 PAYMENT ITEMS:

950.40	Dugout Structure	Each
--------	------------------	------

END OF SECTION

SECTION 12 40 00

SITE FURNISHINGS

PART 1 - GENERAL

- A. RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. WORK INCLUDED:
- A. Provide site improvements in the locations shown or as described herein, complete with anchorages and associated site work.
- C. RELATED SECTIONS:
- Section 03 30 00, Cast-In-Place Concrete  
Section 31 00 00 , Earthwork
- D. SUBMITTALS:
- A. Contractor shall submit catalog information on site improvements for review by Owner's Representative.

PART 2 - PRODUCTS

2.01 SPORTS EQUIPMENT:

- A. HOME PLATE:
1. Model # SHP-PS/Pro Home Plate, with ground anchor as manufactured by Schutt Sports, or
  2. Model # HP-200 major league home plate manufactured by Jaypro Sports, or
  3. Model #8501-00 professional style home plate as manufactured by Patterson-Williams Athletic MFG. Co., or
  4. An approved equivalent. All systems to be provided with approved anchoring. All components are to meet NFHS Standards and to be approved by the Engineer.
- B. BASES:
1. Bases shall be Hollywood Impact Bases Model No. HIBL/ Hollywood Impact Bases, set of 3 bases with BBP-44 ground anchor mounts and BBP-1 Anchor plug with indicator as manufactured by Schutt Sports, or

2. Model #BB-500 Pro- style Hollywood bases manufactured by Jaypro Sports.
3. Model 8503-00 heavy duty white rubber bases as manufactured by Patterson-Williams Athletic MFG. Co., or
4. An approved equivalent. All systems to be provided with approved anchoring. All components are to meet NFHS Standards and to be approved by the Engineer.

C. PITCHER'S RUBBER:

1. Model # SPR-4SO/ Official size pitchers rubber as manufactured by Schutt Sports, or
2. Model #PR-624 Professional pitching rubber manufactured by Jaypro Sports, or
3. Model #8510-00 4-way pitching rubber as manufactured by Patterson-Williams Athletic MFG. Co., or
4. An approved equivalent. All systems to be provided with approved anchoring. All components are to meet NFHS Standards and to be approved by the Engineer.

D. BASKETBALL GOALS AND BACKBOARDS

1. Model # RB120 Supergoal, Model # XL7042 Perforated Backboard, Model # PG956 Gooseneck Post (4 total each) manufactured by True Bounce, Inc. 194 Riverside Avenue, New Bedford MA 02746, (866) 873-3715,
  - a. Backboard shall be constructed with ½" thick clear polycarbonate, contain 1/2" perforated holes, and measure 72" x 42". Backboard shall be framed with "E" channeled aluminum extrusion and attached with stainless steel hardware. Official sized white target and shall be silk screened on the face of the backboard. Goal mounting holes (4) to be standard 5" (horizontal) x 4" (vertical) mounting centers.
  - b. Goal shall be Model # RB3000 front mount 18" single ring goal (5/8"), nylon net, powder coated finish.
  - c. Pole shall be Gooseneck Pole System, 5 ½" O.D. schedule 40 steel pipe with 6-layer galvanized finish.
2. Approved equal.

E. TEAM BENCHES:

1. Model # 1103-8, 8' aluminum bench, surface mounted, powder coated with alum plank as manufactured by Patterson-Williams Athletic MFG. Co., or
2. An approved equivalent.

F. TREE GRATE:

1. Model # LX48-96I99TGHP , “Locust 4’ x 8’ heel proof tree grate as manufactured by Iron Age Designs, (206) 276-0925, [www.ironagegrates.com](http://www.ironagegrates.com)
2. An approved equivalent.

G. BIKE RACK:

1. Model # Bike Hitch as manufactured by Dero, A Playcore Company, 42 Northern Stacks Drive, Suite 100 Minneapolis, MN 55421, (888) 337-6729, [www.dero.com](http://www.dero.com)
2. An approved equivalent.

H. DRINKING FOUNTAIN WITH BOTTLE FILLING STATION

1. Model # 4420BF1U with single ADA accessible bubbler and single bottle filler as manufactured by Halsey Taylor, Oak Brook, IL (800.223.5529), [www.halseytaylor.com](http://www.halseytaylor.com)
2. An approved equivalent.

Drinking Fountain shall be freeze-resistant and tamper-resistant, tubular steel construction with weather-resistant internal and external coating. Color: Black

I. CAFÉ TABLE (4 SEAT)

1. Model # Carousel Café 28-inch height dining table and backed 4 chairs unit as manufactured by Landscape Forms, 7800 E. Michigan Avenue, Kalamazoo, MI 49048, (800) 430-6209, [www.landscapeforms.com](http://www.landscapeforms.com)
2. An approved equivalent.

J. CAFÉ TABLE (5 SEAT)

3. Model # Carousel Café 28-inch height dining table and backed 5 chair unit as manufactured by Landscape Forms, 7800 E. Michigan Avenue, Kalamazoo, MI 49048, (800) 430-6209, [www.landscapeforms.com](http://www.landscapeforms.com)
1. An approved equivalent.

K. PICNIC TABLES

1. Model # STTRO-72SC Trio Table Ensemble as manufactured by Forms +Surfaces, 30 Pine Street, Pittsburgh, PA 15223, (800) 451-0410, [www.forms-surfaces.com](http://www.forms-surfaces.com)
2. Model # STTRO-72SC-ADA Trio Table Ensemble with ADA option as manufactured by Forms +Surfaces, 30 Pine Street, Pittsburgh, PA 15223, (800)

451-0410, [www.forms-surfaces.com](http://www.forms-surfaces.com)

3. An approved equivalent.

L. SCULPTURAL BENCHES

1. Model # "Pebble" seats as manufactured by EIS Product, 216 Main Street, Studio B, Venice, CA 90291, (310) 392-8887, [www.eisproduct.com](http://www.eisproduct.com)
2. Model # "Extasi" seats as manufactured by Escofet, 1886 S.A., Montserrat, 162 E 08760 Martorell, Barcelona, Spain, (0034) (937) 737-150 [www.escofet.com](http://www.escofet.com)
3. Model # "Galet" seats as manufactured by Urbanstyle, [www.urbanstyle.com](http://www.urbanstyle.com)
4. An approved equivalent.

M. TRASH AND RECYCLING RECEPTACLES (For size reference only-provided by Town)

1. Model # "HC5/HC5" as manufactured by BigBelly, 150 A Street, Suite 103, Needham, MA 02494, (888) 820-0300, [www.bigbelly.com](http://www.bigbelly.com)

PART 3 - EXECUTION

- A. Equipment shall be permanently installed in concrete anchorages unless otherwise indicated by manufacturer specifications. See Section 03 30 00, Cast in Place Concrete.
  - B. Sports Equipment shall be installed in accordance with Massachusetts State High School Athletic Association Standards, manufacturer's installation instructions, and as shown on the plans.
  - C. Any site improvement materials which are constructed of steel and not galvanized or factory coated with a finish system shall be painted in the field in accordance with Division 9 Specification "Painting and Finishes". Colors by Engineer.
  - D. All Sports Equipment shall be installed ready for use. All nets, cables, uprights, etc., shall be in place. Bleachers and benches shall be placed as required by the Engineer.
-

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT

Site furniture shall be paid for at the contract unit price each complete in place, which price shall be full compensation for all labor, materials, hardware, painting, posts, footings, and equipment necessary to complete the work in a satisfactory manner.

4.02 PAYMENT ITEMS:

389.10	Accessible Drinking Fountain	Each
701.20	Tree Grate	Each
707.40	Picnic Table	Each
707.41	Picnic Table (ADA)	Each
707.50	Bike Rack	Each
707.60	Team Benches	Each
707.70	Sculptural Benches	Each
707.80	Café Table (4 Seat)	Each
707.90	Café Table (5 Seat)	Each
735.10	Pitching Rubber, Home Plate Bases	Each
735.20	Basketball Goals, Backboards, Rims, Nets	Each

END OF SECTION

NOT FOR BIDDING

SECTION 13 00 00

SUMMARY OF WORK FOR SPRAY DECKS

PART 1 – GENERAL

1.01 WORK INCLUDED:

Provide and include all shop drawings for the proposed spray features, mechanical equipment, and mechanical systems.

- A. Lay out water features; benchmark and exact location by General Contractor.
- B. Trenching and backfill as required for spray feature piping.
- C. Furnish and install water feature fittings, piping, and valves as required for operation of the spray deck system. (Specified in Section 22 51 00)
- D. Furnish and install spray equipment, controls, and spray feature electrical system. (Specified in Section 13 14 13)
- E. Coordinate all necessary sleeves, openings, or other penetrations in the equipment cabinet required for water feature construction work.

1.02 RELATED WORK:

- A. The following Sections contain work that relates to this Section.

1. Section 13 14 13 – SPRAY EQUIPMENT

1.03 WORK PERFORMED UNDER OTHER SECTIONS (Not By Spray Deck Contractor, SDC):

- A. Site access for heavy equipment.
- B. Benchmark and exact water feature location.
- C. All machine excavation and backfill for water feature structure, drain piping, or pipe trenches - as shown on the Plans. Disposal of excavated material. General Contractor to furnish any required backfill material.
- D. All base and sub-base material for water feature; compaction; and all compaction testing and soil testing.
- E. Demolition of spray deck area, grading, and any other area preparation required prior to the start of water feature construction.

- F. Construction and backfill of all foundations, equipment room walls, footings, settling tanks and sumps as required for spray deck construction work.
  - G. Furnish and install deck drains as shown on Plans.
  - H. All caulking adjacent to the spray deck systems.
  - I. General construction work not included in spray deck Specifications in this section.
  - J. The Plumbing Contractor shall provide fresh water piping in to mechanical cabinet, including back flow prevention device and shut-off valve. Install solenoid valve(s), water connection to cylinder-operated valves.
  - L. All electrical connections shall be by the Electrical Contractor; the WFC shall provide solenoids, relays, motorized valves, etc., as shown on Plans. All controls – including starters, shall be provided and installed by Electrical Contractor; the Electrical Contractor shall install and wire all electrical equipment furnished by the WFC and shall provide all disconnect switches as indicated or required by code.
  - M. The Electrical Contractor shall ground the entire water feature structure, deck, and equipment in accordance with the National Electrical Code and all local Codes and Ordinances.
  - N. Provide all construction utilities, water, electric heat, or cold weather protection.
- 1.04 QUALITY ASSURANCE:
- A. Design Standards:
    - 1. Within the limits of constraints imposed by existing conditions, it is intended that the work of this contract shall comply with the following requirements:
      - a. American National Spa and Pool Institute Standard for Public Swimming Pools ANSI/NSPI-1 (2003).
      - b. State of Massachusetts Health Code 105 CMR 435.00 minimum standards for swimming pools.
      - c. National Electrical Code, Article 680
      - d. National Sanitation Foundation Standards for Swimming Pool Equipment. (N.S.F.)
      - e. Massachusetts Building Code (780 CMR)
      - f. Virginia Graeme Baker Pool and Spa Safety Act VGB 2008

- g. NSF/ANSI Standard 50 – Equipment for Swimming Pools, Spas, Hot Tubs and Recreational Water Facilities.
  - h. United States Department of Justice – Americans with Disabilities Act (ADA)
  - i. Standards for main drains, ASME A112.19.8-2007/8A-2008.
- B. Experience Qualifications: Work shall be performed by or under direct supervision of Water Feature or Aquatic Contractor with 5 years' experience in construction and equipping of public / private water features. Submit list of 5 public projects, completed at least five years, for which water feature contractor was responsible for constructing a similar feature for public use.
- C. Installation of Water Feature System and Equipment: Water Feature equipment and system shall be installed by a Water Feature Contractor experienced in water feature work and licensed or approved by manufacturer to ensure installation and performance in accordance with manufacturer's warranties and guarantees.

#### 1.05 SUBMITTALS:

- A. Shop Drawings: Submit coordinated spray deck structural steel shop drawings, showing types of anchors and method of anchoring fixed equipment. Provide rough-in information interfacing mechanical and electrical work and accurately dimensioned locations for sleeves, inserts, and anchors to be cast into concrete and installed into the building structure. Contractor shall submit on all materials to be supplied in the construction of this project, certifications, and resumes as stated in each section. Unless otherwise mentioned, the Contractor shall submit (6) copies of shop drawing submittals to the Engineer for review.
- B. Certification: Submit complete equipment list and duplicate copies of certificate from equipment manufacturer, properly attested, with statement that materials meet requirements of Contract Documents. Submit certificate for approval before doing any work.
- C. Product Data: Submit six (6) sets of manufacturer's data for operating equipment, valves, piping, drains, and equipment. Include roughing-in information for mechanical and electrical work. Product data shall be job specific. Generic submittals will be rejected.
- D. Contract Documents: Drawings are diagrammatic in part and are meant to indicate general arrangement of systems and equipment. Information shown on plans but not on Sections or schedules and vice-versa, shall be provided as if expressly required on both. It is not intended that Contract Documents indicate every fitting offset, line or component necessary for particular supplier's system; but it is intended that systems

and equipment supplied shall be complete and operational, whether or not shown or specified. Specified items may in fact be disapproved during Submittal Review if they do not form part of a complete system. Contractor shall submit to the Engineer their proposed piping and equipment layout for the Spray Deck.

- E. Health Department: Contractor shall be responsible for submittal and cost of submissions to regulatory agencies including: Massachusetts Department of Public Health and any other agencies having jurisdiction.
- F. Permits: Contractor shall be responsible for obtaining and paying for all permits, inspections, licenses and certificates required for work under this Section.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.
- B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.
- C. Handle materials in a manner to prevent damage.
- D. Store all materials on clean raised platforms with weather protective covering when stored outdoors. Provide continuous protection of materials against damage and deterioration.
- E. Remove damaged materials from site.

1.07 GUARANTEES:

- A. Provide standard written manufacturers' guarantees in the Owner's name for materials furnished under this Section where such guarantees are offered in the manufacturers' published product data.
- B. Furnish written warranty for materials and workmanship of systems installed under this Section against defect in materials and workmanship for 1 year.
- C. The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of superior quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, improper or insufficient maintenance, improper operation or insufficient maintenance, improper operation, modification not executed by the Contractor or the Owner; the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and

equipment. All warranties shall be for a period of one year from the date of Substantial Completion unless otherwise specified.

- D. The Contractor shall agree to repair or replace any Work at no cost to the Owner, upon written notification from the Owner within the warranty period. Prorated warranties are not acceptable.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS:

- A. Products of particular manufacturers have been specified to establish a standard of quality and performance.
- B. Proposals, including list of manufacturers and itemized products for other systems, will be reviewed by Engineer to determine their comparability to scope and quality required by Contract Documents.
- C. All equipment furnished hereunder shall be by manufacturers with at least 5 years' experience in the fabrication and installation of the item specified with at least 10 installations on public spray decks similar in scope to this project.

## PART 3 – EXECUTION

### 3.01 TESTING AND INSPECTION:

- A. Water Feature Piping: Test water feature piping to 35-psi hydrostatic pressure before placement of covering concrete slabs. Pressure shall remain on piping until the commissioning of the filtration equipment.
- B. Water for testing will be provided by Owner.
- C. Test should be done after installation of features.
- D. Contractor shall coordinate inspector services for all concrete and steel reinforcing.
- E. Additional testing requirements are required per the individual Specification Section for the Spray Deck.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price spray deck and the requirements set herein shall be lump sum compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all spray deck related work shall be lump sum pricing but not limited to items related to 730.10 and all other incidental work necessary for final completion of the spray deck as specified. Spray Deck item 730.10 is listed in Section 13 14 13.

END OF SECTION

NOT FOR BIDDING

SECTION 13 14 13

SPRAY EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. Under this Section, the Contractor shall be responsible for the installation of a series of water features (also referred to as spray features), plumbing, controls, sequencing, and electrical associated with the construction of the spray deck. All work shall be performed as indicated on the Contract Drawings and Specifications and include every aspect of work as obvious or implied and necessary to make the work complete and fully operational. The Contractor shall coordinate with Waterplay (or selected spray feature vendor), the spray equipment manufacturers, for all installation requirements and guidelines prior to bidding the project. The Contractor is also responsible for supplying all required ancillary appurtenances for the installation of the spray features, complete, in place.
- B. Owner has selected these features to be supplied at the spray deck. If the Contractor selects an alternate manufacturer, the features shall have the same visual look, and feature as the features shown on the contract plans. Spray manufacturers shall be Waterplay, or approved equal.
1. Electrical Connections: All main power electrical connections from the exhibit controller to the valves are to be furnished and installed per NEC 680, local codes, manufacturer's recommendations, drawings, and as required by the Engineer in DIVISION 26.
  2. Water Connections: Water connection, piping, and valves required to operate the spray features are to be furnished and installed per local codes, manufacturer's recommendations, drawings, and as required by the Engineer.
  3. The Contractor shall be required to install all of the manufactured equipment and water spray features, all water piping and wiring connecting the manifold and the independent features, and all footings/foundations associated with the work.
  4. Note: that the contractor shall field install a control manifold in the equipment room. This will allow a place where the spray features can be calibrated and a location for where the Owner can winterize the system.
  5. Contractor shall provide a touch bollard that will communicate a signal in a ¾-inch conduit communication line to the spray feature control panel. From there it will activate a timer in the control panel that will turn on the feature for an Owner desired length of time.

6. Contractor shall laminate a system start-up and shutdown control instruction sheet and mount inside the door of the mechanical room, and a complete set of instruction in a manual for mobile use.

C. The contractor or sub-contractor must be experienced with installing this type of spray equipment and satisfy the owner and engineer of these qualifications. The contractor or subcontractor must demonstrate successful completion of at least five (5) water feature projects of this size and scope and be prepared to submit references upon request.

1.02 RELATED WORK:

A. The following divisions contain work that relates to this section:

1. Section 13 00 00, SUMMARY OF WORK FOR SPRAY DECKS
2. Section 22 51 00, SPRAY DECK EQUIPMENT
3. Division 26 – ELECTRICAL

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Submittals for Review:

1. Product Data: Manufacturer's descriptive data, specifications and installation instructions for:
  - a. Spray Features
  - b. Activation Bollards
  - c. Any permanent component on this system,
2. Performance Criteria: For products specified by performance criteria only, document conformance with design calculations or past performance records with list of previous installations and contact information.

1.04 REFERENCES:

A. The following standards are a part of these specifications as referenced:

1. ASTM F2461 – Standard Practice for Manufacture, Construction, Operation and Maintenance of Aquatic Play Equipment.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. All aquatic play products and associated equipment must be properly wrapped and secured in place while in transport to the project site. Care shall be observed during offloading and handling to prevent excessive stress and abrasions.
- B. At the site, the play products and associated equipment are to be stored in safe areas, out of the way of traffic and other construction activities, until the actual time of installation. If required, safety barricades or other like precautions must be taken for the protection of public and adjacent property. Protect all materials from freezing, contamination and moisture. Do not store materials on the ground.
- C. Protective wrapping on the aquatic play features must be left in place until construction work for the exhibits is complete. Use all means necessary to protect the Aquatic Playground mechanical piping items before, during and after installation and to protect the installed work of all other trades.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner.

1.06 GUARANTEES:

- A. A 25 Year Warranty on stainless steel Play Events/Products, stainless steel anchoring systems and aluminum spheres.
- B. A 5 Year Warranty on brass components including; spray nozzles, spray caps and spray heads. High-density polyethylene components, polyurethane components, and ultra high molecular weight polyethylene components. The Subterranean vault (enclosure and access hatches), stainless steel automated water distribution manifold, drain boxes, strainers, electrical enclosures, and chemical controllers.
- C. A 2 Year Warranty on color coatings, stainless steel hardware & moving parts, fiberglass products, Seeflow Polymers, Soft Touch Elastomers (Toe Guards), programmable logic controller (PLC controller).
- D. All warranties shall start on the date of Substantial Completion and are to be managed by the equipment supplier.

PART 2 - PRODUCTS

2.01 WATER SPRAY MATERIALS:

A. Manufactured Equipment and Features

The following items are manufactured by Waterplay, or approved equal.

- 1 CO2-312, Geyser
- 4 0010-3833, Stead Stream
- 2 C02-309, Charlotte's Web
- 5 C02-337, Solo Spurt
- 3 C02-341, The Wave
- 1 0010-1854, Activation Bollard
- 1 Feature Control Panel
- 1 Custom Manifold

2.02 MANUFACTURER:

- A. All equipment shall be installed in accordance with the installation specifications. The Contractor shall use due care when installing the features. Protective wrapping shall be left intact throughout the installation and be removed only upon completion. Structures shall be installed in accurate locations, square, centered, plumbed, and at the required elevation relative to final grade on footings as per the layout.
- B. All phases of the installation shall be inspected by the Owner, or an authorized representative of the Owner, up to and including the final inspection as laid out in the Spray Deck Project Inspection Checklist.

2.03 PRODUCT CONSTRUCTION:

- A. In-ground aquatic play features shall be 9-3/8-inch, flush mounted, non-sequencing nozzle/LED light assembly, consisting of high strength roto-molded polypropylene niche body with integral water stop flange, threaded inserts to accept eye-bolts and jamb-nuts. Shall provide a choice from three different spray patterns, with a 316-stainless steel nozzle, 2" (F) N.P.T threaded drain return connection, 1" (F) N.P.T threaded supply connection, internal balancing valve and flex hose; 3/4" (F) N.P.T conduit connection and one high output "Donut Hole" 360-degree LED light fixture with 20 FT cord, (RGB), recessed into the niche body. Feature shall be finished with a 316 Stainless steel grate with specialty fasteners to open the unit.
- B. Aquatic play features are to meet ADA compliance for handicap accessibility, and meet or exceed current ASTM playground safety standards.
- C. Aquatic play features shall be supplied with all necessary anchoring hardware and installation templates to accommodate site work. A spare tool to access inside the

feature shall be provided to the Owner.

- D. All aquatic play features shall have fittings that allow for winter close off.
- E. All aquatic play features of below grade design shall address winterization.
- F. All features shall contain LED lights (RGB) capable of producing any color light.

#### 2.04 NOZZLES:

- A. Aquatic play feature nozzles shall be constructed of stainless steel. Brass and Nylon are not acceptable. Nozzles shall be capable of providing varying water displays and consumptions to meet the hydraulic requirements of the aquatic play features and the individual exhibit. A mechanical workbook must be supplied to show individual flow rates for each feature including maximum and average flow for each pre-programmed sequence step.
- B. Nozzles shall be tamper resistant and shall be secured using tamper resistant fasteners.

#### 2.05 ELECTRICAL:

- A. All electronic operating systems shall be manufactured by Romain Fountains, or approved equal.
- B. All electrical control panels shall be CSA/UL approved specifically for aquatic spray area operations and must bear certification logos.
- C. All activation mechanisms shall be made accessible only with use of manufacturer supplied tamper resistant, stainless steel security hardware.
- D. All wiring to be specified by the manufacturer of the aquatic spray features.
- E. The actuating device shall be encapsulated within a powder coated aluminum casing with a 316 stainless steel button, and be UV, moisture, graffiti, and impact resistant.
- F. All control system materials are to be of industrial grade quality and controller enclosures shall be rated @ NEMA 4x.
- G. All Spray components shall be grounded using bare #6 AWG wire and an approved ground lug in the 3/8-IN hole provided in the base plates. Consult local electrical inspector for local codes and final inspection.
- H. Electrical connection shall be 1-IN National Pipe Thread (NPT) coupler to be located near the bottom of the component. Conduit shall run up inside of tubular section to activation sensor chamber. The conduit shall be welded via 1/4-IN fillet weld to the component and be completely watertight.

- I. Power supply to the Spray control panel shall be 120V AC, 15 A. Activator wire type shall be #18, 3 conductor SJOW with a diameter of 0.31 in. Each activator requires 1 full, uninterrupted run of wire through a 1-IN conduit to the controller location, and 1 additional ground wire, #14 AWG.
- J. All wire connections must be watertight.
- K. All Activators that do not utilize water, shall provide a ½-IN National Pipe Thread (NPT) coupler located near the bottom of tubular section for drainage. It shall be A304L stainless steel, or aluminum 6061 and affixed to the support column with a watertight fillet weld.
- L. Controller shall communicate between the activation bollard and feature solenoid valves. The controller shall receive a signal from the activation bollard that opens the solenoid valves to bring water to the spray features.
- M. Controller shall have an internal timer to that can be set to owner preference for run time of the features.
- N. Controller shall have a Hand, ON, OFF, setting which would allow the system to operate by the touch bollard, or if the operator wanted to operate the system without the use of the touch bollard.
- O. Controller shall shut down in the event it is operating like a fountain in a rain storm.

#### 2.06 WATER DISTRIBUTION AND MANAGEMENT SYSTEM:

- A. Main line pipe and fittings to be schedule 80 PVC or greater. The distribution laterals and fittings are to be schedule 80 PVC or greater. Ensure that a proper slope is consistently applied to all piping to ensure positive gravity-assisted drainage of the entire system. Ensure all fittings are secured to close openings (off season) to protect from water entry of water back into the piping system. (See nozzles section.) System shall be installed with the ability to be able to winterize ever part of the system. Contractor shall provide all mechanical means such as unions, blow offs, and access points to be able to remove water from the system.

#### 2.07 ACCESSORIES:

- A. All hardware, fittings and fastenings shall be as indicated on the shop drawings and may be required to complete the installation. Anchor fasteners to be stainless steel.
  - 1. Lag bolts shall be stainless steel with flat type vandal-proof head in size indicated on plans. Anchors shall be stainless steel in size required. (tamper proof hardware shall be stainless steel, complete with owner supplied hardware security tools).

2.08 PIPING:

- A. PVC pipe shall be as sized on the drawings and details, Sch 80, solvent weld PVC, ASTM No. D1784 as manufactured by Crestline or approved equal.
- B. Fittings for all PVC piping shall be Schedule 80 solvent weld PVC as manufactured by Dura, Lasco, or approved equal.
- C. PVC solvent shall conform to ASTM and be NSF approved. Solvent shall be appropriate for gluing of pipes and fittings up to 6 inches in size. Solvent shall be as manufactured by IPS, Rectorseal, UniWeld, or approved equal and shall be used in conjunction with an appropriate primer.

2.09 MISCELLANEOUS ITEMS:

A. Cement Concrete

- 1. Cement concrete for use in water play feature foundations and footings shall conform to Section 03 30 00 Cast-in Place concrete for spray decks and decks of the Contract Specifications.

B. Thrust Blocks

- 1. Concrete thrust blocks shall be installed in locations as indicated or as required by the Engineer. Installation of thrust blocks shall include furnishing and placing the concrete and any additional excavation as required. Straps in conjunction with thrust blocks shall be furnished and installed where shown on the plans or required by the Engineer.

C. Control and Power Wiring

- 1. Control wiring from the spray feature controller to the activation bollard shall be a minimum of #12 wire, per manufacturer's requirements.
- 2. Provide a 1.25" conduit to the specified junction boxes, and 3/4" conduit to each individual spray feature. The wiring required shall be a minimum of a #12 wire (or manufacturers required wire) to each individual spray feature for lighting control. A wire is required for each individual spray feature in the 1.25" conduit, and to the 3/4" conduit.

D. Bonding

- 1. All spray features, drains and any other metal components within a five (5) foot radius of the spray zone shall be grounded and bonded in a continuous loop using #6 AWG bare solid copper bonding conductor. Bonding shall follow NEC 680 and meet the requirements of the Owner's Electrical Inspector.

## 2.10 ELECTRICAL CONTROL PANEL:

- A. Electrical control panel shall have the ability to control features, wind control, rain control and remote monitoring.
- B. Electrical control panel shall have a touch screen where the user can actively select and monitor certain features.
- C. Shall allow remote use, monitoring, and operation of the control panel.
- D. Shall be able accept a signal from an activation bollard, with an internal timer that will allow the system to run through its sequence. Sequence time shall be able to be adjusted by City Staff.
- E. Provide up to (5) different flow sequences.
- F. Shall control the flow manifold during the sequencing activities.
- G. Shall be enclosed in a NEMA 4x enclosure, UL listed.
- H. Power shall be three phase, 208v.

## 2.11 FLOW CONTROL MANIFOLD:

- A. A manifold system that will allow to regulate flow and sequence the spray features.
- B. Shall contain solenoid valves, manual ball valves, and unions, that will be controlled by the fountain control panel.

## 2.12 SPRAY DECK CONTROLLER CABINET:

- A. Spray Deck Controller Cabinet shall be as indicated on the drawings.

## 2.12 BACKFLOW PREVENTOR CABINET:

- A. Backflow Preventor Cabinet shall be as indicated on the drawings.

## PART 3 - EXECUTION

### 3.01 PIPE AND FITTINGS:

- A. The installation and backfilling of all pipe, fittings and other related items shall be installed and tested in conformance with the requirements set forth in these specifications. Pipe shall be set with a minimum cover of 18-IN above the invert of the pipe. All pipe shall be pitched to drain by gravity back to the equipment cabinet.

Piping shall be encased in screen sand on all sides.

- B. Install all manufactured items in strict conformance with the requirements of the manufacturer and as required by the Owner Representative.
- C. The installation of the primary water service and electrical service to the equipment vault shall be performed in strict conformance with Specifications.

3.02 TRAINING:

- A. Representatives of the Spray equipment manufacturer shall be required to present a one half day seminar to Owner representatives for the purposes of explaining operation, maintenance and troubleshooting techniques.
- B. At project completion, provide complete operations and maintenance manuals for all water spray components to the Owner Representative.
- C. The Contractor is responsible for laminating and mounting a start-up and shutdown instructions sheet for all controls inside the control cabinet.
- D. All training shall be videotaped and achieved.

3.03 SYSTEM START-UP AND SHUT DOWN:

- A. The General Contractor shall be responsible for the start-up of the spray deck system during the conclusion of the project, and the winterization after the first full year of use. Winterization training shall be demonstrated to the owner. Any items not functioning properly shall be repaired or replaced to the satisfaction of the Owner.

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. Spray Deck will be paid for by the contract lump sum price complete in place which price shall be full compensation for all labor and materials, excavation and backfill and concrete foundations to install the Geyser, Steady Stream, Charlotte's Web, Solo Spurt, The Wave, Activation Bollard, Feature Control Panel, Custom Manifold, spray deck controller cabinet and back flow preventer cabinet, water connection piping and valves, backflow preventer, power supply, electrical and bonding and stone drainage ditch.

4.02 PAYMENT ITEMS:

730.10	Splash Pad	Lump Sum
--------	------------	----------

END OF SECTION

SECTION 26 00 50

ELECTRICAL WORK - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to make ready for use the complete electrical systems as shown on the Drawings and as specified hereinafter.
- B. In conjunction with other sections of Division 26, the work shall include but not be limited to furnishing and installing the following:
1. Underground Secondary Services
  2. Transformers
  3. Lighting Fixtures
  4. Grounding System
  5. Handholes
  6. Bonding materials
  7. Cabinets
  8. Panelboards
  9. Raceways
  10. Fiber optic wiring
  11. Splash pad bonding
  12. Feeder and Branch Circuit Conductors
  13. Hangers and Supports
  14. Solderless Lugs and Connectors
  15. Conduit and wire for equipment and controls furnished under other divisions of the specifications, when shown on the electrical plans.

- C. Make all necessary connections at "packaged" equipment furnished under other sections and Divisions of these specifications.
  - D. Make all connections to equipment and devices furnished under Division 26 and other sections of these specifications except as otherwise specified.
  - E. Connect process and instrumentation cables furnished with field-mounted equipment under other sections and Divisions of these specifications.
  - F. It is the intent of these specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this section shall be furnished at no extra cost to the Owner.
- 1.02 RELATED WORK:
- A. The Contractor's attention is directed to the General Conditions, Supplementary Conditions.
  - B. Excavation and backfilling required for underground electrical work is included under Division 2.
  - C. Concrete work and reinforcing for electrical equipment pads are included under Division 3.
- 1.03 CODES, INSPECTIONS, PERMITS AND FEES:
- A. All material and installations shall be in accordance with the latest edition of the Massachusetts Electrical Code (527 CMR 12.00) and all applicable local codes and ordinances.
  - B. Obtain all necessary permits and pay all fees for permits and inspections.
- 1.04 INTERPRETATION OF DRAWINGS:
- A. The Drawings are not intended to show exact locations of conduit runs.
  - B. Each three-phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.
  - C. Unless otherwise noted and/or approved by the Engineer all conduits shall be installed concealed.
  - D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation.

- E. Any work installed contrary to or without review by the Engineer shall be subject to change as required by the Engineer, and no extra compensation will be allowed for making these changes.
- F. The locations of equipment, shown on the drawings are approximate only. Exact locations shall be as determined by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as required by the Engineer and furnish all labor and materials necessary to complete the work in an acceptable manner.
- G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.
- H. All connections to equipment shall be made as required and in accordance with the approved shop and setting drawings.

1.05 SUBMITTALS:

In accordance with requirements of general specifications, submit the following:

- A. Complete shop drawings shall be submitted for but not limited to the following equipment: lighting fixture and control equipment, panelboards, service cabinets, load centers, transformers, conduit and wire.
- B. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment:
  - 1. Conduit
  - 2. Boxes and fittings
  - 3. Wires, cables and appurtenances
  - 4. Service cabinets
  - 5. Wiring devices and appurtenances
  - 6. Circuit breakers
  - 7. Panelboards
  - 8. Grounding Equipment
  - 9. Control devices and stations
  - 10. Utility metering
- C. Prior to submittal, all shop drawings shall be checked for accuracy and conformance to contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the specifications and drawings. This statement shall

also list all discrepancies with the specifications and drawings. Shop drawings not so checked and noted shall be returned.

- D. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and drawings which may not be indicated on the shop drawings is included under the work of this section.
- E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this section.

1.06 MANUFACTURER'S SERVICES:

Furnish manufacturer's services for testing and start-up when required.

1.07 ELECTRIC SERVICES:

- A. The electric utility serving this project is Eversource.
- B. Service to cabinet will be as shown on the drawings.
- C. The electric utility will furnish and install the primary cables, transformer, and meter.
- D. Make all arrangements with the electric utility for obtaining services and pay all fees and charges by the electric utility for the service installation.
- E. All work and material for the service shall be in accordance with the requirements of the electric utility.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials, where not specified, shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the Engineer.
- B. Materials and equipment used shall be Underwriters' Laboratories, Inc. listed.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be

stored out-of- doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer or shall be replaced at no additional cost to the Owner.

- D. The Contractor's attention is directed to the requirements of the various sections of division 26 additional product specifications.

#### 2.02 MANUFACTURER'S NAMEPLATES:

- A. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information may be die-stamped into the surface of the equipment or may be marked on durable nameplates permanently fastened to the equipment.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Provide and place all sleeves for conduit penetrations through floors, walls, partitions, etc. Locate all necessary slots and inserts for electrical work and place in form before concrete is poured.
- B. Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably to insure that the tilting does not impair the functional integrity of the equipment.

#### 3.02 RECORD DRAWINGS:

As the work progresses, legibly record (red line) all field changes on a set of project contract drawings. Prior to Substantial Completion of the project, submit the red lined prints to the Engineer for use in preparation of the record drawings.

#### 3.03 TESTS AND ADJUSTMENTS:

- A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and equipment and instruct the Owner's personnel in the proper operation of the systems and equipment.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

NOT FOR BIDDING

SECTION 26 00 60

MODIFY EXISTING TRAFFIC SIGNAL CONTROLLER CABINET

PART 1 – GENERAL

Under this item, the Contractor shall modify the existing traffic signal controller cabinet assembly, located at the intersection of Cypress Street / Davis Ave to accommodate the proposed grade change and retaining block wall shown on the plans. The cabinet will also be rotated so the door faces toward the roadway.

1.1 REFERENCES

- A. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 WORK INCLUDED

The contractor will be required to obtain all required permits prior to performing the work and will be responsible any permit fees.

The Contractor is responsible for all service request fees charged by the Electric Utility Company and shall coordinate with the Utility all work that will be required to modify the Existing Traffic Signal Controller.

Modify Existing Traffic Signal Controller Cabinet is intended to include, but is not limited to

1. Disconnecting the Power to the Cabinet
2. Removing the Cabinet from the Existing Foundation
3. Modify (if needed replace) the existing foundation to the required grade and location
4. Relocate the cabinet, with the cabinet door facing toward the roadway, onto the modified foundation.

The contractor shall relocated the cabinet and all the components within the cabinet, furnish and install all necessary materials and equipment, including a new cabinet foundation, signal conductors, loop lead in cables, communication cables and other associated wiring, etc. to complete the traffic signal controller cabinet reinstallation and restoration of the interconnected traffic signal system.

After the Contractor has finished installing the cabinet controller and connected all associated signal equipment, the Contractor shall advise the Engineer, in writing. The Engineer will make a final inspection of the installation in the presence of the Town Traffic Division.

1.4 STANDARDS

- A. 2009 Manual on Uniform Traffic Control Devices (MUTCD),
- B. Section 800 of the Standard specification for highways and bridge, dated 1988, as amended

PART 2 - PRODUCTS

2.1 The contractor will install and maintain temporary vehicle and pedestrian signs at the intersection during the period the Traffic Control Cabinet has been disconnected.

PART 4 - COMPENSATION

4.01 METHOD OF PAYMENT

Modify Existing Traffic Signal Controller Cabinet shall be measured and paid per lump sum, which price shall include all labor, materials, equipment, fees, supplies, excavation, temporary traffic signs, and all incidental costs required to complete the work.

4.02 PAYMENT ITEMS:

816.40	Modify Existing Traffic Signal Controller Cabinet	Lump Sum
--------	---	----------

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Copper wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire Company.
  2. American Bare Conductor.
  3. Belden Inc.
  4. Okonite Company (The).
  5. Southwire Company.
- C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. RoHS compliant.
  3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type RHH and Type RHW-2: Comply with UL 44.
  - 2. Type THHN and Type THWN-2: Comply with UL 83.
  - 3. Type XHHW-2: Comply with UL 44.
  - 4. Type XLP: Comply with UL 44.

## 2.02 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. 3M Electrical Products.
  - 2. AFC Cable Systems; a part of Atkore International.
  - 3. Hubbell Power Systems, Inc.
  - 4. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 5. Thomas & Betts Corporation; A Member of the ABB Group.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: One hole with standard barrels.
  - 3. Termination: Compression.

## PART 3 - EXECUTION

### 3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.02 CONDUCTOR INSULATION AND MULTI-CONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW, USE single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway
- C. Exposed Branch Circuit: Type THHN-THWN, single conductors in raceway.
- D. Underground Feeders and Branch Circuits: THHN-THWN single conductors in conduit

### 3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

### 3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12-inches of slack.

### 3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables.

- B. Identify each spare conductor at each end with identity number, location of other end of conductor and identify as spare conductor.

### 3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

### 4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section includes grounding and bonding systems and equipment, plus the following special applications:
  - 1. Underground distribution grounding.

##### 1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

##### 1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports

##### 1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
  - 1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
    - a. Ground rods.
    - b. Grounding arrangements and connections for separately derived systems.
  - 2. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.
    - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

- b. Include recommended testing intervals.

## 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

## PART 2 - PRODUCTS

### 2.01 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### 2.02 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Burndy; Part of Hubbell Electrical Systems.
  2. ERICO International Corporation.
  3. Harger Lightning & Grounding.
  4. O-Z/Gedney; a brand of Emerson Industrial Automation.
  5. SIEMENS Industry, Inc.; Energy Management Division.
  6. Thomas & Betts Corporation; A Member of the ABB Group.

### 2.03 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4-inches in cross section, with 9/32-inch holes spaced 1-1/8-inches apart.

### 2.04 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Conduit Hubs: Mechanical type, terminal with threaded hub.
- G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- H. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- J. Straps: Solid copper, copper lugs. Rated for 600 A.

### PART 3 - EXECUTION

#### 3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor.
  - 1. Bury at least 24-inches below grade.
- C. Grounding Bus: Install in electrical equipment enclosure and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2-inches minimum from wall, 6-inches above finished floor unless otherwise indicated.
- D. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except as otherwise indicated.

### 3.02 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  1. Feeders and branch circuits.
  2. Lighting circuits.
  3. Receptacle circuits.

### 3.04 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

### 3.05 FIELD QUALITY CONTROL

- A. "Perform tests and inspections" Contractor to perform tests and inspections.
- B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  3. Test completed grounding system at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven, their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10ohms.

Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

NOT FOR BIDDING

SECTION 26 05 33

ELECTRICAL RACEWAYS, BOXES, HANDHOLES AND PEDESTRIAN LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Allied Tube & Conduit; a part of Atkore International.
  - c. Anamet Electrical, Inc.
  - d. Opti-Com Manufacturing Network, Inc (OMNI).
  - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.

4. ARC: Comply with ANSI C80.5 and UL 6A.
  5. IMC: Comply with ANSI C80.6 and UL 1242.
  6. EMT: Comply with ANSI C80.3 and UL 797.
  7. FMC: Comply with UL 1; zinc-coated steel or aluminum.
  8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Allied Tube & Conduit; a part of Atkore International.
    - c. Anamet Electrical, Inc.
    - d. FSR Inc.
    - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
  2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  3. Fittings, General: Listed and labeled for type of conduit, location, and use.
  4. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: Setscrew.
  5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed and including flexible external bonding jumper.
- C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.02 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Anamet Electrical, Inc.
  - c. FRE Composites.
  - d. RACO; Hubbell.
  - e. Thomas & Betts Corporation; A Member of the ABB Group.
- B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  1. RNC: Type EPC-80-PVC as noted complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  2. LFNC: Comply with UL 1660.
- C. Nonmetallic Fittings:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Anamet Electrical, Inc.
    - c. Aruco Corporation.
    - d. FRE Composites.
    - e. RACO; Hubbell.
  2. Fittings, General: Listed and labeled for type of conduit, location, and use.
  3. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
  4. Fittings for LFNC: Comply with UL 514B.
  5. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.03 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. Crouse-Hinds, an Eaton business.
  2. Erickson Electrical Equipment Company.
  3. Hoffman; a brand of Pentair Equipment Protection.
  4. Hubbell Incorporated.

- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Device Box Dimensions: as required for the use.
- G. Gang-able boxes are prohibited.
- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic.
  - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:
  - 1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.04 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
  - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. All work performed under these items shall be in accordance with the relevant provisions of Section 801 of the Standard Specifications and to the requirements of these specifications: All electric handhole frames and covers shall be grounded as shown on the Contract Drawings. All handhole frames and covers shall be provided with provisions for ground connection. All handhole frames and covers shall meet or exceed the criteria for highway loading conforming to AASHTO H-

20/HS20 loading conditions. Cover shall be labeled with the function of the pull box. "Brookline Lighting" in one-inch lettering.

- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Armorcast Products Company.
    - b. NewBasis.
    - c. Oldcastle Enclosure Solutions.
    - d. Oldcastle Precast, Inc.
    - e. Quazite: Hubbell Power Systems, Inc.
  2. Standard: Comply with SCTE 77.
  3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
  4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  6. Cover Legend: Molded lettering, "ELECTRIC." or per appropriate system.
  7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

## 2.05 PEDESTRIAN LIGHTS

- A. General Requirements for pedestrian lights and foundations:
1. The work to be done under these items consists of furnishing and installing light standard foundations in accordance with the Standard Specifications, Contract Drawings, and as hereinafter specified.
  2. Submittals for light standard foundations shall be made in a timely fashion including all manufactures data sheets, and shop drawings, as applicable, and specified herein.
  3. Shop drawings shall be submitted for the following:
  4. Light Standard Pendant Model #Vesta Klepsi 045 VKP045 as manufactured by Ghishamestieri, Via Grande, 226 • 47032 Bertinoro, Italy, 39 0543-462611 and Foundations Supported shop drawings showing concrete, reinforcing steel, conduit, and anchor bolt. Drawing shall indicate strength of concrete and reinforcing steel.

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC.
  - 2. Underground Conduit: RNC, Type EPC-80-PVC, direct buried or concrete encased as indicated on plans.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
  - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

### 3.02 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- C. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12-inches of changes in direction.
- D. Support conduit within 12-inches of enclosures to which attached.
- E. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- F. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- G. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- I. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
- J. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- K. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of interior and exterior spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- L. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041-inch per foot of length of straight run per degree F of temperature change for PVC conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- M. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72-inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
  2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- N. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- O. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- P. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

### 3.03 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 00 00 "Earthwork" for pipe less than 6-inches in nominal diameter.
  2. Install backfill as specified in Section 31 00 00 "Earthwork."
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12-inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 00 00 "Earthwork."
  4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
  - a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3-inches of concrete for a minimum of 12-inches on each side of the coupling.
  - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60-inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

### 3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Retain this article if Project includes small amounts of exterior underground wiring 600 V and less.
- B. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- D. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1-inch above finished grade.
- E. Install handholes with bottom below frost line.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

### 3.06 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

### 3.07 PEDESTRIAN LIGHTING

- A. Protect coatings and finishes from damage and deterioration.
- B. Materials shall meet the requirements specified in the following Subsections of Division III, Materials:
  - 1. Cement and Cement Concrete Materials M4
  - 2. Metals and related Materials M8
  - 3. Gravel M1.03.0, Type c
- C. Light standard foundations shall be provided with the anchor bolts, reinforcing rods, conduit sweeps, as shown on the Contract Drawings and in accordance with the applicable requirements of Section 901 Cement Concrete Masonry and Section 801.62 Foundations.
- D. Light standard foundations shall be used in all locations as indicated on the Contract Drawings unless the foundation cannot be installed due to conflict with ledge.
- E. Contractor shall provide a six (6) inch cushion of gravel borrow under the base.
- F. The contractor shall take all precautions not to cause any harm to the existing utilities during all phases of construction. The contractor shall provide temporary sheeting as required to protect adjacent roadway, utilities, or property.
- G. Where light standard foundations are installed in existing sidewalk, or paved median areas to remain, the work shall include replacement of the gravel base material and the surface pavement to match pre-construction conditions. No separate payment will be made for this work, but all costs in connection therewith shall be included in per each price bid.
- H. Pedestrian Lighting shall be installed plumb and true, and shall meet the requirements of the manufacturer.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. Measurement and payment under these items shall conform to the relevant provisions of the plans and to the requirements of these specifications.
- B. The work of this section shall be measured by each handhole; per linear foot of conduit and associated wiring for pedestrian lighting; per linear foot of conduit and associated wiring for sports lighting system; and per each electrical outlet at seatwall provided by the Contractor complete in place, and approved by the Engineer.

#### 4.02.1 PAYMENT ITEMS

- A. Payment for Item 804.20 will be paid at the contract unit price, complete, accepted in place, which price shall include full compensation for all materials, excavation, backfill, gravel sub-base, surface restoration, saw cutting, grounding bushings, ground wire and slack wire, conduit end bells, pull irons, and all equipment, tools, labor and work incidental thereto.
- B. Payment for Items 804.20 shall be at the contract unit price per lump sum, for furnishing and installing conduit of the appropriate size and kind to include all labor, equipment, conduit fittings, supports, saw cutting of pavement, removal and offsite disposal of pavement, removal and resetting of granite curbs or concrete rumble strips, trench excavation (except rock), gravel borrow, sand bedding, backfill, compaction, restoration of surface to match existing, penetrations into existing and new handholes and pull boxes, connection to existing conduits, pull wires and warning tape. Payment for Items 804.20 shall also include all conductors and cables as required per the contract drawings and as specified in Section 26 05 19. Surface restoration shall include, but is not limited to, restoration of way surfaces, sidewalk surfaces, and grass areas at the end of each workday and at the completion of work. It shall include all incidental costs required for the proper completion of the work specified herewith, as shown on the plans, or as required by the Engineer, complete in place.
- C. Payment for Item 804.30 will be paid at the contract unit price, complete, accepted in place, which price shall include full compensation for all materials, concrete, reinforcing steel, form work, excavation, backfill, gravel sub-base, surface restoration, saw cutting, grounding bushings, ground wire and slack wire, conduit end bells, pull irons, and all equipment, tools, labor and work incidental thereto.
- D. Payment for Item 804.30 shall be at the contract unit price per lump sum, for furnishing and installing conduit of the appropriate size and kind to include all labor, equipment, conduit fittings, supports, saw cutting of pavement, removal and offsite disposal of pavement, removal and resetting of granite curbs or concrete rumble strips, trench excavation (except rock), gravel borrow, sand bedding, backfill, compaction, restoration of surface to match existing, penetrations into existing and new handholes and pull boxes, connection to existing conduits, pull wires and warning tape. Payment for Item 804.30 shall also include all conductors and cables as required per the contract drawings and as specified in Section 26 05 19. Surface restoration shall include, but is not limited to, restoration of way surfaces, sidewalk surfaces, and grass areas at the end of each workday and at the completion of work. It shall include all incidental costs required for the proper completion of the work specified herewith, as shown on the plans, or as required by the Engineer, complete in place.
- E. Excavatable Controlled Density Fill and Concrete required for conduit under roadway shall be included within the unit price of conduit 804.20 and 804.30.

F. Payment for Item 804.60 will be paid at the contract unit price, complete, and accepted in place, which price shall include full compensation for all materials, including reinforcing rods, anchor bolts, concrete, form work, excavation, backfill, surface restoration, temporary sheeting, gravel sub-base, dewatering, for each Light Standard and Foundation under including all equipment, tools, labor and work incidental thereto.

G. Payment for Item 804.80 will be paid at the contract unit price, complete, accepted in place, which price shall include full compensation for all materials, excavation, backfill, gravel sub-base, surface restoration, saw cutting, handhole, handhole cover and frame, and all equipment, tools, labor and work incidental thereto.

804.20	Electrical Conduit and wiring for Sports Lighting	Lump Sum
804.30	Electrical Conduit and wiring for Pedestrian Lighting	Lump Sum
804.60	Pedestrians Lights	Lump Sum
804.80	Lighting Handholes	Each

END OF SECTION

NOT FOR BIDDING

## SECTION 26 05 53

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Comply with NFPA 70E requirements for arc-flash warning labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

## 2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
1. Black letters on an orange field.
  2. Legend: Indicate voltage.
- B. Color-Coding for Phase-Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit] conductors.
1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  3. Colors for 480/277-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  4. Colors for 240-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
  5. Color for Neutral: White or gray.
  6. Color for Equipment Grounds: Green.
- C. Warning Label Colors:
1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36-INCHES."
- E. Equipment Identification Labels:
1. Black letters on a white field.

## 2.3 LABELS

- A. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. Brother International Corporation.
    - c. Ideal Industries, Inc.
    - d. Panduit Corp.
  - 2. Minimum Nominal Size:
    - a. 1-1/2 by 6-inches for raceway and conductors.
    - b. 3-1/2 by 5-inches for equipment.
    - c. As required by authorities having jurisdiction.

## 2.4 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Champion America.
    - b. Ideal Industries, Inc.
    - c. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2-inches wide; compounded for outdoor use.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Brady Corporation.
    - b. emedco.
    - c. Marking Services, Inc.
- C. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Brady Corporation.
  - b. Ideal Industries, Inc.
  - c. Marking Services, Inc.
2. Tape:
  - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
  - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
  - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
  - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

## 2.5 SIGNS

### A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Brady Corporation.
  - b. Carlton Industries, LP.
  - c. emedco.
2. Engraved legend.
3. Thickness:
  - a. For signs up to 20 sq. in., minimum 1/16-inch thick.
  - b. For signs larger than 20 sq. in., 1/8-inch thick.
  - c. Engraved legend with black letters on white face.

- d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.6 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. HellermannTyton.
  2. Ideal Industries, Inc.
  3. Marking Services, Inc.
  4. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
  1. Minimum Width: 3/16-inch.
  2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: Black, except where used for color-coding.

## 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Verify identity of each item before installing identification products.
- C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- D. Apply identification devices to surfaces that require finish after completing finish work.

- E. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- F. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- I. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- J. Underground Line Warning Tape:
  - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8-inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
  - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- K. Laminated Acrylic or Melamine Plastic Signs:
  - 1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2-inches high.
- L. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage.
- B. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

- C. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels.
  - 1. Apply to exterior of door, cover, or other access.
  - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
    - a. Controls with external control power connections.
- E. Arc Flash Warning Labeling: Self-adhesive labels.
- F. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.
- G. Equipment Identification Labels:
  - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

##### 4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

## SECTION 26 24 16

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

##### 1.02 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

##### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for SPD as installed in panelboard.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.06 FIELD CONDITIONS

- A. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.

1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface -mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
    - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  - 2. Height: 84-inches maximum.

3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: Top or Bottom.
- G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Retain "Seismic Performance" Paragraph for projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.
- B. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
- C. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

## 2.03 POWER PANELBOARDS

- A. Power panelboards, as specified in this article, fall under requirements of "Distribution Panelboards" in NEMA PB 1.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. Square D; by Schneider Electric.
- C. Panelboards: NEMA PB 1, distribution type.
- D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36-inches high, provide two latches, keyed alike.
- E. Mains: Circuit breaker.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers or Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers.

## 2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards, as specified in this article, comply with requirements of "Lighting and Appliance Branch-Circuit Panelboards" in NEMA PB 1.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: Circuit breaker.

- E. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

## 2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

## 2.06 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Mount panelboard cabinet plumb and rigid without distortion of box.
- D. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification.
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate

### 3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.
- C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

##### 4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

SECTION 26 27 13

ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electricity metering work to accommodate utility company revenue meter.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For electricity-metering equipment.
  - 1. Include elevation views of front panels of control and indicating devices and control stations.
  - 2. Include diagrams for power, signal, and control wiring.
  - 3. Metering equipment shall meet the requirements of Eversource Electric.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Submit evidence that meters are compatible and conform to Eversource Electric Company requirements.
- B. Field quality-control reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.

## 1.6 COORDINATION

- A. Electrical Service Connections: Coordinate with utility companies and utility-furnished components.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 916.

### 2.2 UTILITY METERING INFRASTRUCTURE

- A. Install metering accessories furnished by the utility company, complying with its requirements.
- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Sockets:
  - 1. Comply with requirements of electrical-power utility company.
- D. Arc-Flash Warning Labels:
  - 1. Labels: Comply with requirements for "Self-Adhesive Equipment Labels" and "Signs" in Section 26 05 53 "Identification for Electrical Systems." Apply a properly sized self-adhesive label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.

- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install arc-flash labels as required by NFPA 70.
- D. Wiring Method:
  - 1. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- E. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### 3.2 FIELD QUALITY CONTROL

- A. Testing: By Contractor.
- B. Perform tests and inspections with the assistance of a factory-authorized service representative.
- C. Prepare test and inspection reports.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

### 4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80, 816.40 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. GFCI receptacles.
  2. Toggle switches.
  3. Wall plates.

1.02 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
  2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  3. Leviton: Leviton Mfg. Company, Inc.
  4. Pass & Seymour: Pass& Seymour/Legrand.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.04 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.01 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- E. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations

### 2.02 GFCI RECEPTACLES

- A. Non-feed-through-type GFCI unit shall be selected where no protection of downstream receptacles is required.
- B. General Description:
  - 1. 125 V, 20 A, straight blade, feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- C. Duplex GFCI Convenience Receptacles:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.

- d. Pass & Seymour/Legrand (Pass & Seymour).

## 2.03 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
  - 1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).

## 2.04 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: High-impact thermoplastic in finished spaces.
  - 3. Material for Unfinished Spaces: Galvanized steel.
  - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

## 2.05 FINISHES

- A. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  - 4. Connect devices to branch circuits using pigtails that are not less than 6-inches in length.
  - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### 3.02 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. Tests for Convenience Receptacles:

- a. Line Voltage: Acceptable range is 105 to 132 V.
- b. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
- c. Using the test plug, verify that the device and its outlet box are securely mounted.
- d. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. Measurement and payment under these items shall conform to the relevant provisions of the plans and to the requirements of these specifications.
- B. The work of this section shall be measured by each receptacle; as provided by the Contractor complete in place, and approved by the Engineer.

4.02.1 PAYMENT ITEMS

- A. Payment for Item 804.40 will be paid at the contract unit price, complete, accepted in place, which price shall include full compensation for all materials, to install electrical outlet in their respective boxes with covers, and all equipment, tools, labor and work incidental thereto.

804.40	Pedestal Electrical Outlet at Dugout	Each
--------	--------------------------------------	------

NOT FOR BIDDING

## SECTION 26 28 16

### ENCLOSED SWITCHES AND CIRCUIT BREAKERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY:

###### A. Section Includes:

1. Fusible switches.
2. Non-fusible switches.
3. Enclosures.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For enclosed switches and circuit breakers.
  1. Include plans, elevations, sections, details, and attachments to other work.
  2. Include wiring diagrams for power, signal, and control wiring.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- C. Field quality-control reports.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

##### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

## 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

### 2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

## 2.3 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Eaton.
  2. General Electric Company.
  3. SIEMENS Industry, Inc.; Energy Management Division.
  4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
1. Single throw.
  2. Three pole.
  3. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
  4. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

## 2.4 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Eaton.
  2. General Electric Company.
  3. SIEMENS Industry, Inc.; Energy Management Division.
  4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty, Three Pole, Single Throw: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

## 2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).
- C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable directly operable through the front cover of the enclosure (NEMA 250 Type 1)

## PART 3 - EXECUTION

### 3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
  1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  2. Outdoor Locations: NEMA 250, Type 3R.
  3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

- D. Install fuses in fusible devices.
- E. Comply with NFPA 70 and NECA 1.
- F. Set field-adjustable circuit-breaker trip ranges to values indicated on the Drawings.

### 3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

### 3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections: All testing is to be done by the contractor with the assistance of the manufacturer as required.
- B. Tests and Inspections for Switches:
  - 1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.
    - c. Verify that the unit is clean.
    - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    - e. Verify that fuse sizes and types match the Specifications and Drawings.
    - f. Verify that each fuse has adequate mechanical support and contact integrity.
    - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
      - 1) Use a low-resistance ohmmeter.
        - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.

i. Verify correct phase barrier installation.

j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

b. Measure contact resistance across each switchblade fuse holder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.

b. Inspect physical and mechanical condition.

- c. Inspect anchorage, alignment, grounding, and clearances.
  - d. Verify that the unit is clean.
  - e. Operate the circuit breaker to ensure smooth operation.
  - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
  - h. Perform adjustments for final protective device settings in accordance with the coordination study.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.
- 1. Test procedures used.
  - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
  - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

NOT FOR BIDDING

## SECTION 26 43 13

### SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

##### 1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage.

### 2.2 SERVICE ENTRANCE SUPPRESSOR

- A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. ABB USA.
  - 2. Eaton.
  - 3. General Electric Company.
  - 4. Leviton Manufacturing Co., Inc.
- B. SPDs: Comply with UL 1449, Type 2.
  - 1. SPDs with the following features and accessories:
    - a. Integral disconnect switch.
    - b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
    - c. Indicator light display for protection status.
- C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 1200 V for 480Y/277 V.
  - 2. Line to Ground: 1200 V for 480Y/277 V.
  - 3. Line to Line: 2000 V for 480Y/277 V.
- E. SCCR: Equal or exceed 100 kA.

- F. I-nominal Rating: 20 kA.

## 2.3 PANEL SUPPRESSORS

- A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Advanced Protection Technologies Inc. (APT).
  - 2. Current Technology Inc.
  - 3. Eaton.
  - 4. General Electric Company.
- B. SPDs: Comply with UL 1449, Type 2.
  - 1. Include LED indicator lights for power and protection status.
  - 2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
- C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- A. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 1200 V for 480Y/277 V
  - 2. Line to Ground: 1200 V for 480Y/277 V
  - 3. Neutral to Ground: 1200 V for 480Y/277 V
  - 4. Line to Line: 2000 V for 480Y/277 V
- B. SCCR: Equal or exceed 100 kA.
- C. Inominal Rating: 20 kA.

## 2.4 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
  - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
  - 2. Inspect anchorage, alignment, grounding, and clearances.
  - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain SPDs.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials, excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all electrical related work shall be pricing per the specific items listed: 804.20, 804.30, 804.40, 804.50, 804.60, 804.70, 804.80 and all other incidental work necessary for final completion of other electrical work as specified.

END OF SECTION

NOT FOR BIDDING

SECTION 26 56 68

SPORTS LIGHTING SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for Cypress Playground using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. The sports lighting will be for the following venues:
  - 1. Soccer
  - 2. (2) Softball Overlays
  - 3. Basketball
- E. The primary goals of this sports lighting project are:
  - 1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. There-fore light levels are guaranteed to not drop below specified target values for a period of 25 years.
  - 2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors. The LED design should provide better control than a good HID design.
  - 3. Life-cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
  - 4. Control and Monitoring: To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

## 1.2 LIGHTING PERFORMANCE

- A. **Illumination Levels and Design Factors:** Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Soccer	40FC	2:1	77	30' x 30'
Softball Overlays	50FC (infield) 30FC (outfield)	2:1 (infield) 2.5:1 (outfield)	25 (infield) 88 (outfield)	20' x 20'
Basketball	20FC	3:1	40	10' x 10'

- B. **Color:** The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.
- C. **Mounting Heights:** To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

# of Poles	Pole Designation	Pole Height
4	A1-A4	60'
6	B1-B4 and S1-S2	70'
2	P1 and P2	50'

## 1.3 ENVIRONMENTAL LIGHT CONTROL

- A. **Light Control Luminaires:** All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.
- B. **Spill Light and Glare Control:** To minimize impact on adjacent properties, spill light and candela values must not exceed the following.

Spill Readings at the Property Line	Maximum
Vertical Footcandles	<5FC
Horizontal Footcandles	< 3.5FC
Candela	<85,000CD

- C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.
- D. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified independent testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

## PART 2 – PRODUCT

### 2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

- A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.
- C. System Description: Lighting system shall consist of the following:

1. Galvanized steel poles and cross-arm assembly.
2. Non-approved pole technology:
  - a. Square static cast concrete poles will not be accepted.
  - b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.
3. Lighting systems shall use concrete foundations. See Section 2.3 for details.
  - a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
  - b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or reinforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
4. Manufacturer will supply all drivers and supporting electrical equipment
  - a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure.
5. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
6. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
7. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
8. Control cabinet to provide remote on-off control and monitoring of the lighting system. See Section 2.4 for further details.
9. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
  - a. Integrated grounding via concrete encased electrode grounding system.
  - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be

connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

10. Enhanced corrosion protection package: Due to the potentially corrosive environment for this project, manufacturers must provide documentation that their products meet the following enhanced requirements in addition to the standard durability protection specified above:
  - a) Exposed carbon steel horizontal surfaces on the crossarm assembly shall be galvanized to no less than a five (5) mil average thickness.
  - b) Exposed die cast aluminum components shall be Type II anodized per MIL-STD-8625 and coated with high performance polyester.
  - c) Exposed extruded aluminum components shall be Type II anodized per MIL-STD-8625 and coated with high performance polyester.
- D. Safety: All system components shall be UL listed for the appropriate application.

## 2.2 ELECTRICAL

- A. Electric Power Requirements for the Sports Lighting Equipment:
  1. Electric power: 480 Volt, 3 Phase
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
- B. Energy Consumption: The kW consumption for the field lighting system shall be 68 kW, or less.

## 2.3 STRUCTURAL PARAMETERS

- A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 130mph and exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).
- C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. If no geotechnical report is available, the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2009 IBC Table 1806.2.
- D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

## 2.4 CONTROL

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming with be set via scheduling options (Website, app, phone, fax, email)
- D. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

- E. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- F. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

1. Cumulative hours: shall be tracked to show the total hours used by the facility
  2. Report hours saved by using early off and push buttons by users.
- G. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.

## PART 3 – EXECUTION

### 3.1 SOIL QUALITY CONTROL

- A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:
1. Providing engineered foundation embedment design by a registered engineer in the State of Massachusetts for soils other than specified soil conditions;
  2. Additional materials required to achieve alternate foundation;
  3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

### 3.2 DELIVERY TIMING

- A. Delivery Timing Equipment On-Site: The equipment must be on-site 6-8 weeks from receipt of approved submittals and receipt of complete order information.

### 3.3 FIELD QUALITY CONTROL

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.
- B. Field Light Level Accountability
1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 Years.
  2. The contractor/manufacturer shall be responsible for an additional inspection one year from the date of commissioning of the lighting system and will utilize the owner's light meter in the presence of the owner.
  3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.
- C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

### 3.4 WARRANTY AND GUARANTEE

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

## PART 4 – DESIGN APPROVAL

### 4.0 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

- A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Product: Musco's Light-Structure System™ with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.
- D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

*All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. Submit checklist below with submittal.*

Yes / No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: <ul style="list-style-type: none"> <li>a. Field Name, date, file number, prepared by</li> <li>b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x &amp; y), Illuminance levels at grid spacing specified</li> <li>c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics</li> <li>d. Height of light test meter above field surface.</li> <li>e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaires, total kilowatts, average tilt factor; light loss factor.</li> </ul>
	D	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	F	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.
	G	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Massachusetts, if required by owner. (May be supplied upon award).
	H	Control &	Manufacturer of the control and monitoring system shall provide written definition

		Monitoring System	and schematics for automated control system to include monitoring. They will also provide ten (10) references of customers currently using proposed system in the state of Massachusetts.
	I	Electrical Distribution Plans	Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Massachusetts.
	J	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Massachusetts.
	K	Project References	Manufacturer to provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of Massachusetts. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	L	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	M	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	N	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	O	Life-cycle Cost Calculation	Document life-cycle cost calculations as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included in the warranty. All costs should be based on 25 Years. (complete table below)

25-Year Life Cycle Operating Cost			
a.	Luminaire energy consumption _____ luminaires x _____ kW demand per luminaire x 19¢ kWh rate x annual usage hours x 25 years		
b.	Demand charges, if applicable	+	
c.	Cost for maintenance, not covered, for 25 years Assume 5 repairs at \$750 each if not included with the bid	+	
	TOTAL 25 -Year Life-cycle Operating Cost	=	

The information supplied herein shall be used for the purpose of complying with the specifications for Cypress Playground. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: \_\_\_\_\_ Signature: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Contractor: \_\_\_\_\_ Signature: \_\_\_\_\_

NOT FOR BIDDING

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. Sports Lighting System will be paid for by the contract lump sum price complete in place which price shall be full compensation for all labor and materials, excavation and backfill and concrete foundations to install and erect the sports lighting system, panels cabinets for complete system in a satisfactory manner. Electrical conduit and wiring for the Sports Lighting System is covered separately under Item 804.20.

4.02 PAYMENT ITEMS:

804.50	Sports Lighting System	Lump Sum
--------	------------------------	----------

END OF SECTION

NOT FOR BIDDING

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

1.02 RELATED WORK:

- A. Section 31 05 19.13, GEOTEXTILE FABRICS
- B. Section 31 11 00, CLEARING AND GRUBBING
- C. Section 31 23 16.26, ROCK EXCAVATION AND DISPOSAL
- D. Section 32 12 00, PAVING
- E. Section 32 91 19, LOAMING AND SEEDING

1.03 REFERENCES:

American Society for Testing and Materials (ASTM)

- |      |       |  |
|------|-------|--|
| ASTM | C131  | Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.                    |
| ASTM | C136  | Method for Sieve Analysis of Fine and Coarse Aggregates.   |
| ASTM | C330  | Specification for Lightweight Aggregate for Structural Concrete.   |
| ASTM | D1556 | Test Method for Density of Soil in Place by the Sand Cone Method.  |
| ASTM | D1557 | Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 Lb.) Hammer and Eighteen-inch (18") Drop. |
| ASTM | D2922 | Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).   |

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

Code of Massachusetts Regulations (CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.05 PROTECTION OF EXISTING PROPERTY:

- A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.
- C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of project.

1.06 DRAINAGE:

- A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

- A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.
- B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.03.0, Type b.

B. DENSE GRADED CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.

C. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	-	100%
Passing No. 8 sieve opening	-	0%

E. BACKFILL MATERIALS:

1. Class B Backfill:

Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

2. Select Backfill:

Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3"	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

F. SPECIAL PIPE BEDDING MATERIAL

1. The special pipe bedding material shall consist of a filter fabric installed on the trench bottom before backfilling with crushed stone as specified and as shown on the contract drawings. Filter fabric shall be as specified in Section 02071, GEOTEXTILE FABRICS.

G. PROCESSED GRAVEL:

1. Processed gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.
2. The gradation shall meet the following requirements:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
3 in.	100
1 1/2 in.	70-100
3/4 in.	50-85
No. 4	30-60
No. 200	0-10

3. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

PART 3 - EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION:

- A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.
- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.
- C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

### 3.02 EXCAVATION:

#### A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.
2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.
3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.
4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.
5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow,

ice, and trash. Unless specified elsewhere or otherwise required by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.
2. The Contractor shall satisfy all dewatering requirements specified in Section 31 23 19 DEWATERING, before performing trench excavations.
3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.
4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.
5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.
6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.
7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.
8. The Contractor shall obtain a trench permit from the municipality where the trench is located prior to making any excavations of trenches (any subsurface excavation greater than three (3) feet in depth and fifteen (15) feet or less between soil walls as measured from the bottom).
9. All trenches required to be permitted must be attended, covered, barricaded, or backfilled. Covers must be road plates at least ¾-inch thick or equivalent, barricades must be fences at least 6-feet high with no openings greater than 4-

inches between vertical supports and all horizontal supports required to be located on the trench-side of the fencing.

C. FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.
2. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.
3. If, in the opinion of the Engineer, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as required by the Engineer. If, in the opinion of the Engineer, filter fabric is required; the Contractor shall place filter fabric, approved by the Engineer, as per manufacturer's recommendations. Crushed stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

D. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.
2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.
3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.03 BACKFILL PLACEMENT AND COMPACTION:

A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.
2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.

3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

<u>Location</u>	<u>Percent of Maximum Density</u>
Below pipe centerline	95
Above pipe centerline	92
Below pavement (upper 3 ft.)	95
Embankments	95
Below pipe in embankments	95
Adjacent to structures	92
Below structures	95

4. The Engineer reserves the right to test backfill for conformance to the specifications and Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Contractor. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.
5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.
6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.
7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.
2. As soon as practicable after pipes have been laid, backfilling shall be started.
3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.
4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.
5. Water Jetting:
  - a. Water jetting may be used when the backfill material contains less than 10 percent passing the number 200 sieve, but shall be used only if approved by the Engineer.
  - b. Contractor shall submit a detailed plan describing the procedures he intends to use for water jetting to the Engineer for approval prior to any water jetting taking place.
  - c. Compaction of backfill placed by water jetting shall conform to the requirements of this specification.
6. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.
7. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as directed.

C. BACKFILLING UNDER FOUNDATIONS:

Material to be used as structural fill under footings and foundations shall be dense graded crushed stone as shown on the Drawings or as required by the Engineer. Where crushed stone fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO WALLS:

1. The Contractor shall not place backfill against or on walls until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.
2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.
3. Where backfill is to be placed on only one side of a structural wall, only hand-operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 DISPOSAL OF SURPLUS MATERIALS:

- A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.
- B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by him. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.
- C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.
- D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not be disposed of at locations where concentrations of oil and/or hazardous material at the

receiving site are significantly lower than the levels of those oil and /or hazardous materials present in the soil being disposed or reused.

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. Dense graded crushed stone The work under this item shall conform to the relevant provisions of Section 402 and the following:

Certified weight slips countersigned by the Engineer on the date of delivery will be required. Materials not delivered by the Cubic Yard for this item will require the Contractor to provide a material density based on tests performed by an independent testing company. All costs of testing shall be the responsibility of the Contractor.

- B. ¾” Dense Graded Crushed Stone for choker layer will be paid for at the contract unit price per ton, complete in place. This price shall include full compensation for all labor, material, and equipment necessary to complete this work as specified.

- C. Certified weight slips countersigned by the Engineer on the date of delivery will be required. Materials not delivered by the TON for this item will require the Contractor to provide a material density based on tests performed by an independent testing company. All costs of testing shall be the responsibility of the Contractor.

4.02 PAYMENT ITEMS:

- A. Payment under this item will be ¾” dense graded crushed stone used as a base for bituminous concrete pavement, under granite block walls, under concrete stairs and ramps, and other areas as noted on the drawings or as directed by the engineer.

402.10	Dense Graded Crushed Stone	CY
--------	----------------------------	----

END OF SECTION

## SECTION 31 05 19.13

### GEOTEXTILE FABRIC

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as required by the Engineer.

##### 1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings or working drawings and material specifications shall be submitted to the Engineer for review for geotextile fabric furnished. General installation practices and installation schedule shall be included.

#### PART 2 - PRODUCTS

##### 2.01 GEOTEXTILE FABRIC:

- A. The geotextile fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Tencate Mirafi 140N.
- B. The geotextile fabric shall be Tencate Mirafi 140N as manufactured by Tencate Geosynthetics, Pendergrass, GA; Foss-65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION:

###### A. GENERAL:

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Engineer.

###### B. GEOTEXTILE FABRIC:

The geotextile fabric shall be installed as shown on the drawings or designated by the Engineer, in accordance with manufacturer's recommendations.

##### 3.02 FINAL INSPECTION AND ACCEPTANCE:

- A. The Engineer, at the Contractor's expense, reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

#### PART 4 - COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. The bid price for all electrical work shall be based on compensation accordingly for all work necessary to complete the work, including materials and placing and equipment, tools and all other incidental work necessary for final completion of items as specified.

##### 4.02 PAYMENT ITEMS

- A. The bid price for all Geotextile Fabric shall be pricing per the specific items listed as specified.

END OF SECTION

NOT FOR BIDDING

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall do all required clearing and grubbing as indicated on the drawings or herein specified in the area required for construction operations on the Owner's land or in the Owner's permanent or temporary easements and shall remove all debris resulting therefrom.
- B. Unless otherwise noted, all areas to be cleared shall also be grubbed.
- C. The Contractor shall not clear and grub outside of the area required for construction operations.

1.02 RELATED WORK:

Any trees and shrubs specifically designated by the Owner not to be cut, removed, destroyed, or trimmed shall be saved from harm and injury.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.01 CLEARING:

- A. Unless otherwise indicated, the Contractor shall cut or otherwise remove all vegetation.

3.02 GRUBBING:

- A. Unless otherwise indicated, the Contractor shall completely strip and remove all turf grass and roots to a depth of 2-inches.
- B. Any depression remaining from the removal of a stump or root removal and not filled in by backfilling shall be filled with gravel borrow and/or loam, whichever is appropriate to the proposed ground surface.

3.03 DISPOSAL:

All material collected in the course of the clearing and grubbing, which is not to remain, shall be disposed of in a satisfactory manner away from the site or as otherwise approved. Such disposal shall be carried on as promptly as possible and shall not be left until the final clean-up period.

PART 4 - COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. Remove and Dispose of turf grass shall be paid for at the contract unit price per lump sum which shall be full compensation for removing and disposing all turf grass.

4.02 PAYMENT ITEMS

124.00	Turf Grass removal (2" Depth)	Lump Sum
--------	-------------------------------	----------

END OF SECTION

NOT FOR BIDDING

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for erosion and sedimentation control work indicated on contract drawings and as specified herein.

1.03 PROJECT CONDITIONS:

- A. Earthmoving activities in the project area shall be conducted in such a manner as to prevent accelerated erosion and the resulting sedimentation.
- B. The Contractor shall implement and maintain erosion and sedimentation control measures as shown on the contract drawings or as required by the Owner or Engineer from the start of construction until provisional acceptance of seeded areas, to effectively prevent accelerated erosion and sedimentation.

1.04 SUBMITTALS IN ACCORDANCE WITH SECTION 01330, SUBMITTALS:

- A. The Contractor shall submit to the Engineer certification that the materials used for silt fence and straw wattle construction meet the specifications.

1.05 GENERAL METHODOLOGY:

- A. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:
  1. Topographic features of the Project area.
  2. Types, depth, slope and areal extent of the soils.
  3. Proposed alteration of the area.
  4. Amount of run-off from the Project area and the upgradient watershed areas.
  5. Staging of earthmoving activities.

6. Temporary control measures and facilities for use during earthmoving.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. Twelve inch (12") diameter straw wattle shall consist of 99.9% weed-free wheat, oat, barley, or rice straw, compacted. Diameter may vary +/- 13 percent. Wattle netting shall be non-woven photodegradable HDPE with a 1 year UV inhibitor.
- B. Mulch, if used to protect the hydroseed from erosion, shall consist of cured straw free from primary noxious weed seeds, twigs, debris and rough or woody materials. Mulch shall be free from rot or mold and shall be acceptable to the Engineer or Owner. Alternately, mulch shall be specially processed cellulose homogeneous fiber containing no growth or germination-inhibiting factors. Processed cellulose fiber shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a slurry when sprayed on the ground. The material shall allow homogeneous absorption and percolation of moisture. The manufacturer shall show the air-dry weight content on each package of the cellulose fiber. Mulch shall be utilized on all newly graded subgrade and topsoil areas that cannot be seeded within five (5) days.
- C. Erosion Control Blanket shall be a 100% biodegradable erosion control blanket containing no netting, primarily designed to control water erosion on slopes. Material shall be Curlex Net Free as manufactured by American Excelsior Company or approved equal.
- D. Inlet Sediment Control shall be a catch basin filter shall device created specifically for inserting within a catch basin structure to prevent intrusion of sediment. Device shall be SiltSack or equal.

## PART 3 - EXECUTION

### 3.01 CONSTRUCTION SEQUENCE:

- A. Construction of erosion control measures as depicted on drawings will be completed prior to any site work.
- B. Sediment barriers shall be used at locations shown on the drawings. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering stormwater runoff.

- C. All temporary erosion control measures will be maintained throughout the course of site construction activities until provisional acceptance of the site vegetation by the Engineer or Owner, at which time the Contractor shall remove all remaining temporary erosion control structures, and properly dispose of accumulated sediment on-site in areas approved by the Owner.
- D. The Engineer or Owner may order additional erosion and sediment controls be installed. The Contractor shall comply with Engineer or Owner's request and immediately install the required controls.
- E. The Contractor shall inspect all erosion control measures after any storm event to ensure they are in proper working order.

### 3.02 CONSTRUCTION METHODS:

- A. Straw wattles shall be installed at the site downgradient of work areas as required by Owner or Engineer in the field. Straw wattles shall be placed at locations shown on the contract drawings or approved by the Engineer. The base of all straw wattles shall be embedded to the depths shown on the contract drawings.
- B. Straw mulch, if used, shall be applied at a rate of 100-lbs/1000 ft<sup>2</sup>.
- C. On slopes, the Contractor shall provide protection against washouts by an approved method. Any washout, which occurs either in the Contractor's work area or in areas topographically below his work, shall be regraded and reseeded at the Contractor's expense until an accepted vegetative stand is established.

## PART 4 - COMPENSATION

### 4.01 METHOD OF MEASUREMENT

- A. Straw wattles shall be measured by the linear foot complete in place, as accepted by the engineer.
- B. Inlet Sediment Control shall be measured per each.
- C. Erosion Control Blanket shall be measured be square foot.

### 4.02 PAYMENT ITEMS:

- A. Straw wattles, inlet sediment control and erosion control blanket shall be paid for at the contract unit price listed below, which prices shall be full compensation for all labor, materials, and equipment necessary to complete the work in a satisfactory manner, including removal at end of project, except for erosion control blanket which shall be biodegradable and left in place.

130.20	Straw Wattles	Linear Foot
130.30	Inlet Sediment Control	Each
130.40	Erosion Control Blanket	Square Foot

END OF SECTION

NOT FOR BIDDING

SECTION 32 12 16.13

BITUMINOUS CONCRETE PAVEMENT  
AND COLOR SEALCOAT

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Under this Section, the Contractor shall furnish all necessary labor, materials, equipment, and transportation necessary to construct the following:
1. The bituminous concrete pavement for the court shall be composed of materials as specified herein and shall be constructed on a prepared base course to the depth, grade and cross-section shown on the plans, as specified herein and as required by the Engineer.
  2. Unless otherwise specified in the Drawings, bituminous concrete pavement shall be composed of a one and a half (1 1/2) - inch bituminous concrete binder course, and a one and a half (1 1/2) inch bituminous concrete dense mix course.
  3. Color sealcoating of bituminous concrete pavement as shown on the plans and as specified herein.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK

1.03 REFERENCE STANDARDS AND SPECIFICATIONS:

- A. Reference to the standards, specifications and tests of technical societies, organizations and governmental bodies are made in the Contract Documents.
1. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications).
  2. ASTM - American Society for Testing and Materials.
  3. MassDOT Standard Specs. - Latest edition of the Standard Specifications for Highways and Bridges, Massachusetts Department of Transportation, hereinafter referred to as the "Massachusetts Standard Specifications."

1.04 SUBMITTALS:

- A. Asphalt emulsion Type SS-1 product and application specification.

- B. Color Sealcoat: The Contractor shall submit catalog cuts, manufacturer's specifications and color chips or charts.
- C. Field layout of color sealcoat must be approved by Engineer prior to installation.
- D. Submit catalog cuts and manufacturer's specifications for Airport Grade Asphalt Emulsion Mix and Aggregate.
- E. Compaction tests are required on all bituminous concrete base surfaces on a 5-foot grid interval or per Engineer's direction. At the Contractor's expense, an independent testing agency must perform the work and submit the results directly to the Engineer.

1.05 QUALIFICATIONS/SPECIAL REQUIREMENTS – COLOR SEALCOAT APPLICATION:

- A. The Contractor shall engage the manufacturer's representative to inspect and monitor the application of the initial filler coat upon the prepared surfaces of all pavements to receive color sealcoat.
- B. If a latex-ite acrylic sealer/surfacer is to be utilized, the addition of silica by mechanical agitation on-site shall be inspected and monitored by the manufacturer's representative who is to be engaged by the Contractor at the Contractor's cost.
- C. Adequate means shall be provided to protect the color seal coating(s) from damage until such time that each layer has cured sufficiently and no seal will adhere to and be picked up by the tires of vehicles or by pedestrian traffic.
- D. No color seal coating shall be applied during any period within which rain or sub-application temperatures are predicted within forty-eight (48) hours, unless otherwise specified by the manufacturer.

1.06 GUARANTEE/WARRANTY:

- A. The pavement and coatings shall be guaranteed against defects in workmanship or quality for a period of two (2) years after final acceptance. The Contractor shall replace, repair, recoat or otherwise make satisfactory to the Owner any unacceptable pavement and or coating at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 BITUMINOUS CONCRETE PAVEMENT:

- A. Bituminous Concrete Pavement shall consist of binder mix and dense mix courses constructed to the thicknesses shown on the plans and shall conform to the relevant provisions of Sections 460 and (M3.11.03) of the Massachusetts Standard Specifications, unless specified otherwise hereinafter.

B. Base/Binder Courses

1. Base/Binder Courses shall be Bituminous Concrete Pavement, Dense Finish Course Type I-1.

C. Leveling/Overlay Courses

1. Leveling/Overlay Courses shall conform to "Surface Treatment" mix, Table A, Section M3.11.03 of the MassDOT Standard Specifications, comprised of Class I Dense Bituminous Concrete, Type ST or Dense Mix Type I-1, at the Contractor's option.
2. The general composition of the bituminous concrete mixture (the proportion of asphalt cement to mineral aggregate) shall be in accordance with MassDOT requirements.
3. The mineral aggregate composition for Type ST shall be as follows:

TYPE ST SIEVE ANALYSIS U.S. Standard Sieve No.	MINERAL AGGREGATE Percent Passing by Weight (per ASTM C-136)	
Size	Minimum	Maximum
3/8	100	-
4	96	100
8	85	100
16	55	85
30	25	60
50	15	40
100	3	15
200	2	7

2.02 ASPHALT EMULSION TACK COAT:

- A. Asphalt emulsion tack coat shall be Type SS-1 or SS-1H as specified by the Asphalt Institute.

2.03 TROWELABLE ASPHALT FILLER/PATCH:

- A. Airport grade asphalt emulsion mix and aggregate shall be used to repair gouges or cracks which can then be brought to grade to receive an overlay or color sealcoat.

2.04 COLOR SEALCOAT:

- A. The layout and design of color sealcoating shall be installed per contract drawings and shall consist of a two-color system with white painted lines. Final colors shall be as selected by

the Owner but shall consist of basketball shooting key areas and center circle as Color 2 with the area inside the court as Color 1, and the area directly outside the court boundaries to edge of bituminous concrete as Color 2. For bidding purposes, Color 1 shall be Plexipave's "DecoTURF-"Stone Gray" and Color 2 shall be Plexipave's DecoTURF –"Olympic Blue" or approved equal.

- B. The two (2) filler coats shall be Plexipave as manufactured by California Products Corporation, 169 Waverly Street, Cambridge, Massachusetts, or approved equal. Colors shall be as indicated above. The two (2) Plexipave filler coats shall be applied to the cleaned bituminous pavement as specified hereunder. It shall be non-flammable upon exposure to flame. The filler coats shall contain a minimum of 9 lb./gal. of Silica, 100 percent (100%) passing a 100% mesh as pre-mixed at the manufacturer's plant. No sand or silica shall be added to the emulsion in the field. The bituminous pavement shall cure for fourteen (14) days prior to applying the Plexipave Acrylic Color System.
- C. Water, if approved, may be added to the Plexipave emulsion mixes. In no case may the quantity of water in the filler coat emulsion mix exceed thirty-three percent (33%) of the emulsion volume. (One (1) part water: two (2) parts filler coat). In no case may the quantity of water in the finish coat emulsion mix exceed fifty percent (50%) of the emulsion volume. (One (1) part water: one (1) part finish coat). Water shall be potable and its temperature above forty degrees F (40°F) upon addition to the emulsions.
- D. The color emulsion coating shall be California Products Company's "Plexichrome" or an approved equal emulsion product. Colors shall match those of the Plexipave filler coats as indicated above. The Plexichrome shall be applied lengthwise of the court with a wide type pushbroom.
- E. The base vehicle for the finish coat shall be an acrylic polymer dispersed in water and which has the ability to withstand extremes in temperature and general weathering. The film former shall provide a non-skid surface upon drying and under all weather conditions. Pigment dispersions in the color coating are to be of the best quality chrome oxides so as to obtain a permanent true color. The coating shall contain no material, which will cause cracking due to extremes in temperatures and is to be factory mixed and consistent in color. It shall be a one hundred percent (100%) acrylic emulsion containing no alkyds, butadiene styrene, or vinyls and shall be thinned with water. It shall not chalk or discolor any equipment.
- F. The finished surface shall be smooth and uniform, true to required grade and cross section, and free of depressions, ridges, or other irregularities.

### PART 3 - EXECUTION

#### 3.01 BITUMINOUS CONCRETE PAVEMENT:

- A. Bituminous concrete pavements shall be constructed on a prepared foundation of gravel in accordance with the Massachusetts Standard Specifications, Section 405, except where

overlayment is over existing pavement.

- B. The bituminous mixtures shall be placed on the approved base only when, in the opinion of the Engineer, the course is sufficiently dry and weather conditions are suitable.
- C. Where walls, curbing, or other suitable permanent supports are not present, the Contractor shall secure proper alignment and adequate compaction of the binder and surface courses as shown on the Contract Drawings and finish all edges with a neat tamped edge.
- D. The mixture shall be placed in two (2) courses as shown on the Contract Drawings. Each course shall be spread and finished as required in the Massachusetts Highway Department, Standard Specifications for Highways and Bridges, Section 460.63, latest edition.
- E. Prior to completion of bituminous concrete overlay, the Contractor shall have the existing patched surfaces tack coated and leveled to eliminate all "birdbaths" or extreme lows which may create ponding or drainage problems. Leveling course (surface treatment) bituminous concrete applied as necessary, shall be raked and feathered and be properly rolled and compacted. The Contractor shall apply "level" lines, screeds, or use other measures to achieve the proper leveling surface suitable for overlay.
- F. All adhesive fabric shall be in place and approved prior to completing this work.
- G. After completion, the bituminous concrete courses shall conform to the thickness shown on the Contract Drawings, smooth and even and of a dense and uniform structure. When tested with a sixteen (16) foot straight edge placed parallel to the centerline of the pavement, there shall be no deviation from a true surface in excess of one-quarter (1/4) inch.

### 3.02 ASPHALT EMULSION TACK COAT:

- A. Apply a single very thin (0.05 to 0.15 gallons per square yard) application of diluted asphalt emulsion (Type SS-1) to all existing surfaces to be paved against or overlaid to cover the entire surface of existing pavement.
- B. Essential qualities of coverage are (1) it must be very thin and (2) uniformly cover entire surface of existing pavement.
- C. Place only that amount of tack coat which can be overlaid with new pavement by the end of each day, and; IF RAIN IS ANTICIPATED DO NOT APPLY TACK COAT.

### 3.03 COLOR SEAL COAT:

- A. The bituminous concrete pavement shall cure for fourteen (14) days prior to applying the Color Sealcoat System where specified.
- B. The Contractor shall furnish and apply to the approved bituminous pavements so designated on the plans: two (2) filler coats and one (1) finish coat of acrylic emulsion color coating.

- C. Prior to application of the filler coats, all dirt, sand, dust, and other loose material shall be cleaned from the paved areas to be covered, by sweeping and pressure washing with water. All surfaces shall be dry prior to starting any color seal coating process. The Contractor shall take special precautions to assure that existing pavements are thoroughly cleaned and that all cracks or joints in existing pavements are repaired in conformance with these specifications and to the satisfaction of the Owner. Limits or areas to be color coated shall be taped with minimum two (2) inch wide tape true as to alignment prior to application of the color coating material.
- D. The two (2) filler coats shall be applied so that both coats are of a total quantity and with a uniform spread at the rate of one (1) gallon per each one hundred (100) square feet of surface area. Additional filler coating material is to be used if necessary to complete the court surfaces satisfactory to the Supervisor. The first coat shall be applied length-wise of the court or drive and the second coat cross-wise of the court or drive.
- E. Apply one (1) acrylic color emulsion coating to the properly prepared surfaces with a uniform spread at the rate of one (1) gallon per each two hundred (200) square feet of surface area after the filler coat applications have been completed and approved. The color emulsion coating shall be California Products Company's "Plexichrome" or an approved equal emulsion product. Colors shall match those of the Plexipave filler coats. The Plexichrome shall be applied lengthwise of the court or drive with a wide type pushbroom.
- F. The entire system of two (2) filler coats and one (1) finish coat shall be applied with approved squeegees, respectively. The material shall be thoroughly mixed by mechanical agitation and all work shall be done in a thorough and workmanlike manner. The emulsion shall be thoroughly stirred in its container as received, by stationery bucket power mixer, so that a creamy, smooth consistency of all the emulsion in the container is assured for ready application. The entire work of color coat surfacing shall be done in accordance with the recommendations of the manufacturer's representative. Special care shall be taken so as to allow none of the material to spatter or flow beyond the perimeter of areas to be covered. The filler coats and finish coat shall not be applied in foggy or rainy weather, or when ambient temperature is below forty-five degrees F (45°F), nor shall they be applied if such conditions are anticipated during the next forty-eight (48) hours.
- G. The finished surface shall be smooth and uniform, true to required grade and cross section, and free of depressions, ridges, or other irregularities.

#### PART 4 - COMPENSATION

##### 4.01 METHOD OF MEASUREMENT

- A. Bituminous Concrete Pavement shall measured per ton.
- B. Hot Mix Asphalt-miscellaneous shall measured per ton.

C. Color sealcoat for the basketball court shall be measured per square foot.

4.02 PAYMENT ITEMS:

- A. Payment for bituminous concrete pavement shall be for all materials required to prepare the bituminous concrete pavement in place, including binder course, leveling course, asphalt emulsion tack coat and asphalt patch. This item shall be paid for at the contract unit of measurement listed below. Dense graded crushed stone subbase materials will be paid under that item.
- B. Hot Mix Asphalt-miscellaneous shall be full compensation for placing all materials including equipment, tools and all other incidental work necessary for final completion of the items as specified. This item shall be paid for at the contract unit of measurement listed below.
- C. Color sealcoat for the basketball court shall be full compensation for placing all materials including equipment, tools and all other incidental work necessary for final completion of the items as specified. This item shall be paid for at the contract unit of measurement listed below.

450.10	Bituminous Concrete Pavement	TON
460.03	Hot Mix Asphalt Miscellaneous	TON
702.10	Color Sealcoat at Basketball Court	SF

END OF SECTION

SECTION 32 14 00

POROUS PRECAST CONCRETE UNIT PAVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions, Division 0 and Division 1, General Requirements, apply to the work of this Section.

1.02 SCOPE OF WORK

- A. Under this Section, the Contractor shall furnish all necessary labor, materials, equipment, transportation and services necessary to complete the work of this Section as specified herein, as shown on the drawings, or both.
- B. The work of this Section includes, but is not limited to the following:
1. Precast Concrete Unit Pavers

1.03 RELATED WORK

- A. Carefully examine all the Contract Documents for requirements that affect the work of this Section. Other specification sections that directly relate to the work of this Section include, but are not limited to the following:
1. Section 03 30 00, Cast In Place Concrete Pavement
  2. Section 12 93 00, Site Furnishings

1.04 REFERENCES

- A. American Society of Testing and Materials (ASTM):
1. C 33 - Specification for Concrete Aggregates.
  2. C 136 - Method for Sieve Analysis for Fine and Coarse Aggregate.
  3. C 140 - Sampling and Testing Concrete Masonry Units.
  4. C 936 - Specification for Solid Interlocking Concrete Paving Units.
  5. C 979 - Specification for Pigments for Integrally Colored Concrete.
  6. D 448 - Standard Sizes of Processed Aggregates.
  7. D 698 and D 1557 - Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures.
  8. D 2940 - Graded Aggregate Material for Bases or Subbases for Highways or Airports.

## 1.05 SUBMITTALS

- A. Design Mix Submittals: Submit design mix submittals including description of materials, proportions, and mechanical sieve sizes of aggregates for the following:
1. Certified sieve analysis for grading of bedding and joint/void sand.
  2. Bituminous concrete setting bed mix.
  3. Asphalt tack coat.
- B. Samples: the following samples shall be reviewed in the field for the following items:
1. Furnish not less than four individual concrete pavers of each type, size, color and finish required to the Engineer for approval. Samples shall exhibit the full color range of pavers to be provided.
- C. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following items:
1. Concrete Unit Paver
- D. Test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C 936 and CSA A231.2-95 for resistance to freeze-thaw and or other applicable requirements.
- E. Sieve analysis for grading of bedding/aperture/joint sand.

## 1.06 MOCK-UPS

- A. Construct sample panels of concrete unit pavers on the specified base and as per Contract Documents. Sample panel shall exhibit proposed color range, texture, band, jointing, pattern, finish, paver size, and workmanship. Unless otherwise indicated, size of panel shall be 4 feet x 4 feet minimum.
1. One sample panel representing concrete unit pavers shall be constructed on a concrete base, with bituminous concrete setting bed, pavers and jointing as required for the finished work.
  2. The quality of workmanship, paver jointing and cleanliness of pavers after installation must be approved by the Engineer before permanent paving is started.
  3. 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.
  4. The approved sample shall become the minimum standard for unit paving for this project.

#### 1.07 PROJECT CONDITIONS

- A. Weather: Perform work only when existing and forecasted weather conditions are within the limits established by referenced standards. Perform work only when ambient temperature is forecasted to be at least 50-degrees Fahrenheit and when temperatures have not been below 35-degrees Fahrenheit for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess amount of moisture or is in a frozen state.
- B. Construction methods, transportation and delivery of mixtures, spreading, finishing, compaction joints, etc. shall conform the Section 460 of the Massachusetts Department of Transportation, Standard Specifications for Highways and Bridges unless otherwise specified herein.
- C. Traffic Control: Maintain access for vehicular and pedestrian traffic as required and for other construction activities.
- D. Grade Control: Establish and maintain required lines and elevations.

#### 1.08 REGULATORY REQUIREMENTS

- A. Strictly comply with applicable codes, regulations and requirements of authorities having jurisdiction.

#### 1.09 QUALITY ASSURANCE

- A. Installer must review installation procedures of all unit paving and sequence of work with General Contractor to ensure proper coordination with other subcontractors and suppliers whose work is affected by the delivery schedule and installation of paving work.
- B. Paver manufacturer shall be an ICPI Certified Producer.
- C. Installation shall be by a contractor and crew with at least five years experience in placing concrete pavers on projects of similar size and scope.
- D. Contractor shall conform to all local, state licensing and bonding requirements and shall have received a Record of Completion of the ICPI Commercial Paver Technician Course or be an ICPI Certified Contractor.
- E. Do not install subbase or base materials, or pavers, during heavy rain or snowfall. Do not install subbase or base or pavers over frozen materials.

#### 1.10 TESTING

- A. During the placing and rolling operation, repeated checks shall be made to ascertain the correct rate of application to provide the required compacted thickness

- B. If the average thickness is deficient from the specified thickness by one quarter (1/4) inch or more, the extent of the deficient area shall be corrected at the Contractor's expense.
- C. Upon completion of testing, the Contractor shall properly fill all test holes by compacting a fine aggregate bituminous concrete for the full depth of the core. The finished surface shall be smooth.

#### 1.11 COORDINATION

- A. This Contractor shall coordinate with all other trades especially grading, curb installation, electrical and plumbing contractors, through the General Contractor in order to prevent covering up unfinished or uninspected work and loss of time or labor by mis-scheduling and to assure the steady progress of all work of the Contract. Any rework shall be done at no cost to the Owner.

#### 1.12 LAYOUT AND GRADES

- A. A Registered Land Surveyor employed by the Contractor shall lay out all lines and grade work in accordance with the Contract Documents.

#### 1.13 DISTURBING EXISTING PAVEMENT DURING CONSTRUCTION

- A. Existing paved areas shall be protected from damage by construction activities to the extent possible. Where sections of the finished paved areas have to be removed, the edges shall be saw cut in all cases and patched.
- B. Existing finished paved areas that require extensive cutting and patching or have become damaged and cannot be satisfactorily repaired by cutting and patching shall be resurfaced. These resurfaced areas shall be large enough to be applied by paving machines. Shape of these resurfaced areas shall be near and in rectangular patterns or shall conform to the shape or edges of other adjacent surface improvements. Edges of resurfaced areas shall be saw cut and existing pavements shall be removed from a distance of two feet into areas to be resurfaced, so that new pavement can neatly blend into existing pavement showing no joints or imperfections. If the gravel base course has been disturbed, the Contractor shall remove the disturbed material, repair the existing gravel base and apply a new binder course as specified herein.
- C. All paving beyond the project's property line shall be in accordance with the requirements of the authority having jurisdiction. Provide traffic control for any work within the Town's Right-of-Way.

### PART 2 - PRODUCTS

#### 2.01 GRADING AND COMPACTION OF SUB-BASE

- A. Do all necessary grading in addition to that specified under EARTHWORK to bring subgrade or foundation after final compaction to required grades and sections to obtain a foundation of uniform bearing surface. In absence of specific requirements, compact foundation by such means as will provide firm base and insurance against settlement of superimposed work.
- B. Sub-base preparation, including material, shall be of properly approved quality as specified under EARTHWORK. Start of work under this Section shall constitute acceptance of the foundation conditions to which this work is to be applied. Any defects in work resulting from such conditions shall be corrected under this Section, Site Improvements, at no additional cost to the Owner.

2.02 CONCRETE UNIT PAVERS

- A. The standard of quality, design and function required is based on concrete unit pavers manufactured by Unilock, 35 Commerce Dr., Uxbridge, MA 01569, (508) 278-4536, [www.unilock.com](http://www.unilock.com) or approved equal. All unit pavers shall meet ASTM C 936.
  - 1. Paver size shall be six Unilock Eco-Promenade, Umbriano Finish, (11 3/4")-inches x (3")-inches x (3 7/8")-inches, Paver, For bidding purposes, Color 1 shall be Charcoal. Color 2 shall be Gray. Refer to drawings for pattern and location.
  - 2. All pavers shall have a minimum compressive strength of 8,000 pounds per square inch.
  - 3. Water absorption shall be 5 percent or less when tested in accordance with ASTM C 140 with no individual stone testing more than 7 percent.

2.06 PERMEABLE JOINT OPENING AGGREGATE

- A. Provide Permeable Joint Opening Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 8 as shown in Table 1.

Table 1:

ASTM No. 8	
Sieve Size	Percent Passing
1/2 in (12.5 mm)	100
3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

- A. Provide Permeable Joint Opening Aggregate materials conforming to ASTM C 33 and gradation requirements as presented in Table 2.

1. Color: (Specify granite chip color: gray)

Table 2:

<b>1/8 to 3/16 inch granite chips</b>	
<b>Sieve Size</b>	<b>Percent Passing</b>
1/4 in (6 mm)	97 to 100
No. 4 (4.75 mm)	70 to 83
No. 8 (2.36 mm)	37 to 50
No. 16 (1.18 mm)	0 to 12
pan	

2.07 PERMEABLE SETTING BED AGGREGATE

- A. Provide Permeable Setting Bed Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 8 as presented in Table 3.

<b>ASTM No. 8</b>	
<b>Sieve Size</b>	<b>Percent Passing</b>
½ in (12.5 mm)	100
3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

2.08 PERMEABLE BASE AGGREGATE

- A. Provide Permeable Base Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 57 as presented in Table 4.

Table 4:

<b>ASTM No. 57</b>	
<b>Sieve Size</b>	<b>Percent Passing</b>
1-1/2 in (37.5 mm)	100
1 in (25 mm)	95 to 100
1/2 in (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

## 2.09 PERMEABLE SUBBASE AGGREGATE

- A. Provide Permeable Subbase Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 2 as presented in Table 5.

Table 5:

ASTM No. 2	
Sieve Size	Percent Passing
3 in (75 mm)	100
2-1/2 in (63 mm)	90 to 100
2 in (50 mm)	35 to 70
1-1/2 in (37.5 mm)	0 to 15
3/4 (19 mm)	0 to 5

For all aggregates, provide washed, clean, have zero plasticity, free from deleterious or foreign matter, crushed, angular rock and contain no No. 200 sieve size aggregate materials used in the construction of permeable pavement. Aggregate materials serve as the structural load bearing platform of the pavement as well as a temporary receptor for the infiltrated water that is collected through the openings in the pavement's surface.

## 2.10 GEOTEXTILE

- A. Provide Geotextile material conforming to the following performance characteristics, measured per the test methods referenced:
1. 4 oz., nonwoven needle punched geotextile composed of 100% polypropylene staple fibers that are inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.
  2. Grab Tensile Strength: ASTM D 4632: 115 lbs.
  3. Grab Tensile Elongation: ASTM D 4632: 50%
  4. Trapezoidal Tear: ASTM D 4533: 50 lbs.
  5. Puncture: ASTM D 4833: 65 lbs.
  6. Apparent Opening Size: ASTM D 4751: 0.212 mm, 70 U.S. Sieve
  7. Permittivity: ASTM D 4491: 2.0 sec<sup>-1</sup>
  8. Flow Rate: ASTM D 4491: 140 gal/min/s.f.

## 2.11 EDGE RESTRAINTS

- A. Edge restraint shall be Model # CleanLine XL, (3/16-inch x 8-inch) as manufactured by Permaloc, 13505 Barry Street, Holland, Michigan 49424 USA, (800)356-9660, [www.permaloc.com](http://www.permaloc.com)
1. Material Type: Aluminum

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Permeable Concrete Pavers.
  - 1. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
  - 2. Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
  - 3. Verify that Permeable Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
  - 4. Provide written density test results for soil subgrade, Permeable Base and Subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
  - 5. Verify location, type, and elevations of edge restraints, concrete collars around utility structures, and drainage inlets.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Beginning of bedding sand and paver installation signifies acceptance of base and edge restraints.

### 3.02 PREPARATION

- A. Verify that the subgrade soil is free from standing water.
- B. Stockpile Permeable Setting Bed, Joint, Base and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Geotextile and Permeable Subbase Aggregate materials.
- D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Permeable Joint, Setting Bed, Base and Subbase Aggregate materials contaminated with sediment with clean materials.
- E. Compact soil subgrade uniformly to at least 90 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 95 percent Modified Proctor per ASTM D 1557 for vehicular areas.
- F. Proof-roll prepared subgrade according to requirements in Section 31 00 00-Earthwork to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.

Base compaction and proof-rolling of the subgrade soil on the recommendations of the Engineer. Request the Engineer to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

Mechanical tampers (jumping jacks) are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. Compact areas, not accessible to roller compaction equipment, to the specified density with mechanical tampers. **CAUTION** – Proceed with care around the perimeters of excavations, buildings, curbs, etc. These areas are especially prone to consolidation and settlement. Do not place wedges of backfill in these areas. If possible particularly in these areas, proceed with backfilling and compacting in shallow lifts, parallel to the finished surface.

### 3.03 INSTALLATION

#### A. EDGE RESTRAINTS

1. Provide edge restraints as indicated.
2. Provide metal edge restraints as indicated.
  - a. Provide plastic or metal edge restraints along the perimeter of all paving as indicated and supported on a minimum of 6- inches of dense grade crushed stone.
  - b. Provide 18” stainless steel spike to fasten edge restraint at 24-inches on center for straight sections and 12-inches on center for curved sections.

#### B. GEOTEXTILES

1. Provide separation geotextile on bottom and sides of prepared soil subgrade. Secure in place to prevent wrinkling or folding from equipment tires and tracks.
2. Overlap ends and edges a minimum of 18-inches. (450 mm) in the direction of drainage.

#### C. PERMEABLE BASE AND SUBBASE AGGREGATE

1. Provide the Permeable Subbase Aggregate in uniform lifts not exceeding 6-inches., loose thickness and compact to at least 95 percent as per ASTM D 4254 to depths as indicated.
2. Compact the Permeable Subbase Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
3. Tolerance: Do not exceed the specified surface grade of the compacted Permeable Subbase Aggregate material more than  $\pm 3/4$ -inches over a 10-foot long straightedge laid in any direction.
4. Provide the Permeable Base Aggregate material in uniform lifts not exceeding 6-inches over the compacted Permeable Subbase Aggregate material and compact to at least 95 percent as per ASTM D 4254 to depths as indicated.

5. Compact the Permeable Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the compaction device.
6. Do not exceed the specified surface grade of the compacted Permeable Base Aggregate material more than  $\pm 1/2$  in. (13 mm) over a 10-foot long straightedge laid in any direction.
7. Grade and compact the upper surface of the Permeable Base Aggregate material sufficiently to prevent infiltration of the Permeable Setting Bed Aggregate material both during construction and throughout its service life.

In-place density of the Permeable Base and Subbase Aggregate materials may be checked per ASTM D 4254. Establish a Compacted density of 95% of the laboratory index density for the subbase and base stone.

#### D. PERMEABLE SETTING BED AGGREGATE

1. Provide, spread and screed Permeable Setting Bed aggregate evenly over the Permeable Base Aggregate course.
  - a. Protect screeded Permeable Setting Bed Aggregate from being disturbed.
  - b. Screed only the area which can be covered by pavers in one day.
  - c. Do not use Permeable Setting Bed Aggregate material to fill depressions in the base surface.
2. Keep moisture content constant and density loose and constant until Concrete Pavers are set and compacted.
3. Inspect the Permeable Setting Bed Aggregate course prior to commencing the placement of the permeable concrete pavers.
4. Inspect the Setting Bed Aggregate course prior to commencing the placement of the Permeable Concrete Pavers. Acceptance of the Setting Bed Aggregate occurs with the initiation of Permeable Concrete Paver placement.

#### E. PERMEABLE CONCRETE PAVERS

1. Replace unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).
3. Exercise care in handling face mix pavers to prevent surfaces from contacting backs or edges of other units.
4. Provide Permeable Concrete Pavers using joint pattern as indicated. Adjust joint pattern at pavement edges such that cutting of edge pavers is

- minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.
5. Use string lines or chalk lines on Permeable Setting Bed aggregate to hold all pattern lines true.
  6. Set surface elevation of pavers 1/8-inch above adjacent drainage inlets, concrete collars or channels.
  7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
    - a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
  8. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
  9. Prevent joint (bond) lines from shifting more than  $\pm 1/2$ -inch over 50-feet from string lines.
  10. Fill gaps between units or at edges of the paved area that exceed 3/8-inch with pieces cut to fit from full-size unit pavers.
  11. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
  12. Prevent all traffic on installed pavers until Permeable Joint Aggregate has been vibrated into joints. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and Permeable Joint Aggregate material. .
  13. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
    - a. After edge pavers are installed and there is a completed surface.
    - b. Compact installed concrete pavers to within 6-feet of the laying face before ending each day's work. Cover pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Permeable Setting Bed Aggregate from becoming disturbed.
  14. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
  15. Remove any cracked or structurally damaged pavers and replace with new units prior to installing Permeable Joint Opening Aggregate material.
  16. Provide, spread and sweep Permeable Joint Opening Aggregate into joints immediately after vibrating pavers into Permeable Setting Bed course until full. Vibrate pavers and add Permeable Joint Aggregate material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
  17. Remove excess Permeable Joint Aggregate broom clean from surface when installation is complete.

### 3.04 FIELD QUALITY CONTROL

- A. Verify final elevations for conformance to the drawings after sweeping the

surface clean.

1. Prevent final Concrete Paver finished grade elevations from deviating more than  $\pm 3/8$ -inch under a 10-foot straightedge or indicated slope, for finished surface of paving.

B. Lippage: Paver-to-Paver Lippage:

1. No greater than 1/8-inch difference in height between adjacent pavers.

### 3.05 REPAIRING, CLEANING AND SEALING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.

1. Clean Permeable Concrete Pavers in accordance with the manufacturer's written recommendations.

### 3.06 PROTECTION

A. Protect completed work from damage due to subsequent construction activity on the site.

### 3.07 PERMEABLE JOINT AGGREGATE MATERIAL REFILLING

A. Remove all debris from joint and provide additional Permeable Joint Aggregate material after 120 days and before 150 days after date of Substantial Completion/Provisional Acceptance.

1. Fill Permeable Joint Aggregate material full to the lip of the paver.

### 3.08 GUARANTEE

A. The Contractor shall guarantee all pavement installations, including materials and workmanship, for a period of one year from the date of acceptance. The Contractor shall make interim repairs as necessary to maintain all paved areas in good, usable condition.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for all porous precast pavers shall be full compensation for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all materials including porous precast concrete pavers, geotextile fabric, all base and reservoir stone, and bedding stone including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.
- B. The bid price for steel edging shall be for all materials forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all porous precast concrete pavers 485.20 and steel edging 701.30 related work shall be included in unit bid pricing and all other incidental work necessary for final completion of the items as specified.

485.20	Porous Precast Concrete Pavers	Square Foot
701.30	Steel Edging	Linear Foot

END OF SECTION

NOT FOR BIDDING

SECTION 32 14 40

GRANITE COBBLESTONE PAVERS

PART 1 – GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall furnish all labor, materials, equipment and transportation required to complete the installation of granite pavers according to the lines, grades and details identified on the plans and in accordance with the specifications herein.
- B. In summary, the limited work required under this section shall require the following:
  - 1. Installation of granite pavers as identified on the plans. All granite pavers are to be installed on a mortar setting bed with a concrete base below, as indicated on the details. Pavers are to be furnished in accordance with the schedule identified on the Contract Drawings.
  - 2. All excavations, removals and backfilling of required materials necessary to install the granite pavers.

1.02 RELATED WORK:

- A. Section 01 33 23, Submittals  
Section 03 30 00, Cast-In-Place Concrete

1.03 SUBMITTALS:

- A. The granite supplier shall submit shop drawings for approval in coordination with Section 01 33 23, Submittals.
- B. Shop Drawings shall show all paver dimensions and identify the individual pavers required to complete the work as designated on the drawings. No final sizing or finishing of granite pavers shall be done until the shop drawings for that part of the work have been approved.

1.04 SAMPLES:

- A. Prior to ordering any materials, the Contractor shall submit representative granite samples to the Engineer for selection and approval. Do not order materials until Engineer's approval has been obtained. Delivered materials shall exactly match the approved samples.
  - 1. Granite Cobblestone Pavers

The Contractor shall submit six (6) granite samples to show the texture, finish, and full range of color variation that can be expected in the finished work. Identify both the quarry and fabricator (if different) for all the granite features specified under this section.

2. Granite Paver Sample Panels

Construct two (2) sample panels of pavers on mortar setting bed at locations as required by the Engineer. The sample panels shall encompass twenty-five (25) square feet and be located by the Engineer. The Engineer must approve the quality of workmanship before permanent granite pavement construction is started. If the samples are not approved, the Contractor shall provide additional samples, as required, at no cost to the Owner until an approved sample is obtained. The approved samples shall become the standard for granite pavement throughout the entire job. The sample panels may be constructed on a location becoming part of the final pavement and shall remain undisturbed until all paving is completed.

1.04 SHIPPING AND HANDLING OF MATERIALS:

- A. Notwithstanding any prior acceptance of materials given prior to delivery, acceptance and approval for all work will be based upon the conditions at completion of installation.
- B. It is the responsibility of the Contractor to exercise all necessary precautions to properly protect materials. Where damage occurs the items will be rejected.
  - 1. Granite pavers shall be packaged and delivered/off-loaded to manufacturer's standards. Pavers damaged in any manner will be rejected and shall be replaced with new material at no additional cost to the Owner.
  - 2. Store all granite pavers on raised platforms in such a manner as to prevent damage or intrusion of foreign matter. Storage piles or stacks shall be located to avoid damage and be protected from heavy and unnecessary traffic. Materials shall be stored under an approved roof or covered with waterproof tarpaulins, at all times, except when men are working and using the materials.

1.05 CLEANUP:

- A. After completion of all work, all debris, rubbish, and surplus materials shall be removed from the site. The site shall be left clean, presentable, and to the satisfaction of the Engineer.

1.06 REFERENCE STANDARDS AND SPECIFICATIONS:

- A. Reference to the standards, specifications and tests of technical societies, organizations, and governmental bodies is made in the following publications:

1. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications).
2. ASTM - American Society for Testing and Materials.
3. MassDOT Standard Specifications – Latest edition of the Massachusetts Department of Transportation Standard Specifications for Highways and Bridges.
4. Specifications for Architectural Granite as published by the National Granite Quarries Association, Inc.

#### 1.07 QUALIFICATIONS:

- A. In conformance with qualifications requirements described elsewhere in the contract documents, the entity responsible for the installation of all granite pavers shall possess significant experience with projects of a precise nature. Individuals or companies proposing to accomplish the work of this section shall be subject to the approval of the Owner or its representatives.

### PART 2 – PRODUCTS

#### 2.01 COBBLESTONE PAVERS:

- A. All granite shall be of standard architectural grade, free of cracks, seams, or starts that may impair its structural integrity or function. Color or other visual characteristics indigenous to the particular material and adequately demonstrated in the sampling/submittal process will be accepted provided they do not compromise the structural or durability capabilities of the material. Texture and finish shall be within the range of samples approved by the Engineer. The thickness of all pavers shall be four (4”) inches to five (5”) inches. Other dimensions shall be four (4”) inches to five (5”) inches width to seven (7”) inches to eleven (11”) inches length.
- B. For all paver locations/applications furnish “Chelmsford Grey” or similar. The color shall be light gray with charcoal colored flecks of a medium to course texture indicative of the type and a thermal finish.
- C. The required number of the pavers shall be determined by the Contractor based on the square footage identified on the plans for the particular items. The paving pattern details on the drawings are presented to identify the general concepts. Final paving solutions are the responsibility of the Contractor and subject to the approval of the Engineer.

- D. Fabrication of all pavers shall be in accordance with the National Building Granite Quarries Association to the tolerance typical for the dimensions specified.
- E. Pavers shall be furnished in the following dimensions:
  - 1. Typical Paver: thickness of all pavers shall be four (4") inches to five (5") inches. Other dimensions shall be four (4") inches to five (5") inches width to seven (7") inches to eleven (11") inches length.

2.03 MORTAR SETTING BED AND CEMENT CONCRETE PAD:

- A. The mortar and cement concrete for use as a base below granite pavers shall be a single pour in accordance with Section 03 30 00 CAST-INPLACE CONCRETE..

PART 3 – EXECUTION

3.01 MORTAR SETTING BED AND CEMENT CONCRETE PAD :

- A. After the concrete and gravel bases have been installed to the appropriate grades, place mortar to achieve the specified depths.

3.02 INSTALL PAVERS:

- A. All pavers are to be set with one-half ( $\frac{1}{2}$ " ) inch clearance and the specified pattern alignment must be maintained. Adjust paver alignment so that no less than 1/3 of a full size paver will be used at any point. All adjustment of pavers to the patterning will be done with a special hydraulic masonry saw, or otherwise stipulated by the manufacturer and agreed to by the Engineer.
- B. Adjust any surface variations at this time and reinstall those areas so affected and re-vibrate.
- C. Rake mortar joints between the pavers as many times as necessary to fill any voids.
- D. All areas on which water stands or which are found to be excessively uneven shall be promptly brought to the correct grade and line.
- E. No pavers shall be laid in inclement weather or when the temperature is 36°F, and dropping, nor shall any work be done on rising temperatures until the temperature reaches 32°F, and subgrade is free of frost.
- F. The final surface elevation shall be adjusted so that when the pavers are placed, the top surface of the pavers will be at the required finished grade. A maximum one-half ( $\frac{1}{2}$ " )inch deviation when tested with a twelve-foot straight edge shall be allowable.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The bid price for granite cobblestone pavers and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including all bedding stone materials, forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

- A. The bid price for all granite cobblestone pavers 485.10 and all related work shall be included in unit bid pricing and all other incidental work necessary for final completion of the items as specified.

485.10	Granite Cobblestone Pavers	Square Foot
--------	----------------------------	-------------

END OF SECTION

NOT FOR BIDDING

SECTION 32 16 00

GRANITE CURBING

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section covers furnishing and installation of granite curb where required, as shown on the Drawings and herein specified.
- B. This section also covers replacement of curbing removed during construction.

1.02 RELATED WORK:

- A. Required earthwork is specified under Section 31 00 00 EARTHWORK.

1.03 REFERENCES:

The following standards form a part of these specifications, as referenced:

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings, showing dimensions of typical curb sections.

PART 2 - PRODUCTS

2.01 GRANITE CURBING:

- A. Granite curbing shall be Type VA4 conforming to Subsection M9.04.1 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.
- B. Special shapes and corners shall be supplied as required.

PART 3 - EXECUTION

3.01 GRANITE CURBING:

- A. Removal and resetting and/or removal and replacing of granite curbing shall be in accordance with Section 580 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges. The curbing shall have a 6-inch reveal unless otherwise required by the Engineer.

- B. Except as modified herein or on the drawings, installation of curbing shall conform to Section 500 of the MassDOT Standard Specifications for Highways and Bridges.
- C. Excavation shall be made to the bottom of the 6-inch concrete base below the curbing, the subgrade being sufficiently wide to permit thorough tamping. The subgrade base shall be compacted to a firm, even surface and shall be approved by the Engineer.
- D. The curbing shall be set on edge and settled into place with a heavy wooden hand-rammer, to the line and grade required, straight and true for the full depth. The joints of the stone curbing shall be pointed with mortar for the full depth of the curbing. At approximately 50-foot intervals, a 1/2-inch joint shall not be filled with mortar but left free for expansion. The ends of the stone curbing at driveways and intersections shall be cut at a bevel or rounded as required by the Engineer.
- E. The trench for the stone curbing shall be backfilled with approved concrete.

PART 4 – COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. The work under this item shall conform to the relevant provisions of Section 501 of the Standard Specifications and the following:
- B. Saw cutting, excavation, disposal of excavated material, and concrete for setting and resetting all curbing and edging items shall be considered incidental to and included in each payment item. Concrete for curb and edging items shall be placed in accordance with the detail provided in the drawings and as directed by engineer.
- C. All reset and new curbing and edging shall be adjusted and set on a 6"x18" compacted dense graded crushed stone base. Existing material can be reused if determined to be acceptable by the Engineer.

4.02 PAYMENT ITEMS

- A. The bid price for Granite Curb Type VA4-Straight, Granite Curb Type VA4-Radius, and Curb Removed and Reset, and all related work shall be included in unit bid pricing and all other incidental work necessary for final completion of the items as specified.

504.00	Granite Curb Type VA4-Straight	Linear Foot
504.10	Granite Curb Type VA4-Radius	Linear Foot
504.20	Curb Removed and Reset	Linear Foot

END OF SECTION

## SECTION 32 18 00

### POURED -IN-PLACE RUBBER SAFETY SURFACING

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and transportation required for the placement of poured-in-place rubber play surfacing throughout the playground. The surfacing shall be placed at all locations identified on the Contract Drawings to the indicated grades. Layout and design of surfacing thickness, color and pattern is to be installed per the contract drawings.

##### 1.02 SUBMITTALS

- A. In accordance with Section 01 33 23, SUBMITTALS, submit manufacturer's specification and detail sheets for all materials to be utilized under this section.
- B. Field layout of color and pattern of surfacing to be approved by Engineer prior to installation.
- C. Provide poured-in-place surface color samples for final color selection approval as required by the Engineer.
- D. Post installation testing shall be provided at the Contractors expense. An independent testing agency shall test the completed surface to ensure a Head Injury Criteria (HIC) of less than 800 and a GMax less than 150. The contractor is responsible for removal and reinstallation of the poured in place surfacing if the test results do not conform with the required testing criteria.
- E. Submit copies of testing procedures and results performed by an independent testing source, which demonstrates compliance with CSPS and ASTM guidelines. Supplier must certify that safety surface depth provided exceeds ASTM and ADA requirements as referenced within this specification and U.S. Consumer Product Safety Commission's Technical Guidelines for:
  1. "Recommendations – When tested in accordance with suggested test method in ASTM F355 procedure C; A Surface should not impact a peak acceleration in excess if 200G's to an instrumented ANSI head-form dropped on a surface from the maximum fall height as delineated in the standard specification for Impact Attenuation if surface Systems Under and Around Playground Equipment Designated F1292-91." Note that per this specification, an HIC of less than 800 is required.

2. The surface shall meet the Head Injury Criteria (HIC) of less than 1000. Lab test shall be performed at (3) temperatures per ASTM F1292/F355E over concrete. Testing over aggregate will not be allowed. Note that per this specification, an HIC of less than 800 is required.
- F. Supplier must provide copies of testing procedures and results (g-max and HIC score results) performed by independent testing source(s) which demonstrates compliance with C.P.S.C. Guidelines as referenced. Contractor shall submit test results for review and approval by the owner.
- G. Supplier must provide complete installation instructions.
- H. A certificate of insurance must be provided by the supplier which shall provide a coverage of products liability with limit of liability not less than \$1,000,000.00

### 1.03 QUALIFICATIONS

- A. For installation of the poured-in-place play surface the contractor shall have a minimum of five (5) years' experience provide evidence of successful completion of twenty-five (25) like surfaces installed during the past five (5) years with names of clients and phone numbers.
- B. Certification by the manufacturer that the installer is an approved applicator of the specific playground surfacing system.

### 1.04 REFERENCE STANDARDS AND SPECIFICATIONS

- A. Handbook for Public Playground Safety. U. S. Consumer Product Safety Commission Publication No. 325
- B. American Society for Testing and Materials (ASTM):
  - a. ASTM F1487-17 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.
  - b. ASTM D412 Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - c. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
  - d. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
  - e. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
  - f. ASTM E303 Standard Test Method for Measuring Surface Frictional

Properties Using the British Pendulum Tester.

- g. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
- h. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

## PART 2 - MATERIALS

### 2.01 POURED-IN-PLACE-PLAY SURFACE

A. Poured-In-Place surface shall be:

- 1. "Playbound" poured-in place by Surface America, PO Box 157, Williamsville, NY 14231 as represented by ME O'Brien & Sons, Inc. 17 Trotter Drive, Medway, MA 02053, (508) 539-4200. [www.surfaceamerica.com](http://www.surfaceamerica.com).
- 2. "Everguard" poured-in-place rubber as manufactured by Evergreen Surfacing Inc., 550 Main Street, Westbury, NY 11590, (516) 864-0550, [www.everguardsurfacing.com](http://www.everguardsurfacing.com).
- 3. "Perma-Play" by Pro-Techs Surfacing, LLC. 2072 Coon Road, Akron, OH 4432, (303) 576-6058. <https://pro-techssurfacing.com/>.
- 4. Or Approved Equal.

Color Mix shall be selected by the Engineer.

B. Composition and materials:

- 1. Material shall be a two layer rubber-polyurethane playground surfacing system. The base mat shall consist of 100% post-consumer recycled shredded SBR (styrene butadiene rubber, an elastomeric copolymer) and a polyurethane binder. The top surface shall be EPDM (ethylene propylene diene monomer, an elastomer) and a high grade polyurethane.
- 2. The system shall be designed, manufactured and installed to have the following physical and chemical properties
  - a. Shock Attenuation (ASTM F1292). Exceed this criteria:
    - i. Gmax: Less than 150
    - ii. Head Injury Criteria: Less than 800
  - b. Flammability (ASTM D2859): Pass
  - c. Tensile Strength (ASTM D412): exceed 17 psi

- d. Tear Resistance (ASTM D624): exceed 6 lbs/force/inch
  - e. Water Permeability (Porosity): min 10 gallons/minute/square foot
  - f. Accessibility: Comply with requirements of ASTM F1951
3. Primer: Provide manufacturer's recommended polyurethane primer.
  4. Base Course:
    - a. Base course mix shall be a blend of 100% recycled SBR and polyurethane primer mixed in proportions by weight per manufacturers recommendations.
    - b. Thickness: SBR base coarse thickness shall be determined by the manufacturer to comply with ASTM F1292 requirements for critical fall height of the final approved play equipment. Equipment shown on plans includes components of varying fall heights. Thickness of the base course shall vary accordingly. Minimum thicknesses of the finished surfacing are as indicated on the drawings.
    - c. Formulation components shall be a blend of strand and granular materials.
  5. The wearing course mix shall be a blend of EPDM rubber and polyurethane binder as recommended by the manufacturer.
    - a. Thickness shall be ½ in. thick minimum, 5/8" thick maximum.
    - b. Color: The surface pattern is comprised of three (3) separate colors. Color shall be as selected by the Owner from manufacturer's standard available colors.

## PART 3 - EXECUTION

### 3.01 PROCEDURES

A. Comply with the instructions and recommendations of the playground surfacing manufacturer.

B. In areas installed over dense graded crushed stone base, the area shall be confirmed for planarity and shall be proof compacted prior to installing poured in place surfacing. Soil removal and subbase placement shall account for the varying base mat depths required, and shall result in a uniform completed surface. Final surfacing shall conform to the lines and grades as shown on the contract

drawings.

C. In areas Poured in Place surfacing will be installed over concrete; the concrete shall cure for a minimum of 14 days prior to installing poured in place surfacing.

D. Obtain approval of final prepared subsurface conditions from the Engineer and the manufacturer's representative days prior to installing poured in place surfacing.

E. Adhere to manufacturers recommendations for protection of all component materials. Work shall not proceed under weather conditions prohibited by the manufacturer. Materials shall be protected from temperature extremes per the manufacturer's recommendations, generally not less than 40 degrees F and not greater than 90 degrees F, unless otherwise specified by the manufacturer. Work shall not proceed under rain or in frozen conditions.

F. Using a brush or short nap roller, a primer, as recommended by the manufacturer, shall be applied to the perimeter surfaces, including directly adjacent surfaces surrounding the poured in place perimeter, playground equipment support legs, and other objects that will be in contact with the surfacing system, at a rate as suggested by the manufacturers requirements.

G. The Base Mat for the Poured-in-Place Play Surface shall be installed in accordance with the manufacturer's instructions. The base mat shall be installed using screed sticks, guide poles, and hand trowels to install a uniformly planar surface, The Base Mat shall be installed to the minimum thickness necessary to provide the required absorbency for the maximum potential fall from the proposed play equipment.

H. At play lot edges, place a board between the end of the poured-in-place base pour and the concrete edge and remove the board after the base has sufficiently cured. Pour the top coat surface of poured-in-place surfacing and allow material to fill the void created by the board.

H. The wearing course surface shall be installed following installation of the Base Mat, in accordance with the manufacturer's instructions. The wearing course shall be installed using a hand trowel and a consistent density as recommended by the manufacturer to a nominal thickness of 1/2".

I. Allow completed surface to cure for a minimum of 48 hours. Curing time may vary by temperature and humidity. At the completion of the minimum curing time, verify the completed surface is sufficiently dry and firm to allow foot traffic and use without damage to the completed surface. The contractor shall protect curing surfaces and is responsible for ensuring that no foot traffic is allowed on the surface before the curing is complete.

J. Post-installation testing shall be provided at the Contractors expense. An independent testing agency shall test the completed surface to ensure a Head Injury Criteria (HIC) of less than 800 and a GMax less than 150. The contractor is responsible

for removal and reinstallation of the poured in place surfacing if the test results do not conform to the required testing criteria.

K. Any tests of materials shall be as ordered by the Engineer and paid for by the Contractor regardless of results.

L. The final installed poured in place surface shall be protected by the Contractor from damage resulting from any subsequent construction activity on the site.

#### PART 4 – GUARANTEE AND ACCEPTANCE/LIABILITY

4.01 All structural elements safety surface shall be guaranteed against failure or defect during normal use and operation for the entire warranty period as established by the manufacturer, but shall be for a minimum of five (5) years from the date of installation.

4.02 Safety surfacing shall be free of defects due to workmanship or material for a minimum of five (5) years from date of installation. Any defective elements shall be replaced in part or whole by the Contractor at no cost to the Owner.

4.03 The Contractor and the manufacturer shall hold the Owner and Engineer harmless from any and all damages or liability resulting from negligent acts and omissions on the part of the Contractor or manufacturer, or resulting from defective parts, or improper resilient safety surface installation. Contractor shall be responsible for securing site from pedestrian traffic or vandalism while poured-in-place safety surface cures.

4.04 The Contractor is responsible for securing an independent third-party Certified Playground Safety Inspector to ensure ASTM and CPSC compliance. A certificate of compliance will be issued to the Owner prior to final inspection including testing for HIC and Gmax on safety surfacing before the play area is opened.

#### PART 5 – COMPENSATION

##### 5.01 METHOD OF MEASUREMENT

A. Poured-in-Place Rubber Resilient Safety Surfacing shall be paid for by the contract unit price per lump sum, complete in place. Minimum thicknesses shall be as indicated on the contract drawings, which exceed the standard manufacturer's minimum thicknesses. Price shall be full compensation for all, equipment, materials, and labor necessary to complete the work as specified. Certification from the Contractor showing compliance with the Contract Documents and conformance with material, environmental, and safety standards and regulations is required prior to final payment. Excavation, dense graded crushed stone base and drainage are covered under separate payment items.

5.02 PAYMENT ITEMS

- A. Poured-in-place Rubber Safety Surfacing shall be paid for by the contract unit price per lump sum, complete in place.

723.00	Poured-in-Place Rubber Safety Surfacing	Lump Sum
--------	---	----------

END OF SECTION

NOT FOR BIDDING

SECTION 32 18 23.13

INFIELD MIX SURFACING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The Contractor shall furnish and construct infield mix surfaces to the lines and grades shown on the plans as specified in this Section, including the provision of all materials, labor, tools, equipment and transportation necessary to complete the work.
- B. In advance of installing the new infield mix surfacing, the Contractor shall be responsible for removal of existing materials. Excavated materials may be reused as stipulated on the construction drawings and specifications.

1.02 SUBMITTALS:

- A. Two (2) weeks prior to ordering the material, the Contractor shall submit to the Engineer, a representative sample of the material to be used, and a copy of a soils analysis from an accredited laboratory classifying the mixture and tabulating the sieve analysis. Mixture shall be 100% free of stones of any size, foreign matter and debris.
- B. If the mixture is disapproved by the Engineer, the Contractor shall continue to obtain other sources of material and have them tested, at his own cost, until the Engineer approves the mixture to be utilized for the infield and warning track.

1.03 RELATED WORK:

- A. Shop Drawings: Submit shop drawings in accordance with Division 1 requirements.
- B. Section 31 00 00, EARTHWORK

PART 2 - PRODUCTS

2.01 INFIELD MIX:

- A. The clay infield mixture shall be DuraEdge Classic by DuraEdge Products Inc., Grove City, PA , or an approved equal product.
- B. Infield mix shall contain 70-75% sand.

C. The infield mix shall be top dressed and blended after it has been graded and rolled. The top dressed product shall be DuraEdge Pro-Slide Professional Red as manufactured by DuraEdge Products or Turface Pro-league Red as manufactured by Read Custom Soils, Canton, MA 02021, or approved equal

D. The infield mix shall meet the following:

Sand Sieve Analysis	
Hydrometer Results	
Sand =	72%
Silt =	12%
Clay=	16%

Infield mix shall be clean, dry clay mixed with washed mason-type sand resulting in a weed-free mixture that is reddish brown in color having a yield of 1.35 tons per cubic yard when placed loose or 1.5 tons per cubic yard when compacted 85%-90% on a Standard Proctor Test (ASTM D 689-07) and meet all the performance and execution specifications of DuraEdge Classic Infield Mix.

E. Pitching mound and batter's box surfaces shall be DuraPitch Premium as manufactured by DuraEdge Products or HILLTOPPER Mound Clay as manufactured by Read Custom Soils, Canton, MA or approved equal.

F. Provide and install field bricks as shown on the Drawings. Field Bricks shall be DuraEdge Mound Bricks as manufactured by DuraEdge Products or Mar-Co Field Bricks by Mar-Co Clay Products of Bright, Ontario, Canada or approved equal. Bricks shall be comprised of condensed clay material and be 4"x8"x2.5" in size.

### PART 3 - EXECUTION

#### 3.01 INSTALL, ROLL AND COMPACT INFIELD MIX:

A. Upon approval existing surfaces the Contractor shall install, roll and compact the infield mix specified to a compacted finished depth of four (4) inches. Complete installation of surfaces in conformance with the manufacturer's recommendations or as otherwise required by the Engineer.

B. The edges of the infield shall meet the grades of adjacent turf and other areas. No ridges or depressions will be permitted at edges. Compaction factor is approximately 10%-15% per 1" of material.

C. HILLTOPPER (or approved equal)

1. Pitching Area

a. Set pitching rubber

- a. Excavate to a 4-5-inch depth in a 3' wide x 10' long area, measuring one foot behind the rubber and 9-feet in front of the rubber.
- b. Install Field Bricks as indicated in Drawings.
- c. Apply specified product, or approved equal, and cover with specified infield mix. (approximate amount needed is 35/50 lb. bags)
- d. Fill in back and sides sloping to the edge of the circle, and topdress with approved infield mix.

2. Homeplate Area

- a. Set homeplate with field bricks and square it with the pitching rubber.
- b. Excavate an 8' wide x 13' long area at a 4-5 inch depth
- c. Lightly moisten area if soil is dry
- d. Install Field Bricks as indicated in Drawings
- e. Place specified product, or approved equal in excavated areas in 1 1/2" to 2-inch lifts. Tamp to compact and firm. Repeat as necessary to meet finish grades. (approximate amount needed is 45/50 lb. bags)
- f. Cover area with approved infield mix.

3.02 COMPLETION:

- A. Upon completion, the Contractor shall monitor, until final completion, the constructed infield to assure no migration between the proposed infield and surrounding topsoil. In any instance where topsoil migrated into the infield basepaths, the Contractor must screen infield and remove topsoil.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. Infield Mix Surfacing shall be measured by the cubic yard compacted and complete in place, as accepted by the Engineer, and not as unloaded from the delivery truck.

4.02 PAYMENT ITEMS

- A. Infield Mix Surfacing shall be paid for at the contract unit price per cubic yard, which price shall be full compensation for all labor, material, equipment, and miscellaneous items necessary to complete the work in a satisfactory manner.

751.30	Infield Mix Surfacing	Cubic Yard
--------	-----------------------	------------

END OF SECTION

## SECTION 32 18 25

### WOOD FIBER SAFETY SURFACING

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to perform all installation, of safety surfacing to meet project requirements and as shown on the Drawings and as specified herein.
- B. The work shall include, but not necessarily be limited to, preparation of subbase and base materials with wear mat and wood fiber safety surfacing materials.

##### 1.02 RELATED WORK

- A. Earthwork is included in Section 31 00 00
- B. Playground Equipment is included in Section 11 68 13
- C. Geotextile Fabric is included in 31 05 19.

##### 1.03 SUBMITTALS

- A. Submit, in accordance with Submittals, within 5 days after award of Contract, technical product literature for all commercial products, including wood fiber surfacing and wear mat surfacing.

##### 1.04 REFERENCE SPECIFICATIONS

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements the most restrictive requirement shall govern.
  - 1. Massachusetts Department of Transportation Standard Specifications for Highways and Bridges, latest edition.
  - 2. Massachusetts Architectural Access Board (MAAB) regulations.
  - 3. Handbook for Public Playground Safety. U. S. Consumer Product Safety Commission Publication No. 325
  - 4. American Society for Testing and Materials (ASTM):
    - a. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.

- b. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- c. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
- d. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
- e. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
- f. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
- g. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- h. ASTM F2075-04 Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment

#### 1.05 QUALITY ASSURANCE

- A. Qualifications: Utilize an installer approved and trained by the manufacturer of the playground surfacing system, having experience with other projects of the scope and scale of the work described in this section.
- B. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.
- C. International Play Equipment Manufacturers Association (IPEMA) certified.

#### PART 2 PRODUCTS

##### 2.01 GENERAL

- A. All playground surfacing materials shall be from the same manufacturer.

##### 2.02 WOOD FIBER SAFETY SURFACING

- A. Playground wood fiber safety surfacing shall be Woodcarpet Play Surfacing as manufactured by Zaeger Brothers, Inc. 4000 East Harrisburg Pike Middletown, PA 17057 tel no 800-346-8524, or equal.
- B. Wood fiber mulch shall be composed of randomly sized, elongated, shredded fibrous wood materials free of leaves, bark, soil or other contaminants. Shredded hardwoods and selected softwoods shall have minimum moisture retaining properties with 98% of the fiber dimensions not exceeding 1-3/4" long and 1" wide. The product shall meet requirements of ASTM F1292

C. Geotextile stabilization fabric shall be as specified in 02200.

### 2.03 SWING MATS

- A. Resilient rubber mats shall be “Beveled Dynacushion Wear Mat” #R20B4872, 48” wide x 72” long x 2” thick, as manufactured by Dynacushion, Pierceton, IN 46562, tel: 574-594-3002, or approved equal. Color shall be black.
- B. Wear mat surfacing shall be a commercially manufactured product specifically designed to stabilize, and limit displacement of the wood fiber safety surface, in the higher traffic areas, or kick out areas, of the playground.
- C. Furnish documentation for 5-year warranty as provided by the manufacturer.

### 2.04 GEOTEXTILE FABRIC

- A. Geotextile filter fabric, as shall be non-woven Mirafi 140N by Mirafi Inc. or equal as approved by the Engineer. Fabric shall meet or exceed the following standards:

#### Mechanical Properties:

- |                     |            |          |
|---------------------|------------|----------|
| a. Grab Tensile     | ASTM D4632 | 120 lbs. |
| b. Trapezoidal Tear | ASTM D4355 | 50 lbs   |
| c. Puncture         | ASTM D4833 | 65 lbs   |

#### Hydraulic Properties:

- |                 |            |                             |
|-----------------|------------|-----------------------------|
| a. Permittivity | ASTM D4491 | 1.8 sec <sup>-1</sup>       |
| b. Flow Rate    | ASTM D4491 | 135 gal/min/ft <sup>2</sup> |

### 2.05 ¾” DRAINAGE STONE

- A. ¾” drainage stone for beneath the wood fiber safety surfacing shall be ¾” fine aggregate per MASSDOT Table M4.02.02-5:

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, concrete work, playground equipment installation and other relevant work, has been completed.
- B. Prepare the compacted subgrade to meet the general grades of the swing area. Area shall be planar with no protruding rock.

- C. Install  $\frac{3}{4}$ " drainage stone as shown on the drawings to 6-inch uniform depth.
- D. Install the geotextile fabric as shown on the drawings. Install with minimum 2-ft overlap.
- E. Install wood fiber material as shown on the Drawings and as recommended by the manufacturer to minimum compacted thickness of 12" or greater if required to meet final finish grade based on subgrade elevation. Final grade of wood fiber material shall be flush with the adjacent grade of the poured in place rubber surfacing and adjacent concrete walkway, after compaction and settling. Contractor shall be responsible for adding wood fiber material to meet this final grade at acceptance.
- F. Comply with the instructions and recommendations of the playground wear mat manufacturer.
1. Edges of wear mat shall be installed so that they slope beneath the surrounding finished grades of wood fiber resilient safety surfacing in a manner recommended by the manufacturer.
  2. Prior to installation, confirm with the Engineer and Owner that the wear mat will be installed with rough or smooth side up, as approved.
- G. Site Verification of Conditions: Engineer shall verify that substrate conditions are suitable for installation of the playground surfacing system.
- H. Contractor shall not proceed with installation until unsuitable conditions are corrected.
- I. Protect the installed playground surface materials from damage resulting from subsequent construction activity on the site.
- J. Upon completion of installation, obtain certification from manufacturer that play surface materials are installed in accordance with manufacturer's instructions.

PART 4 – COMPENSATION

4.01 METHOD OF MEASUREMENT

- A. Wood Fibar Safety Surfacing shall be paid for by the contract unit price per cubic yard, complete in place, including ¾” drainage stone base and geotextile fabric. Minimum thicknesses shall be as indicated on the contract drawings. Price shall be full compensation for all, equipment, materials, and labor necessary to complete the work as specified. Certification from the Contractor showing compliance with the Contract Documents and conformance with material, environmental, and safety standards and regulations is required prior to final payment. Excavation, washed stone base base and geotextile fabric are covered under separate payment items.
- B. Swing Mats shall be measured by the contract unit price per each complete in place.

4.02 PAYMENT ITEMS

- A. Wood Fibar Safety Surfacing shall be paid for by the contract unit price per cubic yard, compacted and complete in place, including ¾” drainage stone base and geotextile fabric.
- B. Swing Mats shall paid for by the contract unit price per each complete in place.

721.35	Swing Mats at 5-12 Play Structure	Each
724.00	Fibar at 5-12 Play Structure	Square Yard

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCE

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall provide all labor, materials and appurtenances necessary for the installation of a complete chain link fence systems and shall meet or exceed the standards of the Chain Link Fence Manufacturer's Institute, except as otherwise indicated on the Drawings and as herein specified.
- B. The manufacturer shall supply a total vinyl PVC coated chain link fence system of the height, fabric type, fabric gauge, framework strength, color and coating specifications contained herein. All fence materials unless specifically stated otherwise, shall be extrusion bonded polyvinyl chloride (PVC) coated.

1.02 RELATED WORK:

Section 03 30 00, Cast-In Place-Concrete  
Section 03 05 00, Field Concrete

1.03 REFERENCES:

- A. The following standards form a part of this specification as referenced.

American Society for Testing and Materials (ASTM)

ASTM	A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM	A121	Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM	A392	Zinc Coated Steel Chain Link Fence Fabric
ASTM	A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	F567	Installation of Chain Link Fence
ASTM	F626	Fence Fittings
ASTM	F668	Specification for Poly Vinyl Chloride (PVC) - Coated Steel Chain-Link Fence Fabric.

ASTM F1043 Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

Federal Specifications (FS)

FS RR-F-191 Fencing Wire and Post, Metal (and Gates, Chain-Link Fabric, and Accessories)

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature of the materials specified herein.
- B. Shop drawings of the fence, color shall be BLACK.

1.05 WARRANTY:

- A. Prior to installation, the fence contractor shall provide the fence manufacturer's notarized certification that all components are fully warranted by the manufacturer for 15 years against rust and corrosion.

PART 2 - PRODUCTS – BLACK PVC COATED

2.01 STEEL FRAMEWORK (GENERAL):

- A. All posts, gate frames, braces and horizontal rails shall be Type I round post, hot dipped galvanized with a minimum average coating of 1.8 oz/ft<sup>2</sup>, meeting ASTM F 1083 for Standard Weight Galvanized Pipe and shall be of the sizes and weights given below or other approved equivalent sections of steel having a minimum tensile strength of 50,000 pounds per square inch and a minimum yield strength of 25,000 pounds per square inch.
- B. Minimum cross-section dimensions for line posts of specified shape shall be: either 2-3/8-inch (2.375-inch) outside diameter steel pipe weighing not less than 3.65 pounds per linear foot; or 2.25 by 1.95 by 9/64-inch steel H section weighing not less than 4.10 pounds per linear foot.
- C. Minimum cross-section dimensions for end, corner, and pull posts of specified shape shall be: 2-7/8-in. (2.875-in.) outside diameter steel pipe weighing not less than 5.79 pounds per linear foot; 2-1/2 by 2-1/2-inch square tubes weighing not less than 5.70 pounds per linear foot; or 3-1/2 by 3-1/2-inch rolled-formed sections weighing not less than 8.14 pounds per linear foot.
- D. All tubular and pipe posts shall be capped to prevent precipitation from entering the post, unless a barbed wire extension arm assembly acts as a cap.

- E. Posts, other fence framework, accessories, fittings, and miscellaneous items shall be galvanized and have an extrusion bonded polyvinyl chloride (PVC) coating. The PVC coating on posts shall be a minimum of 10 mils thick. Framework color coating shall match fabric. Galvanized finish shall have not less than the following weight of zinc per square foot:
  - 1. Pipe: 1.8 oz, complying with ASTM A53.
  - 2. H-sections and square tubing: 2.0 oz, complying with ASTM A123.
  - 3. Hardware and accessories: Comply with Table I of ASTM A153.
- F. For top railings and top, middle and bottom braces between terminal posts and adjacent line posts, the minimum cross-section dimensions for the specified shall be 1-5/8-inch outside diameter steel pipe weighing not less than 2.26 pounds per linear foot.
- G. Diagonal truss braces between terminal and adjacent line posts and for gauge framework shall not be less than either 3/8-inch diameter steel rod or double No. 9 AWG steel wire stranded together.
- H. Fittings shall be galvanized press steel, malleable or cast steel as specified in ASTM F626 and Federal Specification RR-F-191.
- I. Where posts do not have provisions for weaving fence fabric to posts, tension or stretcher bars for attaching fabric to terminal posts such as end, corner, gauge and pull posts, shall be flat bar with nominal dimensions no less than 3/16 by 3/4-inch for use with fence fabric having mesh larger than 1-inch, of a length equal to full height of the fence fabric, and used with bar bands, bolts and nuts. Bar bands shall be no thinner than No. 11 gauge coated sheet steel. Bolt diameters shall be not less than 3/8-inch for use with bar bands.
- J. Ties for fastening fence fabric to line posts and rails shall be not less than No. 9 AWG steel wire with the same coating as the fence fabric or other approved bands.

## 2.02 CHAIN LINK FENCE FABRIC – PVC COATED:

- A. Vinyl coated fabric shall be supplied with Class 2A (extrusion bonded) vinyl coating. The coating shall be applied over a galvanized steel core wire and be manufactured in accordance with Federal Specifications RR-F-191 and ASTM F668. The PVC coating shall have a final coating thickness of 0.015-0.025-inch and a core wire size diameter of 0.148-inch.
- B. Wire size: The finished wire size shall be 6 gauge and 9 gauge per the Contract Drawings.
- C. Height and Mesh Size: The fabric height shall be eight (8') feet high with a mesh size of 2-inches, unless otherwise noted on the Contract Drawings.
- C. Selvage: Top edge and bottom edge of the fabric shall be twisted.

- E. The tension wires shall either be No. 7 gauge steel-core wire. PVC coating shall conform to ASTM F668 Class 2a or 2b. Also, a 7-strand galvanized steel ½-inch guy wire with PVC coating may be supplied.
- F. The polyvinyl chloride (PVC) coating shall be free of voids, shall be dense and impervious, shall be of a plasticized or epoxy modified, high specific gravity polyvinyl chloride with high resistance to tear and suitable hardness. The PVC coating shall not support combustion and shall withstand an accelerated aging and weathering test a minimum of 2,000 hours at 145 degrees F with ultraviolet and salt spray without cracking or peeling the PVC coating and without corrosion of the base metal. The PVC coating shall withstand a mandrel bending test of ten times the thickness of the base metal at minus 25 degrees F without cracking. The PVC coating shall not separate from the metal or shrink. Color used in PVC coating shall be stabilized so that it will not fade under long exposure to sunlight. Color shall be BLACK or approved by the Engineer as selected from the manufacturer's standard colors.
- G. Hog rings shall be 11 gauge steel core, PVC coated.

### PART 3 - EXECUTION

#### 3.01 ERECTION:

- A. The fence and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer and these specifications. These specifications shall take precedence over the recommendations of the manufacturer if any discrepancy exists between them.
- B. Maximum post spacing shall be 10-feet. Post spacing shall be uniform and posts shall be plumb. All end, corner, pull and gate posts must be set in concrete. Line posts may be secured by driven blades.
- C. Concrete post foundations in earth shall be concrete cylinders with a minimum diameter of 12-inches, crowned at grade to shed water, and shall extend not less than 3-feet into the ground. Posts shall be set in the full depth of the foundations except for 3-inches of concrete under the posts. If foundation holes are excavated in unsuitable material, the Engineer shall be notified for determination of suitable construction precautions.
- D. If solid rock is encountered without an overburden of soil, poles shall be set into the rock a minimum depth of 12-inches for line posts and 18-inches for terminal posts, such as end, corner, gate and pull posts, and grouted into solid rock with the post hole diameter a minimum of one inch larger than that of the post.
- E. Where solid rock is covered by an overburden of soil or loose rock, the posts shall be set into the rock as specified above. The total pole setting depth shall not exceed the depths required for setting in earth.

- F. Any change in direction of fence line of 30 degrees or more shall be considered as a corner. Pull posts shall be used at all abrupt changes in grade. Maximum area of unbraced fence shall not exceed 1,500 square feet.
- G. Terminal posts such as end, corner, gate and pull posts shall be braced to the adjacent post(s) with horizontal rail braces used as compression members and diagonal truss braces with truss tighteners for tension members, with the lower ends at the terminal post in each panel of fence framework as indicated in detail on drawings.
- H. The top railing shall pass through intermediate or line post tops, form a continuous brace with all splices made by approved couplings, and shall be fastened to terminal posts.
- I. Fabric shall be stretched taut, with the bottom edge following the finished grade, and shall be a continuous mesh between terminal posts. Each span of fabric shall be attached independently at terminal posts. Where terminal posts do not have provisions for weaving fabric to posts, stretcher bars shall be placed through the end weave of the fabric and secured to the post with bar bands spaced not more than 15-inches apart on the post.
- J. Fabric shall be attached with ties to line posts at intervals of not more than 12-inches (and to the top railing and braces at intervals not exceeding 18-inches).
- K. The bottom railing shall be interlaced in the weave of the fabric, pulled taut and fastened to terminal posts.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. Chain Link Fence at heights as indicated on the drawings will be will be paid for by the contract unit price per linear foot, as measured parallel to the ground complete in place exclusive of openings from outside to outside of end posts, which price shall be full compensation for all line and terminal posts, fabric, top, intermediate, and bottom rails, fasteners, clips, excavation, and all labor, materials and equipment necessary to complete the work in a satisfactory manner as specified herein and as shown on the drawings.
- B Softball Chain Link Backstop will be paid for at the contract unit price per each, complete in place, which price shall be full compensation for all posts, fabric, top, intermediate, and bottom rails, fasteners, clips, excavation, concrete footings and all labor, materials and equipment necessary to complete the work in a satisfactory manner as specified herein and as shown on the drawings.

4.02 PAYMENT ITEMS

644.20	42-inch Chain Link Fence	Linear Foot
644.30	48-inch Chain Link Fence	Linear Foot
644.40	72-inch Chain Link Fence	Linear Foot
644.50	78-inch Chain Link Fence	Linear Foot
644.60	96-inch Chain Link Fence	Linear Foot
644.70	Softball Chain Link Backstop	EA

END OF SECTION

NOT FOR BIDDING

## SECTION 32 84 00

### IRRIGATION SYSTEM

#### PART 1 - GENERAL

##### 1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.
- B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective drawings pertaining to other work.

##### 1.02 WORK TO BE DONE

- A. Work to be done includes furnishing labor, materials, equipment and services required to complete irrigation work indicated on the drawings, as specified herein, or both.
- B. The mechanical point of connection for the irrigation system shall be an existing 3-inch pipe located within the existing manhole.
- C. The electrical point of connection for the irrigation system shall be to the new 120-volt electrical circuit for the controller in the proposed transformer cabinet.
- D. Drawings and specifications must be interpreted and are intended to complement each other. Contractor shall furnish and install parts, which may be required by the drawings and omitted by the specifications, or vice versa, just as though required by both. Should there appear to be discrepancies or question of intent, the Contractor shall refer the matter to the Owner's Representative for decision, and his interpretation shall be final, conclusive and binding.
- E. Necessary changes to the drawings to avoid any obstacles shall be made by the Contractor with the approval of the Owner's Representative.
- F. Trench excavation, backfilling and bedding materials, together with the testing of the completed installation shall be included in this work.
- G. The work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the drawings and specifications. Parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not, or indicated on the drawings, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.

- H. Record Drawings as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this work.

#### 1.03 SCOPE

- A. Irrigation system shown on the drawings and described within these specifications represents a single controller, turf and landscape irrigation system supplied from municipal water. The system is designed for 73 gallons per minute. Minimum 83-psi dynamic pressure at full system flow is required upstream of the meter and backflow preventer.

#### 1.04 RELATED WORK

- A. Carefully examine the Contract Documents for requirements that affect the Work of this Section.
  1. Earthwork: Division 31
  2. Utilities: Division 33
  3. Soils: Section 329115
  4. Planting: 329300
  5. Lawns: 329300

#### 1.05 ORDINANCES, PERMITS AND FEES

- A. Work under this Section shall comply with ordinances and regulations of authorities having jurisdiction.
- B. Obtain and pay for permits, tests and certifications required for the execution of Work under this Section.
- C. Furnish copies of Permits, Certifications and Approval Notices to the Owner's Representative prior to requesting payment.
- D. Include in bid any charges by the Water Department, Utility Company, or other authorities for work done by them.

#### 1.06 EXAMINATION OF CONDITIONS

- A. Be informed of existing conditions on the site before submitting bid, and be fully responsible for carrying out the 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, except those conditions described in the GENERAL CONDITIONS.

## 1.07 QUALITY ASSURANCE

- A. Installer: A firm which has at least five (5) years' experience in work of the type and size required by this Section and which is acceptable to the Owner's Representative.
- B. References: Supply five references for work of this type and size with bid including names and phone numbers of contact person(s).
- C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
  1. American Society for Testing & Materials (ASTM)
    - a. ASTM: D1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
    - b. ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and C1200.
    - c. ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
    - d. ASTM: D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
    - e. ASTM: D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
    - f. ASTM: B43-98 Brass pipe.
    - g. ASTM: B88-99 Seamless Copper Water Tube
    - h. ASTM: B828-00 Soldered Copper Joints.
    - i. ASTM: D2737-99 Polyethylene (PE) Pressure rated tube.
    - j. ASTM: F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  2. National Standard Plumbing Code (NSPC)
  3. National Electric Code (NEC)
  4. National Sanitary Foundation (NSF)
  5. American Society of Agricultural and Biological Engineers (ASABE)
  6. Underwriters Laboratories, Inc. (UL)

7. Occupational Safety and Health Administration (OSHA)
8. American Society of Irrigation Consultants (ASIC)

#### 1.08 TESTS

- A. Observation: Owner's Representative will be on site at various times to ensure the system is being installed according to the specifications and drawings.
- B. Coverage Test: After completion of the system, test the operation of entire system and adjust sprinklers as directed by the Owner's Representative. Demonstrate to the Owner's Representative that irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies of coverage due to deviations from the drawings or where it is obviously inadequate or inappropriate. (See Part 3 - Execution).
- C. Owner's Representative shall be notified 7 days in advance for observations.
- D. During final observation, Contactor shall have two-way communication and sufficient personnel to provide instantaneous communication between the observation area and the controller for the system.

#### 1.09 SUBMITTALS

- A. Provide copies of product specification sheets on proposed equipment to be installed to the Owner's Representative for approval prior to the start of work, in accordance with the parameters of Division-1. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be marked up to show proper nozzles, sizes, flows, etc. Equipment to be included:
  1. Sprinklers
  2. Valves: Manual and Automatic
  3. Controller
  4. Decoders
  5. Valve Boxes
  6. Copper Pipe and Fittings
  7. PVC Pipe and Fittings
  8. Polyethylene Pipe and Fittings
  9. Wire and Connectors

10. Quick Coupling Valves
11. Solar Sync
12. Emitters
13. Deep Drip Stakes
14. Drip Tubing and Accessories
15. Flush Valves
16. Pressure Regulators
17. Filters
18. Grounding Equipment
19. Surge Equipment
20. Master Valve
21. Flow Sensor
22. Air Vacuum Release Valve
23. Water Meter
24. Backflow Prevention Devices
25. Enclosures (Controller and Backflow Prevention Device)
26. Miscellaneous Materials

B. Project Record Documents:

1. Provide and keep up-to-date a complete redlined Record Set of Drawings of the system as the project proceeds. Drawings shall be corrected daily, showing every change from the original drawings and specifications. Record Drawings shall specify and exactly locate sprinkler type; pop up height and nozzle for each sprinkler installed. Each valve box location to be referenced by distance from a minimum of two permanent locations. Controller, solar sync, quick coupling valves, water meter, backflow prevention device and other equipment shall be indicated on the drawings. Wire routing, wire size and splices shall be indicated. Mainline pipe and wire route shall have two (2) distinctly different graphic symbols (line types). This redlined record set of drawings shall be kept at job site and shall be used only as a record set.

2. This redlined set of documents shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. This record set of drawings shall be available for observation and shall be kept in a location designated by Owner's Representative. Should this record set of drawings not be available for review or not be up-to-date at the time of the observation, it will be assumed no work has been completed. Provide copies of the redlined record set of drawings for Owner's Representative review on a monthly basis.
3. Make neat and legible notations on this record set of drawings daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, indicate that equipment in a graphic manner in the location of installation and so as to match the original symbols as indicated in the irrigation legend. Should the equipment be different from that specified, indicate with a new graphic symbol both on the drawings and the irrigation legend. The relocated equipment dimensions and northing and easting coordinates should then be transferred to the appropriate drawing in this record set of drawings at the proper time.
4. On or before the date of final field observation, deliver corrected and completed AutoCAD computer plots of "record drawings" on vellum and AutoCAD electronic files on disk to Owner's Representative as part of contract closeout. Delivery of plots will not relieve the responsibility of furnishing required information that may have been omitted from the prints. Record drawings shall not be marked up design drawings. Record drawings shall be on Contractors title block with installed, not proposed irrigation information.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- A. Store and handle materials in compliance with manufacturer instructions and recommendations. Protect from possible damage. Minimize on-site storage.

#### 1.11 GUARANTEE

- A. Obtain in the Owner's name the standard written manufacturer's guarantee for materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. These guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.
- B. In addition to the manufacturers guarantees the Contractor shall warrant the entire irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.
- C. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.

- D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.
- E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

#### 1.12 COORDINATION

- A. Coordinate work closely with the Owner's Representative to avoid misunderstandings and to efficiently bring the project to completion. Owner's Representative shall be notified as to the start of work, progression and completion, as well as any changes to the drawings before the change is made.
- B. Be responsible for and pay for damage to others' work from workmen or sub-contractors. Repairing of such damage shall be done by whomever originally installed the work, as directed by the Owner's Representative.

#### 1.13 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Include in Bid an allowance for four (4) hours of instruction of Town of Brookline's personnel upon completion of check/test/start-up/adjust operations by a competent operator (Owner's Representative office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).
- B. Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3) three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE CYPRESS STREET PLAYGROUND IRRIGATION SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binders shall be:
  - 1. Table of Contents
  - 2. Written description of Irrigation System.
  - 3. System drawings:
    - a. One (1) copy of the original irrigation plan;
    - b. One (1) copy of the Record Drawing;
    - c. One (1) reproducible of the Record Drawing;
    - d. One (1) copy of the controller valve system wiring diagram
  - 4. Listing of Manufacturers.

5. Manufacturers' data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.
  - a. "APPROVED" submittals of irrigation equipment;
  - b. Operation: User's Manuals
  - c. Maintenance: including complete troubleshooting charts.
  - d. Parts list.
  - e. Names, addresses and telephone numbers of recommended repair and service companies.
6. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
7. Winterization and spring start-up procedures.
8. Guarantee data.

#### 1.14 PROCEDURE

- A. Notify city departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of utilities.
- B. Provide and install temporary support, adequate protection and maintenance of structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Owner's Representative.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. Material overages at the completion of the installation are the property of the Contractor and shall be removed from the site.
- B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and acceptance from the Owner's Representative.

## 2.02 COPPER PIPE AND FITTINGS

- A. Copper pipe shall be Type K, hard tempered ASTM B88.
- B. Copper fitting shall be wrought or cast copper, solder joint type in accordance with ASTM B828-00.
- C. Joints shall be soldered with silver solder ASTM B32, Grade 95TA up to 250 degree using non-corrosive flux.
- D. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

## 2.03 BRASS PIPE AND FITTINGS

- A. Brass pipe shall be 125lb., cast bronze, ground joint pattern, threaded, ASTM B43-98.
- B. Brass fittings shall be cast bronze, screwed, 125lb. Class.

## 2.04 PVC IRRIGATION PIPE

- A. Pipe shall bear the following markings: manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.
- B. Mainline pipe 2-1/2 inches and below, lateral pipe for fields and landscape pipe 1-1/2 inches and larger shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 as manufactured by Ipex, JM Eagle, Silverline or equal.
- C. Mainline pipe 3-inches and above shall be PVC, Class 200, Type 1120, SDR 21, Gasket-Joint PVC, conforming to ASTM No. D1784 as manufactured by Ipex, JM Eagle, Silverline or approved equal.
- D. Pipe insertion mark shall be visible to show the proper depth into spigot.
- E. Pipe sleeves beneath non-soil areas shall be PVC, Class 160 water pipe as manufactured by Ipex, JM Eagle, Silverline or equal. Sleeve size shall be as indicated on the drawings. Minimum sleeve size to be 3-inch.

## 2.05 PVC IRRIGATION FITTINGS

- A. Fittings for solvent weld PVC pipe, 2-1/2 inch and smaller in size, shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears or approved equal.
- B. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.

- C. PVC threaded connections in and out of valves shall be made using Schedule 80 toe nipples and Schedule 40 couplers or socket fittings. Schedule 40 threads will not be approved for installation.
- D. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. Cement shall be medium set not fast (no wet and dry or hot). PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or approved equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-70, Oatey Primer for PVC and CPVC, or approved equal. Clear primers and cements are no acceptable.
- E. Nipples to be schedule 80 PVC.
- F. Fittings for PVC directional changes, pipe reductions and plugs 3- inch and larger in size shall be deep bell push-on gasket joint ductile iron fittings for PVC pipe. Fittings shall be manufactured of ductile iron, grade 70-55-05 in accord with ASTM A536 and gaskets shall meet ASTM F477. Fittings shall be as manufactured by Harrington Corporation - Harco, or approved equal.
- G. For mainline pipe to zone valve / lateral pipe connections, Harrington - Harco or approved equal push-on gasket joint ductile iron service tees shall be used. Saddles, (strap, bolt down or snap) will not be approved for installation.

## 2.06 POLYETHYLENE IRRIGATION PIPE

- A. Lateral piping 1-1/4 inch and smaller in size for other than the athletic fields shall be installed with polyethylene (PE3408) pipe, SDR 15, Class 100, Type III, Grade 3, Class C conforming to ASTM D2239, with a minimum pressure rating of 100 psi as manufactured by Oil Creek or equal.

## 2.07 POLYETHYLENE IRRIGATION FITTINGS

- A. Fittings for polyethylene pipe shall be insert PVC or Nylon type fittings. Fittings shall conform to NSF standards and be attached with two (2) offset dog-eared stainless-steel clamps. Clamps shall be as manufactured by Oetiker or approved equal.
- B. Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage. Fittings shall be per ASTM D2609 as manufactured by Dura, Lasco or Spears.

## 2.08 WIRE CONDUIT

- A. Conduit for wiring beneath non-soil areas shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Carlon, Cresline, JMM or equal.
- B. Sweep ells shall be standard electrical type PVC schedule 40 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.
- C. Conduit for above ground wiring to Solar Sync or controller shall be schedule 40 rigid conduits.
- D. Minimum conduit size shall be 2-inch, but must be sized to handle quantity of irrigation wires passing through it.

## 2.09 SPRAY SPRINKLERS

- A. Full and part circle pop up spray sprinklers shall be pressure regulating (30-psi), plastic construction with ratcheting riser, removable nozzle and check valve. Pop-up height shall be 6 inches for turf and 12 inches for shrubs and where indicated on the drawings.
- B. Nozzle size shall be as indicated on the drawing and in the legend. VAN nozzles shall only be used where a fixed arc nozzle is not available.
- C. Sprinkler shall carry a minimum 3-year exchange warranty against defects. Sprinklers shall be manufactured by Hunter Industries, model PROS-06/12-PRS30-CV or approved equal.

## 2.10 MPROTATOR SPRINKLERS

- A. Full and part circle pop up spray sprinklers with multi-stream rotary nozzles shall be pressure regulating (40-psi), plastic construction with ratcheting riser, removable nozzle and check valve. Nozzle size shall be as indicated on the drawing and in the legend. Pop-up height shall be 6 inches for turf and 12 inches for shrubs and where indicated on the drawings.
- B. Multi-stream rotary nozzles shall be manufactured by Hunter Industries, MP1000 for 14-foot spacing, MP2000 for 18-foot spacing, MP3000 for 25-foot spacing and MPLCS and MPRCS for 4-foot x 30-foot and 5-foot x 15-foot where indicated on the drawings.
- C. Sprinkler shall carry a minimum 3-year exchange warranty against defects. Sprinklers shall be manufactured by Hunter Industries model PROS-06/12-PRS40 or approved equal.

2.11 SMALL/MEDIUM ROTARY SPRINKLERS

- A. Small/medium rotary sprinklers shall be gear-driven, rotary type sprinklers, designed for in-ground installation with integral check valves and in-riser flow shut-off capability. Sprinkler shall be capable of covering a 25-44-foot radius and flow range of 0.9-7.0 gpm at 50-55 pounds per square inch of pressure. Sprinklers shall have a one hundred percent warranty for two years' minimum against defects in workmanship.
- B. Nozzle assembly shall elevate minimum four inches when in operation and retraction shall be achieved by a stainless-steel spring. Riser assembly shall be plastic. A nozzle wiper seal shall be included in the sprinkler for continuous operation under the presence of sand and other foreign material.
- C. Sprinkler parts shall be removable through the top of the unit through the removal of a heavy-duty threaded cap. The sprinkler shall have a three quarter-inch (3/4") IPS water connection on the bottom of the sprinkler.
- D. Sprinklers shall be manufactured by Hunter Industries model I20-04.
- E. Approved Performance Chart (18' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I20-04	50psi	90 Deg.	0.50SR	0.50	18'
Hunter I20-04	50 psi	180 Deg.	1.0SR	1.0	18'
Hunter I20-04	50 psi	360 Deg.	2.0SR	2.0	18'

- F. Approved Performance Chart (35' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I20-04	50 psi	90 Deg.	1.5	1.5	31'
Hunter I20-04	50 psi	180 Deg.	3.0	3.0	38'
Hunter I20-04	50 psi	360 Deg.	6.0	6.0	43'

2.12 LARGE ROTARY SPRINKLERS

- A. Large rotary sprinklers shall be gear-driven, rotary type with drain check valve and stainless-steel riser designed for in-ground installation. The nozzle assembly shall elevate three inches when in operation and retraction shall be achieved by a stainless-steel spring. Check valve shall be capable of holding up to 10 feet of

elevation. Sprinkler shall be capable of covering a 51-58-foot radius and flow range of 10.1 to 14.5 gpm at 50 pounds per square inch of pressure.

- B. Sprinkler parts shall be removable through the top of the unit by removing a heavy-duty threaded cap. The sprinkler shall have a one- inch (1") IPS water connection on the bottom of the sprinkler.
- C. Sprinklers shall be manufactured by Hunter Industries model I25-04-SS or approved equal.
- D. Approved Performance Chart (50' Spacing):

Model	Pressure	Arc	Nozzle	Flow	Radius
Hunter I25-04-SS	50 psi	90 Deg.	10	10.1	51'
Hunter I25-04-SS	50 psi	180/360 Deg.	18	14.5	58'

2.13 ELECTRIC CONTROL VALVES

- A. Electric control valves shall be one, one and one half and 2-inch remote control, diaphragm type, fiberglass or reinforced nylon body plastic valves with manual flow control, manual bleed screw and 200 psi pressure rating. Valves shall be equipped with filtration for dirty water.
- B. Valves shall be manufactured by Hunter Industries, model ICV or approved equal.

2.13 FLOW SENSOR

- A. Flow meter (2 inch) shall have ability to track flow through the Hunter A2C controller. Flow meter must be accurate to within plus or minus 1% of full scale and display repeatability of plus or minus 0.5% of full scale for flows or 2.8 to 170 gpm. Flow sensor shall be installed in a 2-inch Schedule 80 PVC tee according to Manufacturer recommendations and the details. Flow sensor to be Creative Sensor Technologies (CST) FSI-T20-001 sensor with Hunter Flo-Sync Sensor.

2.14 MASTER VALVE

- A. Master valve shall be brass construction, normally open, 2-inch with no minimum flow requirement as manufactured by Buckner/Superior, 3300-200 series or approved equal.

2.15 IDENTIFICATION TAGS

- A. Valves shall have ID tags attached. ID tags shall be manufactured from Polyurethane Behr Desopan. Provide one tag for each electric valve. Use one maxi size tag for electric control valve. Each tag shall provide valve and station ID information.
- B. Tags shall be as manufactured by T. Christy Enterprises or approved equal.

## 2.16 VALVE BOXES

- A. Plastic valve boxes shall be manufactured from unformed resin with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. Boxes shall be green or black in color.
- B. Valve box for mainline ringtite isolation gate valves shall be 5-1/4-inch round valve boxes with poly-iron (detectable) sleeves. Top piece shall be 15-1/2 inches long and bottom piece 24 inches. Top shall turn on bottom section to allow for adjustment to grade. Boxes to be as manufactured by Highline Products. "T" handle wrench must fit well inside of box.
- C. Valve boxes for small isolation valves, wire splices and quick coupling valves shall be 10-inch round valve boxes with metal detection, T-top lids and bolt down covers. Splice boxes shall have gray lids.
- D. Valve boxes for single valves with isolation and dual 1-1/2-inch electric valves with isolation, master valve and flow sensor shall be 12-inch standard valve boxes with metal detection, T-top lids and bolt down covers. When multiple 1 inch and 1-1/2-inch electric valves are installed in the same area, they are to be installed two (2) valves per box in a 12-inch standard box.
- E. Valve boxes for deep drip stake valves, MPRotator zones, single and dual 2-inch valves with isolation shall be 18-inch jumbo valve boxes with metal detection, T-top lids and bolt down covers. When multiple 2-inch electric valves are installed in the same area, they are to be installed two (2) valves per box in an 18-inch standard box.
- F. Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer as the box.
- G. Plastic valve boxes shall be manufactured by Dura Plastics, Highline Products or Olde Castle Specification Grade.

## 2.19 AUTOMATIC CONTROLLER

- A. Controller shall be electronic in construction with capability of 1 second to 12 hour run times per zone. Controller to have minimum 32 independent programs, 20 station simultaneous operation, auto/off switch and be capable of manual, semi-automatic and automatic operation. Controller shall have water budgeting feature, cycle and soak feature, sensor input terminal, locking, weather resistant

stainless-steel cabinet and internal transformer. Terminal strip connection shall be easily accessible. The controller shall be U.L. listed, 120-volt, 60 Hertz, A.C. type.

- B. Controller shall have flow monitoring and flow management capabilities with compatible flow sensor connection. Controller shall be capable of automatic flow learning per station and have station level flow diagnostics and alarm shutdown.
- C. Controller shall have 5-year warranty.
- D. Controller shall be compatible with the Town of Brookline's existing Hunter irrigation central control system.
- E. Controller shall be as manufactured by Hunter Industries, model A2C-D-75-SS and Hunter Solar Sync.

#### 2.20 SURGE ARRESTOR (CONTROLLER)

- A. Modular surge arrester shall be a single phase, two pole arrester designed to protect single or split phase 120 volt or 120/240-volt electrical system. Electrical connection shall be embedded in a UL recognized epoxy to seal and protect them from moisture and corrosion.
- B. Surge arrester shall be molded from weather and UV resistant polycarbonate, complying with the UL Standard for flame and strength resistance.
- C. Arrester shall include green LED operating light.
- D. Surge arrester shall be manufactured by Paige Electric, model, 250090LED with mounting bracket or approved equal.

#### 2.21 DECODERS

- A. Decoders shall be installed between the controller and the electric control valves to provide the 24-volt power supply for individual valves. Each decoder shall be available in 1, 2 or 4-station devices. No 6 station devices allowed. Decoder shall have a unique serial number and controller-assigned address to identify it in the network.
- B. Decoder shall be ICD's manufactured by Hunter with minimum 2-year warranty.

#### 2.22 WIRE

- A. Valve control wire from the decoder to the valve shall be minimum #14-awg, single strand, solid copper; UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service. Wire shall be red in color.
- B. In ground wire connections shall be UL listed, manufactured by Paige, 3M, model DBR/Y-6 splice kits or equal. Wire splices shall be made in valve boxes,

electrical junction boxes, at the controller or at valves. Connections shall be installed as per their manufacturers' instructions.

- C. Valve control wire from the controller to the decoders, blue in color shall be through two-wire. Wiring shall be polyethylene double-jacketed or UF-B UL PVC double-jacketed two-conductor solid copper designed for direct burial systems. Wire gauge shall be AWG #14/#14. Cable shall be as manufactured by Paige Electric, P7354D or equal.
- D. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volt A.C. or less.
- E. Wiring shall be in strict accordance with national, state and local electrical codes.

#### 2.23 COMMUNICATION CABLE - CONTROLLER TO FLOW SENSOR

- A. Communication cable from the controller to flow sensor shall be jacketed, four conductor, two pair cable. The cable shall be suitable for direct burial in the earth and also may be installed in ducts or conduits.
- B. Conductors shall be high density insulated tin coated copper conductors. Conductors shall have a 0.00235-inch aluminum/mylar shield helically applied and a #20 AWG drain wire to drain off electrical, magnetic or RF interference. The cable shall be rated 600 volts. The four conductors shall be seven strand, #18 AWG, 0.015 high density PE insulation wall.
- C. The two pair shall be color coded red/black and blue/orange and shall be soft annealed tin coated copper conforming to ASTM B-33. Insulation shall be high density polyethylene conforming to ICEA S-56-434.
- D. Outer jacket shall be 0.045-inch polyethylene conforming to ICEA S-61-402. The communication type cable shall be marked on the jacket as follows: "2 Pr #18 AWG Shld D/B Paige P7171D".
- E. Wire shall be as manufactured by Paige Electric, P7171D or approved equal.

#### 2.24 WIRELESS WEATHER SENSOR

- A. Controller shall be able of accepting weather data from a wireless Solar Sync sensor and using this data to automatically adjust the irrigation schedule. Sensor shall have rain and freeze shutoff.
- B. Solar Sync sensor shall be polycarbonate in construction with adjustable interruption point and metal extension arm. Solar Sync sensor shall have built-in bypass switch.
- C. System operating frequency shall be 433MHz. Package shall be UL listed; FCC approved.

- D. Receiver input power shall be 24 VACS from controller
- E. Weather Sensor package shall carry a five (5) year warranty.
- F. Weather sensor shall be manufactured by Hunter Industries, model Solar Sync or equal. Solar Sync or equal package shall include Solar Sync or equal module, Solar Sync or equal sensor (Transmitter) and Wireless Solar Sync or equal (Receiver).
- G. Sensor shall be installed within a stainless-steel sensor guard as manufactured by VIT.

## 2.25 QUICK COUPLING VALVES

- A. Valve body shall be of cast brass construction with a working pressure of 125 psi. The valve seat disc plunger body shall be spring loaded so that the valve is normally closed under conditions when the key is not inserted.
- B. Top of the valve body receiving the key shall be equipped with ACME threads and smooth face to allow the key to open and close the valve slowly. The quick coupling valve shall be equipped with a vinyl cover.
- C. Valve body construction shall be such that the coupler seal washer may be removed from the top for cleaning or replacement without disassembling any other parts of the valve.
- D. Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top.
- E. Contractor shall provide two (2) keys for quick couplers and two (2) 1-inch x 3/4-inch swivel hose ells.
- F. Quick coupling valves, keys and swivels shall be manufactured by Hunter Industries, model HQ-44LRC-AW-R, HK-44A and HS-1 or approved equal.

## 2.26 ISOLATION VALVES

- A. Isolation ball valves for air/vacuum release valves shall be of bronze construction, US Manufacture, minimum 3/4 port, 600 WOG with stainless steel handle and chrome plated ball. Ball valves are to be as manufactured by Apollo, Boston, Watts or approved equal.
- B. Isolation valves 2-1/2 inches and smaller shall be gate type, of bronze construction, US Manufacture, 200 WOG with bronze cross handle and 200 psi rating. Gate valves to be as manufactured by Nibco model 113-K, Apollo model 102T or approved equal.

- C. Isolation valves 3 inches and larger in size for PVC mainline shall be cast iron epoxy coated inside and outside, ringtite valves, 200 psi rated, ductile iron gland flange, bronze stem-seal replaceable under pressure, stainless steel stem, US Manufacturer, 2-inch operating nut and resilient wedge replaceable disc conforming to AWWA C-509 as manufactured by Waterous 500 Series, Clow 2630 Series or Kennedy Ken-Seal Series.
- D. Ball valves for backflow prevention device installation shall be bronze construction, Nibco S-585-66-LF-LL.

## 2.27 SWING JOINTS

- A. ½-inch and ¾-inch sprinklers shall be installed on swing pipe assemblies, minimum length 12 inches and maximum length of 18 inches.
- B. Swing pipe operating pressure shall be up to 80 psi with an inside diameter of 0.49 inches, manufactured of low-density polyethylene material meeting ASTM D2104, D2239 and D2737. Swing joint swing pipe and fittings shall be manufactured by Hunter Industries, model FLEXsg, with HSBE-050 and HSBE-075 fittings or approved equal.
- C. Large rotary sprinklers shall be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double O-ring seals, minimum 315 psi rating and minimum length of 12 inches. Prefabricated PVC swing joints shall be as manufactured by Lasco, model G132-212 or G132-218.
- D. Quick coupling valves to be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double O-ring seals, minimum 315 psi rating and minimum length of 12 inches with brass insert and stabilizer (unless stabilizer is an integral part of the quick coupling valve). Prefabricated PVC swing joints shall be as manufactured by Lasco, model G13S-212 or G13S-218.

## 2.28 DEEP DRIP STAKE ASSEMBLIES

- A. Deep drip stake shall be 24-inch, constructed of PVC material. Tube shall have an outside diameter of 1¼ inches. Cap material shall be made of ABS and the combination of stake tube and cap shall be able to withstand multiple strikes from a 3-lb. sledge hammer for the purpose of installing.
- B. Deep drip stakes shall incorporate a screen filter within the unit to eliminate debris from entering the internal area of the stake. Deep drip stakes shall be designed so as to permit twisting of stakes after installation to dislodge root intrusion.
- C. Stake cap shall have an opening to accommodate 1/8-inch to ¼-inch diameter drip or low volume distribution tubing. The internal stake tube dimensions shall be able to house a fixed or variable low volume emitter.

- D. ¼ inch diameter drip distribution tubing shall be black EDTUBE as manufactured by Netafim. Fittings shall be UV resistant and be 0.160-inch fittings compatible with solid drip tubing and distribution tubing.
- E. Stakes shall have a 2 gph emitter installed in the stake, 1 gph for smaller trees where indicated on the drawings. Emitter shall be as manufactured by Rain Bird, model XB-20PC (Red).
- F. Drip stake assemblies shall be manufactured by Green King, model ADD24 as indicated on the drawings.

#### 2.29 BLANK DRIP TUBING

- A. Blank drip tubing for tree rings shall be solid, 17 mm, low density polyethylene resin, UV resistant as manufactured by Netafim Irrigation, Model TLD-L0XX or approved equal. Start pressure shall be a minimum of 45 psi.

#### 2.30 BLANK DRIP TUBING FITTINGS

- A. Fittings for blank drip tubing shall be constructed of molded brown plastic having a (I.D) of 0.57 inches. Female and male threaded ends shall be capable of mating to standard pipe threads with tapered threads. In-line drip tubing fittings shall be as manufactured by Netafim, TL Series or approved equal.
- B. Stainless steel clamps shall be used to secure in-line drip tubing to insert barbed fittings. Nominal size shall be 13/16 inches, Part No. 210. Clamps shall be constructed of 304-grade stainless steel. Interior clamp wall shall be smooth to prevent crimping or pinching of tubing. Wall thickness of clamps shall be 0.236 inches with an overall bandwidth of 1/4-inch. Properly secured clamps shall be capable of withstanding a maximum operating pressure of 441 psi. Clamps shall be one "ear" type. Clamps shall be as manufactured by Oetiker or approved equal.
- C. Tubing stakes shall be plastic coated steel, or non-corrosive material to secure tubing.

#### 2.31 DISC FILTER

- A. Filters at each drip and MPRotator zone valve shall be a plastic filter consisting of a two-piece threaded housing with O-ring seal. The filter screen shall be 140-mesh size. Filters shall be sized to mid-range flow and not exceed 2.5 psi pressure loss.
- B. Filter shall be as manufactured by Netafim, Model DF-xxx-140 or approved equal.

#### 2.32 MANUAL FLUSHING VALVE

- A. Deep drip stake zone manual flush valves shall be manufactured of UV and chemical resistance molded plastic and shall accept hose/tubing with an inside diameter of 0.56"-0.60". The valve shall be a manual 17mm ball valve Model TLISOV as manufactured by Netafim or approved equal.

### 2.33 PRESSURE REGULATORS

- A. Pressure regulators shall assure an incoming pressure of 45 psi into drip tubing. Discharge pressure shall not be less than 45 psi. Manifold regulators to match flow rate to mid-range flow.
- B. Pressure regulator shall be as manufactured by Netafim, Model PRV-XXX-XX-45 or approved equal.

### 2.34 WATER METER

- A. 2-inch water meter is existing in the vault.

### 2.35 BACKFLOW PREVENTION DEVICE

- A. Reduced pressure backflow prevention device shall be 2 inch, Watts LF909M1QTS or approved equal.

### 2.36 BACKFLOW PREVENTION ENCLOSURE

- A. Enclosure shall be vandal and weather resistant in nature, aluminum enclosure. Enclosure shall be manufactured with inside dimensions of 60 inches long x 22 inches wide x 42 inches high as manufactured by Hot Box, model LF2.75 H Aluminum Dura Fold or approved equal. See detail.

### 2.37 COMBINATION AIR VACUUM/RELEASE VALVE

- A. Combination air vacuum/release valve to be Crispin, Model IC-10 or approved equal with 1-inch NPT inlet and a 1-inch air and vacuum outlet with a 3/32-inch air release orifice. The valve body shall be cast iron body with stainless steel internals and float and Buna-N seating material. The valves shall exhaust large quantities of air on system start-up and allow air to re-enter the pipeline when the line is being emptied or drained. The valves shall also automatically vent air that accumulates while the system is under pressure.
- B. A 1-inch ball valve and 1-inch bronze wye strainer shall be installed below the air/vacuum release valve. Wye strainer shall utilize a 3/4-inch boiler drain for cleaning. See detail.
- C. Release valve outlet shall be piped with brass elbows and nipples to direct the air out of the valve as shown on the detail.

### 2.38 CONCRETE

- A. Concrete for thrust blocks and concrete bases shall be standard concrete mix in accordance with ASTM C150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 3,000 psi with 1-1/2-inch aggregate.
- B. Concrete base sizes shall be as indicated on the drawings and sited in the specifications.

#### 2.39 CONTROLLER GROUNDING

- A. Controller shall include factory-installed and factory-recommended lightning protection and shall be connected to a 5/8-inch diameter x 10-foot long copper clad grounding rod with minimum #6 AWG, solid, bare copper wire and 4-inch x 96-inch x 0.0625-inch copper grounding plate as outlined below. Minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod. Connection to rod shall be with exothermic connector as specified. Connection to plate shall be performed by the plate manufacturer with 25-feet of insulated copper wire already attached. Grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover with metal detection and six inches of 4-inch drainage pipe. Plate shall be installed in ground enhancement material. Plate shall be covered with 4-inch plastic grated cover with detection and minimum 36 inches of 4-inch drainage pipe. Ground rod and plate shall be UL listed.
- B. Controller shall be grounded to one rod and one plate. 10-foot rod shall be installed penetrating into the soil to its full length. Plate shall be installed at a 36-inch depth with 50 lbs. of ground enhancement material spread evenly below the plate and 50 lbs. spread evenly above the plate in accordance with manufacturer's requirements. The grounding electrodes shall be installed at least 10 feet from wires connected to the controller.

#### 2.40 COMMUNICATION PATH GROUNDING

- A. Two-wire communication path shall be grounded at 600-foot maximum intervals, at every termination of a part of the wire path to a surge arrester decoder where indicated on the drawings, and 50 feet from the controller. Each surge arrester shall be connected to a 5/8-inch diameter x 8-foot long copper clad grounding rod and 4-inch x 36-inch grounding plate with minimum #10 AWG, solid, insulated copper wire. Minimum 8-foot separation between rod and other equipment. Connections to rods shall be with exothermic connectors as specified. Each grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover with metal detection and six inches of 4-inch drainage pipe. Plate shall be installed at a 36-inch depth with 25 lbs. of ground enhancement material spread evenly below the plate and 25 lbs. spread evenly above the plate. Plates shall be covered with 4-inch plastic grated cover with detection and minimum 36 inches of 4-inch drainage pipe. Ground rods and plates shall be UL listed.

#### 2.41 CRUSHED STONE

- A. 1/2-inch crushed stone shall be washed at the source facility to remove fine-grained soils and shall be well graded within the following limits:

<u>Sieve Size</u> <u>(ASTM D422)</u>	<u>Percent Passing</u> <u>by Weight</u>
3/4 inch	100
1/2 inch	90-100
3/8 inch	0-20
No. 4	0-5

2.42 SAND

- A. Shall consist of well-graded natural sand, free from organic, other weak or compressible materials, or frozen materials, conforming to the following gradation:

<u>Sieve No.</u>	<u>Percent Passing by Weight</u>
#8	100
#50	15-40
#100	2-10
#200	0-5

2.43 SPARE PARTS

- A. Supply the following tools and equipment to the Owner's Representative before final observation:
- Two (2) wrenches or keys for disassembling and adjusting each type of sprinkler provided.
  - Four (4) quick coupler key assemblies.
- B. Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown.

PART 3 - EXECUTION

3.01 GENERAL

- A. Before irrigation work is commenced, Contractor shall hold a conference with the Owner's Representative to discuss general details of the work.
- B. Examine contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.
- C. Work indicated on drawings shall be provided whether or not specifically mentioned in the specifications.

- D. If there are ambiguities between drawings and specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by Owner's Representative and Contractor shall comply with the decisions. In the event the installation contradicts the directions given, the installation shall be corrected by Contractor at no additional cost to the Town of Brookline.
- E. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the landscape irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details, legend or specific notes are discovered. Such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.
- F. Make field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the drawings, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.
- G. Layout of sprinkler lines indicated on drawings is diagrammatic. Location of sprinkler equipment is contingent upon and subject to integration with other underground utilities. Contractor shall employ data contained in the Contract Documents and shall verify this information at the construction site to confirm the manner by which it relates to the installation.
- H. Coordinate installation of sprinkler materials, including pipe, to avoid conflict with trees and plantings.
- I. During progress of work, a competent superintendent and assistants necessary shall be on site, satisfactory to the Owner's Representative. Superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and directions given to the superintendent shall be as binding as if given to the Contractor.
- J. Protect landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.
- K. Replace, or repair to the satisfaction of the Owner, existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

### 3.02 PIPE AND FITTINGS INSTALLATION

- A. Using proper equipment, excavate a straight (vertical) and true trench to a depth of 2-inch of pipe invert elevation.

- B. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.
- C. Pipe shall be laid on undisturbed trench bottom provided suitable base is available - no rock or sharp edges; if not, excavate to 2-inch below pipe invert and provide and install sand base or crushed stone upon which to lay pipe.
- D. Backfilling shall be accomplished as follows: the first 6-inches of backfill material shall contain no foreign matter and no rock. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.
- E. Make solvent-weld joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of primer or solvent, and wiping off excess solvent from each connection. Allow welded joints at least 15 minutes set-up/curing time before moving or handling. When the temperature is above 80° F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80° F, follow manufacturer's recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see Wire Installation).
- F. Mainline pipe shall have minimum 22 inches of COVER (excavate to invert as required by pipe size). Lateral pipe shall have minimum 16 inches of COVER for PVC and 12 inches for polyethylene (excavate to invert as required by pipe size).
- G. Install mainline and lateral irrigation pipe under drain lines where they cross.
- H. Cut plastic pipe with handsaw or pipe-cutting tool, removing burrs at cut ends. Pipe cuts are to be square and true. Bevel cut end as required to conform to Manufacturer's Specifications.
- I. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the pipe is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. Pipe, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the pipe, no additional pipe may be installed or backfilled until water is removed from the trench. Pipe shall not be

installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40° F or below. Pipe installed at temperatures below 40° F shall be removed and replaced at no cost to the Owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

- J. In installing irrigation pipe the Contractor shall route the pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, the Contractor shall provide proper root pruning and sealing methods to roots 1-inch and larger.
- K. Maintain 6-inch minimum clearance between sprinkler lines and lines of other trades. Do not install sprinkler lines directly above another line of any kind.
- L. Maintain 3-inch minimum between lines which cross at angles of 45 to 90 degrees.
- M. Throughout the guarantee period it will be the responsibility of the Contractor to refill trenches that have settled due to incomplete compaction.

### 3.03 ELECTRICAL WIRE CONDUIT INSTALLATION

- A. Electrical conduit shall be installed in non-soil areas, as well as for above ground wiring where wire passes under or through walls, walks and paving to controller and Solar Sync sensor.
- B. Conduit shall extend 18 inches beyond edges of walls and pavement.

### 3.04 PIPE SLEEVING INSTALLATION

- A. Sleeving shall be installed wherever pipe is going under hardscape areas where indicated on the drawings. Minimum cover over sleeving pipe shall be 24 inches as shown on the detail.
- B. Sleeving shall extend 18 inches beyond edges of walls and pavement. Prior to the installation of irrigation pipe and wiring, the ends of sleeving shall be field marked with a vertical wood stake extending above grade to allow field location at the time of irrigation installation.
- C. Be sure required sleeving is installed prior to starting any pavement operations or casting concrete structures which require sleeving to pass through the items. Review sleeve locations in the field to confirm that sleeves are properly located for the required irrigation pipe runs. In no case, will saw cutting into newly installed pavement or jacking under new pavement be permitted to install sleeving which was not installed in proper sequence or in the required orientations or locations.

### 3.05 ISOLATION VALVE INSTALLATION

- A. Install isolation valves per detail where indicated on the drawings. Install isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench. Install specified valve box over each isolation valve.
- B. Check and tighten valve bonnet packing before valve box and backfill installation.
- C. Provide and install thrust blocks for ringtite valves as per detail.

### 3.06 VALVE BOX INSTALLATION

- A. Furnish and install a valve access box for each electric valve, filter, master valve, flow sensor, flush valve, quick coupling valve, isolation valve and wire splice.
- B. Valve access boxes shall be installed on a minimum 4-inch crushed stone base. Finish elevation of boxes shall be at grade. Crushed stone to be supplied by the Contractor and installed before valve box. Crushed stone shall not be poured into previously installed valve boxes.
- C. Valve boxes shall be installed neatly. Boxes shall be parallel or perpendicular to hardscape edges and equidistance to other valve boxes installed in the same location. A sufficient amount of turf shall remain in place between each valve box and between valve boxes and hardscapes
- D. Valve box extensions shall be provided as required on valve boxes in order to install valve box covers at grade.
- E. Valve box locations shall be in mulched areas where possible a minimum of 10 feet from the walkways. Owner's Representative shall approve location of valve box locations before installation. This shall consist of them viewing the location and providing the contractor with a verbal or written approval.
- F. Bricks, stones, etc. shall not be used to support valve boxes.

### 3.07 24 VOLT CONTROL VALVE INSTALLATION

- A. Control valves shall be installed on a level crushed stone base. Grade of bases shall be consistent throughout the project so that finish grades fall within the limits of work. Valves shall be set plumb with adjusting handle and bolts, screws and wiring accessible through the valve box opening. Valves shall be set in a plumb position with 24-inch minimum maintenance clearance from other equipment.
- B. Adjust zone valve operation after installation using flow control device on valve.

### 3.08 24 VOLT MASTER CONTROL VALVE/ FLOW SENSOR INSTALLATION

- A. Valve and flow meter shall be installed on a level crushed stone base. Valve and meter shall be set plumb with bolts, screws and wiring accessible through the valve box opening.
- B. Install master valve and flow meter in individual 12-inch standard valve boxes separated per the flow meter requirements and as shown on the details.
- C. Communication cable from controller shall be wired to flow sensor. Connect flow sensor using one pair, red and black of 18-4 cable, two pair. Waterproof connections and spare wires.

### 3.09 WIRING INSTALLATION

- A. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid, decoder, splice and connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box.
- B. Wire shall be laid in trenches and shall be carefully backfilled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 2 inches layer of sand or stone dust on the bottom before the wires are laid into the trench and backfilled. The wires shall have a minimum of 22 inches of cover (See Detail). Wire not to be installed that day shall not be laid out.
- C. An expansion curl shall be provided and installed within 6 inches of each wire connection to a solenoid or decoder on the #14 wire – do not curl two-wire communication cable. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.
- D. Service wiring in connection with drawings and local codes for low voltage service. In-ground wire connections shall be waterproofed splice kits. Splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the record drawings.
- E. Provide a complete wiring diagram showing wire routing for the connections between the controller and valves. See section one for the inclusion of wiring diagram in operation and maintenance manuals.
- F. Two-wire communication cable shall be installed along mainline path and indicated on the record drawings.

### 3.10 CONTROLLER INSTALLATION

- A. Controller shall be mounted in the new transformer cabinet. Wiring within the enclosure shall be neatly run, bundled, and cinched. Zone wires shall be labeled as to zone/station served at controller.
- B. Install minimum one (1), 1-1/2-inch PVC conduit sweep ell and spool piece through cabinet pad as required for 24-volt valve communication cable. Install minimum one (1), 1-1/2-inch PVC conduit sweep ell and spool piece through cabinet pad for #6 AWG bare copper wire. Install minimum one (1), 1/2-inch PVC conduit sweep ell and spool piece through cabinet pad for flow meter wires. Maintain required depth of bury in/out of pad.
- C. Controller communication, flow sensor and #6 AWG bare copper wire shall be brought to the exterior through separate sleeves in the support pad. Grounding wire shall be installed through the cabinet concrete pad through a separate 1-1/2-inch sleeve and not through the cabinet enclosure.
- D. Contractor shall install control and other irrigation-related wiring; as well as 120-volt hard wired service to controller.
- E. Above ground wire, other than in cabinet shall be installed in conduit.
- F. Seal enclosure sweep holes with expandable foam insulation.
- G. Keys shall be turned over to Owner's Representative.

### 3.11 GROUNDING INSTALLATION

- A. Grounding rods shall be driven into the ground their full length 12-feet from controller and 8 foot for surge arrestors and connected via exothermic connections to #6/#10 solid, insulated copper wire. The copper wire is to be installed in as straight a line as possible, and if it is necessary to make a turn or bend, it shall be done in a sweeping curve with a minimum radius of 8 inches and a minimum included angle of 90 degrees. There shall be no splices in the bare copper wire. The top of the ground rods shall be driven below the ground surface. A 4-inch grated cover as specified, set a minimum of 1-inch below grade, shall be placed over the ground rods and exothermic connection for periodic maintenance. Covers shall be installed on a minimum of 6 inches of 4-inch corrugated polyethylene, perforated drainage pipe. Plates shall be installed 36 inches below grade with 50 lbs. of ground enhancement material spread evenly below the plate and 50 lbs. of ground enhancement material spread evenly above the plate for the controller and 25 lbs. of ground enhancement material spread evenly below the plate and 25 lbs. of ground enhancement material spread evenly above the plate for the surge arrestors in accordance with the manufacturer's requirements. Plates shall also be covered with a 4-inch grated cover as specified, set a minimum of 1-inch below grade, to facilitate drainage onto the plates. Covers shall be installed on a minimum of 36 inches of corrugated polyethylene, perforated drainage pipe.

- B. When tested, grounding grid shall have an earth resistance no greater than 10 ohms. If earth resistance is greater than 10 ohms, additional grounding rods and/or plates and enhancement material shall be added to system until desired test results have been met.

### 3.12 SOLAR SYNC SENSOR INSTALLATION

- A. Install Solar Sync sensor on ball field backstop approximately where indicated on the drawings. Coordinate final location of Solar Sync sensor with Owner's Representative. Weather station sensor shall be in direct contact with the weather and not in contact with the irrigation spray.
- B. Install Solar Sync sensor wiring within 1/2-inch conduit where exposed. Above ground wires shall be installed in conduits.
- C. Install sensor guard to protect from vandalism.

### 3.13 SPRINKLER INSTALLATION

- A. Spray sprinklers, and small rotary sprinklers shall be installed flush (perpendicular) to grade on swing pipe assemblies, minimum length 6 inches, maximum 18 inches.
- B. Large rotary sprinklers shall be installed flush to grade on 1-inch prefabricated PVC unitized swing joint assemblies with integral O-rings, minimum length 12 inches.
- C. Sprinklers shall not exceed maximum spacing indicated
- D. Adjust sprinkler zone after installation using flow control device on valve.

### 3.14 QUICK COUPLING VALVE INSTALLATION

- A. Provide and install quick coupling valves where indicated on the drawings.
- B. Quick coupling valves to be mounted on 1-inch prefabricated PVC unitized swing joint assemblies with integral O-rings, minimum length 12 inches with brass insert and stabilizer as per details.

### 3.15 AIR/VACUUM RELEASE VALVE INSTALLATION

- A. Install air vacuum/release valve as per detail at location shown on the drawings.
- B. Provide ball valve shut-off, boiler drain and wye strainer under air vacuum/release valve as per detail. Ball valve shut-off shall be easily accessible through the valve box. Install boiler drains on discharge of wye strainers.
- C. Drill thirty-two (32), 3/8-inch holes in air vacuum/release valve box covers for air passage.

- D. Air vacuum/release valve shall be installed straight up from mainline and not on the side.
- E. Air vacuum/release valve shall be installed at the end of the mainline in the vicinity of where shown on the drawings.

### 3.16 TUBING STAKE INSTALLATION

- A. Drip tubing shall be secured with stakes. Stakes shall be spaced to ensure that tubing does not shift location in presence of foot traffic, operations, gravity on slope installations, or environmental effects. Stake tree rings minimum 3 per ring to prevent movement.

### 3.17 FLUSH VALVE INSTALLATION

- A. Flush valves shall be installed on deep drip stake zones where indicated on drawings.

### 3.18 DEEP DRIP STAKE INSTALLATION

- A. Drip stakes to be installed four per tree as shown on the details. Stakes shall have 2 gph emitters (1 gph where indicated) installed in the stake. Place tree watering stakes generally as indicated on the drawing and details. Tree stakes shall be placed in the edge of the root ball. Install stake as per the manufacturer's recommendations, to a depth where the top of the cap is flush with finish grade.
- B. ¼-inch distribution tubing shall be installed from the blank drip tubing ring and 18 inches into the tree stakes.
- C. Emitter shall be installed on end of distribution tubing to the bottom of deep drip stake.

### 3.19 ENCLOSURE INSTALLATIONS

- A. Install enclosures on concrete pads as indicated on the details, where indicated on the drawings. Final location of enclosures shall be coordinated with the Owner's Representative as to best screen the enclosure and deter vandalism. ‘
- B. Concrete pad for controller enclosure shall be minimum 32 inches wide by 25 inches deep by 6 inches thick. Base shall be installed on a minimum 6-inch crushed stone per details.
- C. Concrete pad for backflow prevention device enclosure shall be minimum 72 inches long by 34 inches wide by 6 inches thick. Base shall be installed on a minimum 6-inch crushed stone per details. Install two (2) 4-inch Schedule 40 sleeves through concrete pad into enclosure for water in and irrigation out as per detail.

### 3.20 CHECK/TEST/START-UP/ADJUST

#### A. Flushing:

1. After pipe, valves, sprinkler bodies and pipe are in place and connected, but prior to installation of sprinkler internals and emitters, open the control valves and flush out the system under a full head of water.
2. Sprinkler internals, nozzles and emitters shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
3. Flush the entire system after installation is complete and unclog clogged nozzles and emitters for thirty (30) days after substantial completion of the landscape irrigation system installation.

#### B. Testing:

1. Leakage test: test lines for leaks under operating pressure. Repair leaks and re-test.
2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Owner's Representative at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust sprinklers and/or sprinkler locations as necessary or directed to achieve proper coverage.

### 3.21 CLEANING AND ADJUSTING

- A. At the completion of the work, parts of the installation shall be thoroughly cleaned. Equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.
- B. Adjust sprinklers, valve boxes, deep drip stakes, and quick coupling valves to grade as required, so that they will not be damaged by maintenance operations.
- C. Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.
- D. Each control zone shall be operated for a minimum of 5 minutes and sprinklers and emitters checked for consistency of delivering water. Adjustments shall be made to sprinklers and emitters that are not consistent to the point that they match the manufacturer's standards. Sprinklers, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

### 3.22 ACCEPTANCE AND OPERATION BY OWNER

- A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative(s) in the operation of the system (provide minimum 7 day written notice in advance of test). Contractor shall furnish, in addition to the Record Drawings and operational manuals, copies of available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. The Contractor shall guarantee parts and labor for a minimum period of one (1) year from date of acceptance.

### 3.23 CLEAN UP

- A. Upon completion of installation work remove leftover materials and equipment from the site in a safe and legal manner.
- B. Remove debris resulting from work of this section.
- C. Regrade, lightly compact, and replant around sprinklers where necessary to maintain proper vertical positioning in relation to established grade.
- D. Fill depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with drawings requirements.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The bid price for the Irrigation System and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all materials, forms and equipment, tools and all other incidental work necessary for final completion of items as specified.

### 4.02 PAYMENT ITEMS

- A. The bid price for the Irrigation System and all related work shall be included in lump sum pricing and all other incidental work necessary for final completion of the work as specified.

371.10	Irrigation System	Lump Sum
--------	-------------------	----------

END OF SECTION

## SECTION 32 90 00

### ROOT ZONE MIX

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK

- A. Under this Section, the Contractor shall furnish all labor, materials, equipment (including low ground pressure, LGP, equipment) and transportation required to furnish and place, or prepare Root Zone Mix for the field for the areas shown on the drawings and as specified.
- 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 and SECTION 32 91 00-SCREENED LOAM BORROW AND TOPSOIL RE-USED.
- C. This work shall consist of preparing a root zone mixture consisting of screened native on-site loam, sand and compost or suppling from an outside source. The root zone mix will be evaluated by using the ASTM test methods for High Performance Sand-based Root Zones for Sports Fields, ASTM F 2396-04 as shown in Appendix A. A sand sample and compost sample shall be submitted to a testing agent for adherence to specifications prior to blending operations.
- D. The contractor shall have the option, at their discretion, to use on-site screened loam from stockpile and either mix on site or bring in Root Zone Mix that adheres to this specification.
- E. No heavy-duty equipment and vehicular traffic shall be allowed on the prepared areas.

##### 1.02 SAMPLES/TESTS

- A. The Contractor shall furnish an outline of their approach to the project no less than ten (5) days prior to the start of construction.
- B. The Contractor shall furnish a Certified Laboratory Report showing the soils classification and nutrient analysis of representative samples of the Loam, sand and compost that is proposed to be used, including the extent of lime and fertilizer required. Samples submitted for approval must be representative of the total volume to be furnished, taken in the presence of the Engineer, and delivered to a certified laboratory by the Contractor; all costs for such shall be borne by the Contractor.

- C. If the material does not conform to the above requirements it shall be rejected and additional sources shall be found. Sampling and testing shall be accomplished as specified herein until an approved material is found, all at the Contractor's expense.
- D. To assure that materials fulfill specified requirements regarding textural analysis, organic matter content, pH, and fertility, depending on the approach, testing may be undertaken:
  - 1. Prior to site delivery; at source;
  - 2. At time of delivery; on-site
- E. For quality control, immediately following spreading on site, soil may be tested at the owner's discretion. Soil sampling shall also indicate if specified soil was supplied uniformly to the minimum specified depth.

#### 1.03 RELATED WORK:

- A. Section 32 91 00-SCREENED LOAM BORROW AND TOPSOIL RE-USED
- B. Section 32 92 19-SEEDING

#### 1.04 STANDARDS

- A. ASTM - American Society for Testing and Materials.

#### 1.05 NOTIFICATION

- A. The Contractor shall notify the Owner in writing at least ten (10) days in advance of the time he intends furnishing Root Zone Mix or amendments stating the location and amount of such deposit, the name and address of the supplier and also shall furnish such facilities, transportation and assistance as the Engineer may require for collecting and forwarding samples.

#### 1.06 QUALITY CONTROL

- A. Root zone mix: A one-gallon sample for every 2,000 cubic yards of root zone mix shall be tested by the Engineer's Testing Agent for approval. All costs shall be done by the Contractor.
- B. Following installation of irrigation system and prior to seeding, contractor shall notify the Engineer or owner and provide the owner with compaction tests along the center line of the field as well as along the side lines to ensure that the root zone mix has not been heavily compacted. Compaction test shall fall within the industry standards for fields and any areas of the field that exceed these standards

shall be corrected at the contractor's expense prior to seeding.

- C. The Contractor or Sub-contractor must have a minimum of five (5) years of experience installing root zone mix based athletic fields of similar size and quality of this project.

## PART 2 - MATERIALS

### 2.01 LOAM BORROW

- A. Refer to Section 32 91 00-SCREENED LOAM BORROW & TOPSOIL RE-USED.

### 2.02 SAND

- A. Sand for Root Zone Mix shall conform to ASTM standard F 2396-04 Sand for High Performance Sand-based root zones for Sports Fields or 2mm USGA specification sand for golf course fairway top dressing.

### 2.03 PEAT OR ORGANIC MATERIAL

- A. Peat moss shall be of a standard brand free of sticks, stones, hay or any other deleterious Matt and meet the following requirements:

<u>Parameter</u>	<u>Specification</u>
Total Ash	15% or less
PH	6.5 to 7.5
% Moisture	30% to 50%
<u>Sieve Criteria</u>	
2.0 mm sieve	0-5% retained
1.0 mm sieve	Less than 20% retained

- B. Compost - Compost shall be derived from organic wastes including sawdust, clean ground wood and biosolids that meet all State Environmental Agency requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth. Leaf compost shall not be accepted.

Compost shall have the following properties:

<u>Parameters</u>	<u>Range</u>
pH	6.5 - 7.5
Moisture content	35% - 55%
Soluble Salts	< 4.0 mmhos (dS)
C:N ratio	15 - 30:1

Particle Size	< 1/2"
Organic Matter Content	> 40%
Bulk Density	< 1000 lbs./cubic yard
Foreign Matter	< 1% (dry weight)
Total Ash	15% or less

Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements. Generator shall supply documentation showing state approval for intended use.

- C. Fertilizer - Renovate Plus, 3-3-, or approved equal.

#### 2.04 ROOT ZONE MIX

- A. Mixing Materials: Mixing of the sand, peat and soil mixture for the root zone mix must be blended by an experienced blending operator.
- B. Physical performance Evaluation of the root zone mix will be in accordance with the guidelines set forth in ASTM standard F 2396-11 as found in Appendix E.

#### 2.05 ASTM F2396 DRAINAGE LAYER

- A. Drainage layer shall be F2396-11 Gravel Filter Drainage Layer, Section 5.4.3.3 Option 3 set forth in ASTM standard F 2396-11 as found in Appendix E.
- B. Drainage layer shall be a 3/8" washed crushed stone meeting the following:

Sieve Size	Weight Retained	% Retained	% Passing
3/8"	0.6	2.8	97.2
1/4"	9.4	43.5	56.5
#4	15.8	73.1	26.9
#8	20.9	96.8	3.2
#16	21.3	98.6	1.4

### PART 3 - EXECUTION

#### 3.01 ROOT ZONE MIX RATIOS

- A. Upon approval of the amended existing salvaged loam borrow, sand and compost components, the owners testing agents shall blend the components to determine the correct ratio of sand and compost to create the root zone mix. This ratio of sand and compost will be based on laboratory testing and performance guidelines established by these specifications.

Based on previous testing and for bidding purposes, the field root zone mix ratio will contain **60% sand, 35% Native Screened Loam and 5 %** compost by volume.

- B. The root zone mix developed by the Engineer's testing agent will establish the required mix ratio and specifications for approval or rejections of all quality control submittals during construction.

*Performance Testing:* ASTM testing procedures for sand based athletic fields shall be used for performance testing.

### 3.01 PLACEMENT

Blended Root zone Mix:

- A. The Contractor shall place and spread Root Zone Mix to the depths shown on the contract drawings, which depth shall be the minimum required depth after settlement. No compaction shall be required beyond that extent necessary for the establishment of seed.
- B. Root Zone Mix shall be spread in such a manner as to establish a loose, friable seedbed.
- C. Fine grading shall be accomplished with a fully automated dual plain LGP laser grader.
- D. Under no circumstances will loaded rubber-tired vehicles in excess of 1 ton be allowed on the gravel base prior to or during the spreading of the root zone mix.
- E. Finish grades shall be verified by the Contractor using laser operation survey instruments with a tolerance of +/- ¼ inch.

### 3.02 ADDITIVES

- A. The Contractor shall apply all necessary fertilizer and lime to the soil in accordance with the manufacturer's and laboratory's recommendations and as required by the seeding specifications referenced elsewhere.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. Drainage layer shall be measured by the cubic yard for placing, grading and fine grading complete in place which price shall be full compensation for all labor, material, equipment, and miscellaneous items necessary to complete the work in a satisfactory manner.

- B. Root Zone Mix shall be measured by the cubic yard for amending existing stripped top soil loam, blending with new imported sand and imported compost components, placing, grading and fine grading complete in place which price shall be full compensation for all labor, material, equipment, and miscellaneous items necessary to complete the work in a satisfactory manner.

4.02 PAYMENT ITEMS

402.30	ASTM F2396 Drainage Layer (4" min)	Cubic Yard
751.20	Root Zone Mix	Cubic Yard

END OF SECTION

NOT FOR BIDDING

## SECTION 32 91 00

### SCREENED LOAM BORROW AND TOPSOIL RE-USED

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK

- A. Under this Section, the Contractor shall furnish all labor, materials, equipment (including low ground pressure equipment (LGP)) and transportation required to furnish and place 4" Screened Loam Borrow as shown on the drawings or as required for the Root Zone Mix and as specified. Where proposed tree and shrub planting mix and seed is noted on the drawings, it shall be composed of Loam Borrow, or Topsoil Reused in compliance with this specification. Refer to Appendix for textural analysis and proposed amendments.
- 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.
- C. The Contractor shall be responsible for screening and amending topsoil as required.
- D. No heavy duty equipment and vehicular traffic shall be allowed on the prepared areas. While using the blecavator, the contractor shall fine grade soil over the blecavation areas based on the proposed elevations indicated on the site plan.

##### 1.02 SAMPLES/TESTS

- A. The Contractor shall furnish a Certified Laboratory Report showing the soils classification and nutrient analysis of representative samples of the proposed Loam to be used, including the extent of lime and fertilizer required. Samples submitted for approval must be representative of the total volume to be furnished, taken in the presence of the Engineer, and delivered to a certified laboratory by the Contractor; all costs for such shall be borne by the Contractor.
- B. At least ten (10) days prior to shipment/delivery of materials, the Contractor shall submit to the Owner a one (1) cubic foot representative sample, certifications, certified test results for materials as specified below. The Contractor shall provide a listing of the addresses (locations) identifying the origin of the soil to be delivered. If the origin is from multiple locations, all locations shall be provided at the time of submission of required information specified above. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Owner. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner shall reserve the right to reject, on or after delivery, any material that does not meet these

Specifications.

- C. If the material does not conform to the above requirements it shall be rejected and additional sources shall be found. Sampling and testing shall be accomplished as specified herein until an approved material is found, all at the Contractor's expense.
  
- C. To assure that materials fulfill specified requirements regarding textural analysis, organic matter content, pH, and fertility testing may be undertaken:
  - 1. Prior to site delivery; at source;
  - 2. At time of delivery; on-site; and/or
  - 3. Immediately following spreading on site. Soil sampling shall also indicate if specified soil was supplied uniformly to the minimum specified depth.

1.03 STANDARDS

- A. ASTM - American Society for Testing and Materials.

1.04 NOTIFICATION

- A. The Contractor shall notify the Engineer in writing at least ten (10) days in advance of the time he intends furnishing Screened Loam Borrow stating the location and amount of such deposit, the name and address of the supplier and also shall furnish such facilities, transportation and assistance as the Engineer may require for collecting and forwarding samples.

1.05 QUALITY CONTROL

- A. Following installation of irrigation system and prior to installation of seed, contractor shall notify Engineer or owner and provide the Engineer with compaction tests along the center line of the field as well as along the side lines to ensure that the root zone mix has not been heavily compacted. Compaction test shall fall within the industry standards for fields and any areas that exceed these standards shall be corrected at the contractor's expense prior to installation of sod.
  
- B. The Contractor or Sub-contractor must have a minimum of five (5) years of experience installing root zone mix based athletic fields of similar size and quality of this project.
  
- C. The Contractor shall avoid excessive compaction of the subgrade prior to installation of the loam. Refer to section 31 00 00 EARTHWORK.

PART 2 - MATERIALS

2.01 LOAM BORROW

- A. In accordance with the specific requirements of this project, existing on-site soil may be re-used as Loam Borrow only if it meets this Specification. Existing topsoil that does not meet this Specification may be re-used only up to the subgrade elevation within the limits of areas to receive new Loam Borrow. The Contractor shall furnish all required Loam Borrow, from off site sources, as necessary, to complete the project.
- B. Screened Loam shall be “fine sandy loam” or “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</u>	<u>Average Percentage</u>
Sand (0.05 – 2.0mm)	50 – 80	70
Silt (0.002 – 0.05mm)	15 – 30	20
Clay (Less than 0.002mm)	5 – 10	10

- C. Screened Loam shall be a natural product consisting primarily of natural topsoil, free from subsoil, and obtained from an area that has never been stripped, as noted above, the location of the source of the loam must be submitted to the Owner. Screened Loam shall not contain less than five percent (5%) nor more than seven percent (7%) 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 site delivery, by the addition of composted leaf mold or peat moss. Use of organic amendments is accepted only if random soil sampling indicates a through incorporation of these materials. No mixing or amending of Loam will be permitted on site. The Loam shall not be delivered when in a wet or frozen condition.
- D. Screened Loam shall consist of fertile, friable, natural loam capable of sustaining vigorous plant growth. 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 Owner. Screened Loam shall be within the pH range of 6.0 to 6.5 except as where noted on plans and details. 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.

- E. 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 square feet of loam, incorporated into the soil, or 50 pounds of limestone per 1,000 square feet of loam, surface application, within a single season.
- F. The Owner will reject any material delivered to the site that does not meet these Specifications after post-delivery testing. If the delivered screened loam does not meet the specifications stated in this document, the delivered screened loam will be removed by the Contractor at the Contractor's expense and at the time of rejection.
- G. The topsoil shall not be handled or moved when in a wet or frozen condition.
- H. Topsoil structure shall not be destroyed through excessive and unnecessary handling or compaction. Inappropriate handling leading to the compaction or deterioration of soil structure will result in rejection of topsoil for use.
- I. At no time should equipment or material rest on the soil.
- J. Loam Borrow shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to, or less than, 1.0 millimhos/cm. (test material passing #4 sieve).

## 2.02 REUSE OF EXISTING TOPSOIL

- A. The reuse of topsoil that does not meet the specifications for use as loam borrow may only be permitted for use as a general fill material to subgrade elevations at the limits of lawn and planting areas (not athletic field).
- B. Care shall be taken not to overwork the soil, causing it to break down, utilizing only agricultural equipment such as plows, discs, or harrows and portable quarry sieves, screens, or blenders.

## PART 3 - EXECUTION

### 3.01 PLACEMENT

- A. The Contractor shall furnish and spread Loam Borrow to the depths shown on the contract drawings, which depth shall be the minimum required depth after settlement. No compaction shall be required beyond that extent necessary to place sod or to plant trees and shrubs to ensure against unevenness or settling below accepted growth lines.
- B. All backfill to subgrade, shall be compacted to not less than eighty-five percent (85%) and not more than ninety percent (90%) of the maximum dry density of the

material as determined by the Standard AASHTO Test Designation T-180-86, Modified Proctor Test.

- C. Low Ground Pressure (LGP) Equipment must be used for final grading of subgrade in order to minimize the compaction on the backfill and subgrade.

3.02 ADDITIVES

- A. The Contractor shall apply all necessary fertilizer and lime to the soil in accordance with the manufacturer and laboratory's recommendations and as required by the sodding, seeding and/or planting specifications referenced elsewhere.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The quantity of Topsoil Rehandled and Spread shall be equal to the amount excavated and stacked.
- B. Loam Borrow will be measured by the cubic yard compacted in place.
- C. All soil additives required to be mixed with the existing topsoil will be included as part of the volume measurement of the loam in place and will not be measured or paid for separately.

4.02 PAYMENT ITEMS

- A. Loam Borrow and Topsoil Rehandled and Spread will be paid for at the Contract unit price per cubic yard which shall be full compensation for topsoil, soil additives, amendments, and any other materials necessary for the adjustment of topsoil, compaction, rough and fine grading, and other related materials, labor, and equipment required to complete the work.

751.00	Existing Topsoil Amended, Rehandled and Spread	Cubic Yard
751.10	Imported Loam Borrow	Cubic Yard

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section includes furnishing all labor, materials, equipment, seed and incidental materials necessary to accomplish all grass seeding and related work, complete in place, maintained, and accepted, in accordance with the Contact Drawings and Specifications. All grassed areas disturbed by the Contractor's operations shall be repaired as herein specified.
- B. The Contractor shall bear the responsibility and cost of furnishing and applying water or any other substances, as necessary to ensure the sustainability of grass seeded areas, as part of the work of this contract.

1.02 RELATED WORK:

- A. Section 32 91 00, Screened, Loam Borrow Reused
- B. Section 32 93 00, Trees, Shrubs, Groundcover and Landscaping

1.03 SUBMITTALS:

In accordance with requirements of Section 01 33 23, Submittals, the Contractor shall submit the following to the Engineer for review and approval:

- A. Information for seed mixes including the following:
  - 1. Name and address of the seed supplier.
  - 2. Source of origin and dates of harvest for each of the various types of seed
  - 3. Certification of seed mix composition and proportion, indicating named seed varieties by percent, percent germination, purity, and percent crop seed, percent inert matter, and percent weed seed content.
  - 4. Estimated number of seeds per pound of each type of seed in the mix
- B. Information detailing proposed limestone, fertilizers, insecticides, herbicides, fungicides, mulch materials, hydroseeding materials (as required), and slope protection material (as required) to be applied to seeded areas.
- C. Watering, fertilizing and maintenance schedule.

- D. Marked up prints indicating the square footage of all proposed seeded areas with quantities of various soil additives and amendments, and quantities of seed for each area prior to beginning work.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

#### A. LOAM BORROW:

1. Loam Borrow shall be as specified in Section 32 91 00, Screened Loam Borrow Reused.

#### B. LIMESTONE:

1. Lime shall be an approved agricultural limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide). The material will be ground such that 50 percent of the material will pass through a No. 100 mesh sieve and 98 percent will pass a No. 2 mesh sieve. Lime shall be uniform in composition, dry and free-flowing and shall be delivered to the site in the original sealed containers, each bearing the manufacturer's guaranteed analysis.

#### C. FERTILIZER:

1. Fertilizer shall be a complete, standard commercial fertilizer, homogenous and uniform in composition, dry and free-flowing, and shall be delivered to the site in the manufacturer's original sealed containers, each bearing the manufacturer's guaranteed analysis and marketed in compliance with State and Federal Laws. All fertilizer shall be used in accordance with the manufacturer's recommendations.
2. The analysis for supplemental maintenance fertilizer shall have a ratio of Nitrogen (N) – Phosphorous (P) – Potassium (K) of approximately 4 – 1 – 2 and shall be applied to deliver 1 pound of Nitrogen per 1000 square feet, or as approved by the Engineer. At least 50 percent of nitrogenous elements shall be Urea-form or derived from organic sources and contain no less than 3 percent water soluble Nitrogen.

#### D. SEED:

1. Seed shall be of an approved perennial variety mixture, the previous year's crop, clean, and high in germinating value. Weed seed content shall be less than 0.5 percent and include no noxious weeds. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates of compliance relative to mixture purity and germinating value. Seed shall be furnished and delivered in new, clean, sealed and properly labeled containers. All seed shall comply with

applicable State and Federal laws. Seed that has become wet, moldy or otherwise damaged shall not be accepted.

2. Grass seed for lawn areas shall conform to the following requirements:

Botanical and Common Names	Proportion by Weight	Germination Rate	Purity Minimum
Chewing's Fescue (Festuca rubra commutata)	30%	70%	97%
'Kentucky 31' Tall Fescue (Festuca arundinacea 'Kentucky 31')	30%	90%	98%
Kentucky Bluegrass (Poa pratensis)	20%	80%	85%
Perennial Ryegrass (Lolium perenne)	20%	90%	98%

3. Grass seed for athletic fields shall conform to the following requirements:

Botanical and Common Names	Proportion by Weight	Germination Rate	Purity Minimum
'Rebel II' Tall Fescue (Festuca arundinacea 'Rebel II')	80%	90%	90%
'Palmer III' Perennial Ryegrass (Lolium perenne 'Palmer III')	10%	90%	98%
'Baron' Kentucky Bluegrass (Poa pratensis 'Baron')	10%	80%	85%

E. HYDROSEED MULCH, TACKIFIERS AND WATER RETENTION AGENTS:

1. Wood fiber mulch for Hydroseed application shall be a manufactured product of natural wood cellulose fibers with a non-toxic green marking dye incorporated to ensure uniform distribution. Mulch shall be packed in sealed original containers, clearly labeled with brand name and manufacturer. It shall have delivered moisture content less than 12 percent.
2. Hydroseed tackifier shall be a powdered starch-based product approved by the Engineer. Hydroseed tackifier shall be applied in conjunction with the hydroseed slurry in accordance with the manufacturer's recommendations.

3. Moisture retention agent shall be a powdered starch-based product, approved by the Engineer, and shall be capable of retaining up to 400 times their weight in water. Moisture retaining agents shall be added to the hydroseed slurry in accordance with the manufacturer's recommendations. Moisture retention agent shall be 'Hydro-Gel', as manufactured by Finn Corporation, Fairfield, OH.

F. SLOPE EROSION PROTECTION:

1. Erosion control blanket shall be 100 percent biodegradable mesh with 100 percent biodegradable straw or straw/coconut fill. Fill shall be held together by biodegradable fastening. Weight shall be 0.50 pounds per square yard. Erosion control blankets shall be applied parallel to direction of water flow. The erosion control blankets shall be by North American Green, Evansville, IN or approved equal. For slopes 2:1 or greater, erosion control blanket shall be composed of 70 percent straw 30 percent coconut fiber, Model SC150. For slopes less than 2:1, erosion control blanket shall be a high velocity straw matting, Model S150.
2. Six-inch wire staples shall be placed in accordance with the manufacturer's recommendations to anchor the mesh material. Staples shall be biodegradable.

I. WATER:

1. Water shall be furnished by the Contractor, unless otherwise specified, and shall be suitable for irrigation and free from ingredients harmful to plant growth and viability. The delivery and distribution equipment required for the application of water shall be the furnished by the Contractor, at no additional cost to the Owner.

J. INSECTICIDES:

1. No insecticides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
2. Insecticides shall be EPA registered and approved for use in public open spaces. All insecticides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
3. Insecticide use shall be limited and selective, only to control specific insect infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.
4. Grub control insecticide shall be Proturf Insecticide III, as manufactured by A.M. Scotts & Sons, Inc.; Dursban Granules, as manufactured by Old Fox Chemical Corp., or APMC; or approved equal.

K. HERBICIDES:

1. No herbicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
2. All herbicides shall be EPA registered and approved for use in public open spaces. All herbicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
3. Herbicide for post-emergent application shall be glyphosate contact, 'Roundup', as manufactured by Monsanto, Inc., or approved equal.
4. Herbicide use shall be limited and selective, only to control specific weed infestations that have been identified by the Contractor or the Owner's Representative.

L. FUNGICIDES:

1. No fungicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
2. Fungicides shall be EPA registered and approved for use in public open spaces. All fungicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
3. Fungicide use shall be limited and selective, only to control specific fungal pathogenic disease infestations, as identified by the Contractor or the Owner's Representative that may result in the disfigurement, decline, or death of plant materials.

PART 3 - EXECUTION

3.01 GENERAL:

- A. All work shall be performed by skilled workers with a minimum of 2 years of seeded lawn construction and establishment experience and under the full-time supervision of a qualified foreman.
- B. Seeding operations shall not begin less than 4 days after the application of lime and fertilizer and the seedbed areas are reviewed and approved by the Engineer.
- C. Seeding shall be done when soil and weather conditions permit in early spring, until June 15, or from September 10 to October 15, unless otherwise approved. If it becomes necessary for seed to be sown after June 15, provisions shall be made for supplementary water and using a mulch cover over lawn areas.

- D. If there is a delay in seeding, during which weeds grow, or soil is washed out, the Contractor shall eliminate the weeds by chemical or physical means, or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.
- E. Seed shall be sown at the approved rate, on a non-windy day by machine, or as approved by the Engineer.
- F. The surface shall be kept moist by a fine spray until the seed shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 square feet, the Contractor shall reseed, roll, and water as necessary to obtain proper germination.
- G. If there is insufficient time in the planting season to complete soil preparations, fertilizing, and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor, or as required by the Engineer. In that event, a temporary cover crop shall be sown. This cover crop 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 area shall be fertilized and the permanent seed crop shall be sown as specified.
- H. Protection of all newly loamed and graded areas is required and shall be accomplished by whatever means necessary such as mulch applied with a tackifier, or by other means approved by the Engineer. The Contractor shall be responsible for the prevention of siltation in areas beyond the limit of work and for all means of protection throughout the maintenance period at no additional cost to the Owner.

### 3.02 SURFACE PREPARATION:

- A. If approved by the Engineer, the entire site area to be seeded shall be treated with an approved herbicide, in accordance with the manufacturer's instructions, not less than 7 days before the start of seeding operations.
- B. If approved by the Engineer, grub control insecticide shall be spread on the surface of the seedbed, in accordance with the manufacturer's instructions, after the seedbed has been properly graded, not less than 24 hours before the start of seeding operations.

### 3.03 BROADCAST SEEDING, PLACING MULCH AND SLOPE EROSION PROTECTION:

- A. The seed mix shall be broadcast at 6 pounds per 1000 square feet, as recommended by the seed supplier, or as required by the Engineer. Seed shall be divided into 2 equal amounts and uniformly distributed in 2 applications at right angles to each other. Seed shall then be raked lightly into the soil to a depth of 1/4-inch.
- B. If mulch is not necessary the seed shall be directly firmed into the soil with a roller that will apply pressure between 75 and 100 pounds per linear foot of width.

- C. Straw Mulch shall be used based on time of seeding as previously specified over all seeded areas, as designated on the plans, or as otherwise required. If mulch is to be used, it shall be loosely spread to a uniform depth at a rate of 4-1/2 tons per acre to provide ¼-inch of cover, or as otherwise required. The seed and mulch shall then be firmed into the soil with a roller that will apply a pressure between 75 and 100 pounds per foot of width.
- D. Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer, the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80 percent of the hay or straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.
- E. Slope erosion control blankets shall be placed as indicated on the plans or as required by the Engineer.

#### 3.04 HYDROSEEDING:

- A. The application of lime, fertilizer, grass seed and mulch may be accomplished in a single operation with the use of approved hydroseeding equipment. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The slurry shall be of such consistency that it can be sprayed from a hydroseed gun or through at least 200 feet of 1½- inch diameter hose. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of lime, fertilizer, grass seed, and mulch shall be equal to the specified quantities.
- B. Prior to the start of hydroseeding, the Contractor shall furnish to the Engineer, in writing, the weights of limestone, fertilizer, grass seed, mulch, tackifier (as required) and moisture retention agent (as required) per 100 gallons of water to be used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of hydroseeding operations are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other means.
- C. Seed shall be incorporated with the mulching material to obtain a minimum hydroseeded sown coverage of 200 pounds of the specified seed mix per acre, as recommended by the seed suppliers, or as required by the Engineer.
- D. Wood fiber mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise directed. Mulch shall be placed by spraying from an approved spraying machine with pressure sufficient to cover the entire area in a single operation.
- E. The Contractor shall immediately cleanup hydroseed oversprays from plant materials, pavements, furnishings, etc., to the satisfaction of the Engineer.

### 3.05 MAINTENANCE:

- A. The Contractor shall maintain and protect the entire seeded area, as necessary to ensure dense healthy growth, until completion of the guarantee period and final acceptance of the project, or for 60 days, whichever is longer. If lawns are planted in late summer or during the fall, maintenance shall continue through the following spring for at least 30 days. Maintenance shall include watering as specified, liming, fertilizing, removal of stones, control of weeds, insect pests and fungal pathogens, and regular mowing. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.
- B. The first cutting of lawn areas shall be done when the grass is between 2½ - to 3-inches in height. The lawn shall be cut no shorter than 2-inches in height and shall be regularly mowed as necessary to maintain the above-prescribed conditions. All cuttings shall be removed from the lawn during the maintenance period and disposed of off-site.
- C. The Contractor shall be responsible to regularly water seeded areas with the equivalent of 1-inch minimum of rainfall per week, or as necessary to develop and sustain dense, green growth.
- D. Six weeks after turf has established, and only during the months of April, May, or September, the Contractor shall apply fertilizer as specified above, at one half the rate recommended by the initial soils laboratory tests, or as required by the Engineer.
- E. The Contractor shall be responsible for securing all seeded areas from physical damage as necessary, including warning signs, barriers, temporary fencing, or other means of protection, through the guarantee period until final acceptance. All damaged areas shall be repaired to reestablish healthy vigorous growth of turf to the satisfaction of the Engineer, at no additional cost to the Owner. All temporary barriers shall remain the property of the Contractor and shall be removed by the Contractor upon final acceptance by the Engineer.
- F. Pavement shall be kept clean and clear of cuttings and debris at all times during the maintenance period to the satisfaction of the Engineer.

### 3.06 INSPECTION AND PRELIMINARY ACCEPTANCE:

- A. At the beginning of the planting season following that in which the permanent grass crop is sown, seeded areas will be inspected. Any section not showing dense, vigorous growth shall be promptly reseeded by the Contractor at no additional cost to the Owner. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor, as many times as necessary, in accordance with these specifications, until they are accepted.
- B. The Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of inspection for preliminary acceptance. The Engineer shall

recommend preliminary acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals, or replacements.

- C. Inspection and acceptance of seeded areas may be requested and granted in part, provided the areas for which acceptance is requested are relatively substantial in size, and with clearly definable boundaries. Acceptance and use of these areas by the Owner shall not waive any other provisions of this Contract.

### 3.07 GUARANTEE:

- A. Seeded areas shall be guaranteed until final acceptance of the project, or, in the case of late summer or fall planting, the guarantee period shall extend through the following spring.
- B. When the work is accepted in part, the guarantee period shall extend from each partial acceptance to the terminal date of the last guarantee period. All guarantee periods terminate at one time.
- C. Guarantee shall not apply to the replacement of seeded lawns resulting from the removal, loss, or damage due to occupancy of the project in any part; vandalism or acts of neglect on the part of others; physical damage by animals, vehicles, etc.; and Acts of God, including but not limited to, catastrophic fire, hurricanes, riots, war, etc.
- D. In the instance of curtailment of water by local water authorities (when supply was to be furnished by the Owner), the Contractor shall furnish all necessary water by water tanker, the cost of which will be approved and paid for by the Owner.

### 3.08 FINAL INSPECTION AND FINAL ACCEPTANCE:

- A. At the end of the guarantee period, the Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of final inspection for final acceptance.
- B. The Engineer shall recommend final acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The quantity of seeding shall be the number of square yards based on actual measurements made over the general contour of the areas, limed, fertilized and seeded, complete in place and accepted.
- B. This work includes soil preparation, one application of liming, one application of fertilizing, and one application of seeding complete in place in new lawn areas which price shall include full compensation for all labor, materials and equipment necessary to

do the required work.

- C. When a satisfactory stand of grass has not been established at the time of acceptance, no payment for seeding shall be allowed at the time of acceptance. At the time the final estimate is ready to be forwarded to the Contractor the seeded areas will again be inspected by the Engineer and if a satisfactory stand of grass and meadow has been established, the seeded areas with a satisfactory stand of grass and meadow will be included for Payment

4.02 PAYMENT ITEMS

765.01	Liming, Fertilizing and Seeding Lawn Areas	Square Yard
765.02	Aerating and Slice Seeding Existing Tree Critical Root Zone Areas	Square Yard
765.03	Athletic Field Seed Mix Area	Square Yard

END OF SECTION

NOT FOR BIDDING

SECTION 32 93 00

TREES, SHRUBS, GROUNDCOVERS, AND LANDSCAPING

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section includes furnishing all labor, materials, equipment, plants, and incidental materials necessary to perform all operations related to the planting of all trees, shrubs, vines, herbaceous plants, ground covers, and for all appurtenant work, complete in place, maintained, and accepted, in accordance with the Contract Drawings and Specifications.
- B. The Contractor shall bear the responsibility and cost of furnishing and applying water or any other substances, as necessary to ensure the sustainability of plant materials, as part of the work of this contract.
- C. SCREENED LOAM BORROW REUSED, of the Standard Specifications for the items of work specified herein.
- D. The work of this Section consists of providing all equipment, materials and labor necessary to supply and place Planting Soil and Structural Soil as indicated on the Drawings and as specified herein or both. Supplying and placement of Structural Soil shall include, but not be limited to:
  - 1. Supplying, placing, spreading and grading of all materials required in the Structural Soil system in tree ways, including sand-based Structural Soil and planting pit medium.

1.02 REFERENCES

- A. Commonwealth of Massachusetts Department of Transportation (MasDOT): Standard Specifications for Highways and Bridges
- B. American Society for Testing and Materials (ASTM): D 75 Practice for Sampling Aggregates D 422 Test Method for Particle-Size Analysis of Soils D1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-in. Drop
- C. A.O.A.C.: Association of Official Agricultural Chemists.
- D. USDA: United States Department of Agriculture
- E. AASHTO: American Association of State highway and Transportation Officials
- F. Massachusetts Department of Agriculture

### 1.03 SUBMITTALS

- A. Prior to planting, State nursery inspection certificates for all plant materials.
- B. Samples of the manufacturer's product data, as applicable, for the following materials:

- 1. Limestone.
- 2. Fertilizer.
- 3. Sphagnum Peat Moss.
- 4. Humus.
- 5. Organic Compost.
- 6. Manure.
- 7. Mulch.
- 8. Guying and Staking Apparatus.
- 9. Crepe Wrapping for tree trunks.
- 10. Anti-transpirant/Anti-desiccant.
- 11. Insecticides.
- 12. Herbicides.
- 13. Fungicides.

- C. Submit the following samples and submittals for approval in conformance with the requirements of Structural Soil herein.

- 1. Base Loam for use in manufacturing Structural Soil, Sand for use in manufacturing Structural Soil and the final, manufactured Structural Soil shall be sampled and tested in accordance with the following:

The Contractor shall provide a 2.5 lb representative sample from each proposed source of Base Loam, Sand, and organic amendment for testing, analysis, and approval. Additionally, the Contractor shall provide 2.5 lb representative samples of Structural Soil delivered to the site and stockpiled for use. Samples from on-site stockpiles of these three soil materials shall be taken as directed by the Engineer and packaged in the presence of the Engineer.

- 2. Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Engineer. Tests for gradation, organics, soil chemistry and pH shall be performed by a soil testing agency at the University of Massachusetts Soil and Plant Nutrient Testing Laboratory or an equal. Test reports shall include the following tests and recommendations:

- a. Sieve analysis shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by ignition. The silt and clay content shall be determined by a hydrometer test of soil passing the #200 sieve.
- b. Percent of organics shall be determined by the loss on ignition of oven-

- dried samples. Test Samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
- c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH). Nutrient levels shall be measured in parts per million (PPM). A Conductance Meter shall be used to measure Soluble Salt levels in soils: water extracts.
  - d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular planting objectives noted.
  - e. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists.
3. Limestone: Submit supplier's certification to the Engineer certifying that the limestone being supplied conforms to these Specifications.
  4. Fertilizer:
    - a. Submit product literature of planting fertilizer and 6 certificates showing composition and analysis.
    - b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.
  5. If biosolid compost is used as an organic component of the proposed planting soil mixture, the amount of organic material used shall not exceed agronomic rates for nitrogen and phosphorus for trees and shrubs, turf or ornamental perennials. Provide certificates of agronomic rates from vendor for organic matter used in loam borrow manufacturing process.
  6. Provide name of manufacturer of compost, telephone number of contact person at the manufacturer, the specific site of the manufacturing of the compost.
  7. All testing and analysis shall be at the expense of the Contractor.
  8. Submit the Landscape Contractor's qualifications showing past experience with installation of Structural Soils by outlining projects of similar quality, schedule requirements and construction detailing over the last 5 years. Qualifications shall include the names of all similar projects, year completed, location, description of the scope of work including the types and quantities of planting mix installed and the name, address and telephone number of the Department or the Engineer.
  8. Sand: Submit sieve test results and a ten-pound sample.

#### 1.04 DELIVERY, HANDLING, AND STORAGE

- A. Do not deliver or place soils in frozen, wet, or muddy conditions. Do not deliver or place materials in an excessively moist condition
- B. Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, allow material to drain to near optimum compaction moisture content.

#### 1.05 EXAMINATION OF CONDITIONS

- A. All areas to receive Structural Soil shall be inspected by the Contractor before starting work and all defects such as incorrect grading, compaction and inadequate drainage etc. shall be reported to the Engineer prior to beginning this work.
- B. The Contractor shall be responsible for judging the full extent of work requirements involved, including but not limited to the potential need for temporary storage and staging of soils, including moving soil stock piles at the site to accommodate scheduling of other work and the need to protect installed soils from compaction, erosion and contamination.

#### 1.02 RELATED WORK:

- A. Section 32 9100, SCREENED LOAM BORROW REUSED
- B. Section 32 92 19, SEEDING

#### 1.03 SUBMITTALS:

In accordance with requirements of Section 01 33 23 SUBMITTALS, the Contractor shall submit the following:

### PART 2- PRODUCTS

#### 2.01 PLANT MATERIALS:

- A. The Contractor shall furnish and plant all plant materials as shown on the plans and in the quantities and sizes listed thereon. No substitutions shall be permitted without the written approval of the Engineer.
- B. Plants larger than those specified in the Plant List may be used if approved by the Engineer. However, use of such oversized plants shall not be considered grounds for any increase in the contract price. If the use of larger plants is approved, the required

spread of roots or ball of earth shall be increased in proportion to the size of the plant and plant pits shall be increased as necessary.

- C. All plants shall be certified to have passed all required Federal and State inspection laws requiring ensuring freedom from plant diseases and insect infestations. The Contractor shall obtain clearance from applicable governing agencies, as required by law, before planting any plants delivered from outside the state in which they are to be planted.
- D. All plants shall be nursery-grown under climatic conditions and environmental stresses similar to those in the locality of the project. All plants shall originate from nurseries that are no more than one Hardiness Zone higher (as established by the Arnold Arboretum, Jamaica Plain, MA) than where the plant is to be installed. Plants also shall conform to the botanical names and standards of size, culture, and quality for the highest grades and standards as adopted by the American Association of Nurserymen, Inc. in the American Standard for Nursery Stock, ANSI-Z60.1, latest edition. All plants shall be legibly tagged with their proper botanical name.
- E. No heeled-in plants or plants from cold storage shall be used. All plants shall be typical of their species or variety and shall have a normal habit of growth. Plants shall be sound, healthy, and vigorous, well branched and densely foliated when in leaf; shall be free of disease, insects, eggs or larvae; and shall have healthy, well-developed root systems. All parts of the plant shall be moist and shall show active green cambium when cut.
- F. All nursery plants shall be balled and burlapped or container-grown and shall have been acclimatized for at least one growing season. Container-grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil together, firm and whole, after removal from the container. No plants shall be loose in the container. Container-grown plants shall have no girdling roots and shall not be in a root-bound condition. Plants shall remain in their container until planted.
- G. Care shall be exercised in digging and preparing field-grown plants for shipment and planting. Balled and burlapped materials shall have solid unbroken balls of earth of sufficient size to encompass all fibrous feeding roots necessary to ensure successful recovery and development of the plants. Balls shall be firmly wrapped in untreated biodegradable burlap and tied securely with wire cages and/or jute twine. Roots or balls of plants shall be adequately protected at all times from sun and drying winds. No plant shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during planting, or after the burlap, staves, wire cage, rope, or platform in connection with its transplanting have been removed. Soil characteristics (i.e., composition, texture, pH, etc.) of all field-grown plants shall closely match those of the soil where plant materials are to be planted.

- H. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated in the Plant List in the Drawings. The branching height for deciduous trees installed adjacent to or within walks shall be 7 feet minimum, having been pruned to this height at least 1 year prior to transplanting. Except when a clump is designated, the trunk of each tree shall be a single trunk growing from a single, unmutated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire, or other causes. All pruning cuts shall comply with acceptable horticultural practices. No pruning wounds having a diameter of more than 1½-inches shall be present. Any such wounds must show vigorous bark growth on all edges. Evergreen trees shall be branched to within 1 foot of the ground. No tree that has had its leader cut or die shall be accepted.
- I. Caliper measurements for tree trunks shall be taken 6-inches above ground for trees up to and including 4-inch caliper size and at 12-inches above ground for larger sizes.
- J. Shrubs shall meet the requirements for spread and/or height stated in the Plant List on the Drawings. The measures for height are to be taken from the crown or root flare to the average height of the top of the shrub mass (not the longest branch). The fullness of each shrub shall correspond to the trade classification "No. 1". Single stemmed or thin plants will not be accepted. The side branches must be generous, well-twigged and the plant as a whole must be well-bushed to the ground. The plants must be in a moist, vigorous condition, free from dead wood, bruises or other root or branch injuries.
- K. Herbaceous plants, vines and groundcovers shall be of the size, age and/or condition designated in the Plant List on the Drawings.
- L. Plants shall be delivered only after preparations for planting have been completed. Plants shall be handled and packed in a horticulturally approved manner and all necessary precautions shall be taken to ensure that plants arrive on-site in a healthy vigorous condition. Trucks used for transporting plants shall be equipped with covers to protect plants from windburn, desiccation, and overheating during transport. Plants that have not been thoroughly watered shall not be accepted at the planting site. Any plants delivered to the site in a dry or wilted condition shall be rejected and replaced at no expense to the Owner. All plant materials shall be protected, watered and otherwise maintained prior to, during, and upon delivery to the site.
- M. Plants shall be subject to inspection and approval by the Engineer at the place of growth, or upon delivery, for conformity to specification requirements as to quality, size, variety, and condition. Inspection and selection of plants before digging shall be at the option of the Engineer. The Contractor, or his representative, shall be present, if requested by the Engineer, for inspection of plants at the Nursery. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of work, for size and condition of balls and roots, disease, insects and latent defects or injuries. Rejected plants shall be removed immediately from the site.

Certificates of inspection of plant materials shall be furnished as may be required by Federal, State and other authorities to accompany shipments.

2.02 LOAM BORROW:

Loam Borrow shall be as specified in Section 32 91 00, SCREENED LOAM BORROW REUSED.

2.03 SOIL ADDITIVES AND AMENDMENTS:

A. LIMESTONE:

Lime shall be an approved agricultural limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide). The material will be ground such that 50 percent of the material will pass through a No. 100 mesh sieve and 98 percent will pass a No. 2 mesh sieve. Lime shall be uniform in composition, dry and free-flowing and shall be delivered to the site in the original sealed containers, each bearing the manufacturer's guaranteed analysis.

B. FERTILIZER:

1. Fertilizer shall be a complete, standard commercial fertilizer, homogeneous and uniform in composition, dry and free-flowing, and shall be delivered to the site in the manufacturer's original sealed containers, each bearing the manufacturer's guaranteed analysis and marketed in compliance with State and Federal Laws. All fertilizer shall be used in accordance with the manufacturer's recommendations.
2. Fertilizer for tree, shrub and groundcover plantings shall contain all major plant nutrients and minor trace elements essential to sustain plant growth and shall have the following analysis:

Nitrogen (N)	Phosphorous (P)	Potassium (K)
10%	10%	10%

3. As approved by the Engineer, a slow release root contact fertilizer installed at the time of planting, may be used in place of the above, at the discretion of the Contractor.

C. Organic Compost shall be a standard commercial product comprised of fully decomposed, 100 percent plant-derived, natural organic matter. Its composition shall furnish ample water holding capacity and cation exchange capacity for the retention of plant nutrients. Compost shall be free of sticks, stones, weed seeds, roots, mineral or other foreign matter and delivered air dry. It shall be free from excessive soluble salts, heavy metals, phytotoxic compounds, and/or substances harmful to plant growth and viability. Organic compost shall have an acidity range of 4.5 to 7.0 pH.

- D. Sphagnum Peat Moss shall be a standard commercial product. Its composition shall furnish ample water holding capacity and cation exchange capacity for the retention of plant nutrients. Peat moss shall be free of sticks, stones, weeds or weed seeds, roots, mineral or other foreign matter. It shall be free from toxic substances and/or compounds harmful to plant growth and viability. It shall be delivered air dry in standard bales and shall have an acidity range of 3.5 to 5.5 pH.
- E. Humus shall be natural humus, reed peat, or sedge peat. Its composition shall furnish ample water holding capacity and cation exchange capacity for the retention of plant nutrients. Humus shall be free of sticks, stones, weeds, roots, mineral or other foreign matter and/or toxic substances harmful to plant growth and viability. It shall be low in wood content, free from hard lumps and excessive amounts of zinc and delivered air dry in a shredded or granular form. The acidity range for humus shall be 5.5 to 7.5 pH, and the organic matter content shall be not less than 85 percent, as determined by loss on ignition. The minimum water holding capacity shall be 200 percent by weight on an oven-dry basis.
- F. Manure shall be well-rotted, leached, cow manure not less than 8 months or more than 2 years old. It shall be free of sawdust, shavings, or refuse of any kind and shall not contain more than 25 percent straw. It shall contain no substances harmful to plant growth. The Contractor shall furnish information regarding chemical disinfectants, if any, that may have been used in storage of the manure.

2.04 PLANTING SOIL:

Planting mix shall consist of 7 parts loam borrow and 1 part organic compost, humus, sphagnum peat moss, or manure, thoroughly blended.

2.04 STRUCTURAL SOIL:

Base Loam

- A. Base Loam as required for the work shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam shall also be free of quack-grass rhizomes, *Agropyron Repens*, and the nut-like tubers of nutgrass, *Cyperus Esculentus*, and all other primary noxious weeds. Base Loam shall not be delivered or used for planting while in a frozen or muddy condition. Base Loam for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

<u>Percent Passing</u>	<u>Minimum</u>	<u>Maximum</u>
<u>U.S. Sieve Size Number</u>		
10	100	--
18	87	100
35	65	92
60	45	80

140	26	46
270	16	32
0.002mm	2	5

- B. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 5 or less. (D80/D30 <5).
- C. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
- D. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
- E. The organic content shall be between 3.5 and 6.0 percent.

Sand

- A. Sand for Sand-Based Structural Soil, for Planting Pit Medium, for amending loam shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock free from loam or clay, surface coatings and deleterious materials with the following gradation.

<u>Percent Passing</u>	<u>U.S. Sieve Size Number</u>		<u>Minimum</u>	<u>Maximum</u>
10	100	--		
18	60	80		
35	25	45		
60	8	20		
140	0	8		
270	0	3		
0.002mm	0		0.5	

- B. Maximum size shall be (25mm) one inch largest dimension. The maximum retained on the #10 sieve shall be 10% by weight of the total sample.
- C. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D30) shall be 3.0 or less. (D70/D20 <3.0)
- D. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

Organic Amendment Materials (Compost)

- A. Compost for amending planting media shall be a stable, humus-like material produced from the aerobic decomposition of organic residues. The residues, if

biosolids, shall consist of compost meeting the required criteria as listed herein this Section or approved equal. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by the producer.

1. The ratio of carbon to nitrogen shall be in the range of 10:1 to 25:1.
2. Stability shall be assessed by either a CO<sub>2</sub> evolution test, a re-heating test, or the Solvita procedure. Protocols for each are specified by the coalition of Northeastern Governors Source Reduction Task Force (CONEG) in their 1966 report, "Model Procurement Specifications for Source Separated Compost," and the Solvita manual (version 3.5). For the CO<sub>2</sub> test, the compost respiration shall be no more than 6 mg CO<sub>2</sub>-C/gBVS day. For re-heating using the Dewar self-heating test, the maximum heat rise shall be no greater than 9 degree C above room temperature (20 to 25 degrees C). For the Solvita test, the compost must achieve a maturity index of 6 or more. Stability tests shall be conducted by Woods End Laboratories, Mt. Vernon, Maine or approved equal.
3. Pathogens/Metals/Vector Attraction reduction shall meet 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32, and Commonwealth of Massachusetts 310 CMR 32.00 (for applications to soils with human activity).
4. Organic Content shall be at least 40 percent (dry weight). One hundred percent of the material shall pass a (9mm) 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve according to procedures performed by the University of Massachusetts Amherst Soil and Plant Nutrient Testing Laboratory or equivalent laboratory. A 50-cc subsample of the screened and mixed compost is ground to pass the number 60 sieve. Two to three grams (+ 0.001g) of ground sample, dried to a constant weight at 105 degrees C is placed into a muffle furnace. The temperature is slowly raised (5C/minute) to 450C and maintained for three hours. The sample is removed to an oven to equilibrate at 105C and the weight is taken. Organic matter is calculated as loss on ignition.
5. PH: The pH shall be between 5.5 to 8.0 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis, Part 2, 1986.
6. Salinity: Electrical conductivity of a one to two soil to water ratio extract shall not exceed 2.0 mmhos/cm (dS/m).
7. The compost shall be screened to 3/8 inch maximum particle size and shall contain not more than 3 percent material finer than 0.002mm as determined by hydrometer test on ashed material.
8. Nutrient content shall be determined by the University of Massachusetts Amherst Soil and Plant Nutrient Testing Laboratory or equivalent laboratory and utilized to evaluate soil required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation

Exchange Capacity, and soil reaction (pH).

Soil Additives

- A. Acidulant for adjustment of Structural Soil and Planting Pit Medium pH shall be commercial grade flours of sulphur, ferrous sulfate, or aluminum sulfate that are unadulterated. Acidulants shall be delivered in unopened containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- B. Ground limestone for adjustment of Structural Soil pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve.

Planting Fertilizer

- A. Commercial fertilizer for use in Structural Soil shall be a product complying with the State and United States fertilizer laws. Deliver fertilizer to the site in the original unopened containers, which shall bear the manufacturer's certificate of compliance covering analysis, which shall be furnished to the Engineer. Fertilizer shall be free of nitrogen with percentages of weight for phosphorus and potassium as recommended by soil testing and analysis. Phosphorus and potassium shall be added to the top 18 inches of the Structural Soil in 6-inch lifts as the Structural Soil is placed. Rototill fertilizer into each successive 6- inch lift. Structural Soil shall be sampled and tested after application of fertilizer to verify that amended Structural Soil meets the requirements of the soil test analysis recommendations. Submit soil test results to the Engineer for review and approval.

2.05 WATER:

Water shall be furnished by the Contractor, unless otherwise specified, and shall be suitable for irrigation and free from ingredients harmful to plant growth and viability. The delivery and distribution equipment required for the application of water shall be furnished by the Contractor, at no additional cost to the Owner.

2.06 MULCH:

Mulch shall be fibrous pliable shredded softbark mulch, not exceeding ½-inch in width. It shall be 98 percent organic matter with a pH range between 3.5 and 4.5 and a moisture content not to exceed 35 percent. It shall be free of weeds, weed seeds, debris, and other materials harmful to plant growth and viability. Organic mulch shall be aged no longer than 2 years.

2.07 MATERIALS FOR STAKING, GUYING, AND WRAPPING:

- A. Tree stakes shall be sound, untreated 2 x 3 (nominal) x 8-foot length Douglas Fir reasonably free of knots. No paint or stain shall be used in conjunction with tree stakes.

Tying material shall be flexible braided nylon webbing, 3/4-inch wide and have a tensile strength of 900 pounds. Webbing shall be 'ArborTie', or approved equal.

- B. Drive anchors and guy wire assemblies shall be suitable for protecting trees and shall be sized in accordance with the manufacturer's recommendations. No materials shall be used for guying that will girdle, chafe, or otherwise injure trees.
- C. Tree wrap shall be duplex, waterproof kraft paper crinkled to 33-1/3 percent stretch, 4 to 6-inch wide strips. Tying materials shall be jute twine, 2-ply for shrubs and trees less than 3-inch caliper; 3-ply for larger plants.

2.08 TREE PAINT:

Tree paint shall not be used.

2.09 ANTI-TRANSPIRANT/ANTI-DESICCANT:

Anti-transpirant or anti-desiccant shall be 'Wilt-Pruf', as manufactured by Nursery Specialty Products, Inc., Groton Falls, NY, or approved equal. It shall be delivered in original sealed manufacturer's containers and used in accordance with the manufacturer's instructions.

2.10 INSECTICIDES:

- A. No insecticides shall be used on-site without the Contractor notifying and obtaining the prior approval of the Engineer.
- B. Insecticides shall be EPA registered and approved for use in public open spaces. All insecticides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
- C. Insecticide use shall be limited and selective, only to control specific insect infestations, as identified by the Contractor or the Owner's Representative that may result in the disfigurement, decline, or death of plant materials.

2.11 HERBICIDES:

- A. No herbicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
- B. Herbicides shall be EPA registered and approved for use in public open spaces. All herbicide shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.

- C. Herbicide for post-emergent application shall be glyphosate contact, 'Roundup', as manufactured by Monsanto, Inc., or approved equal.
- D. Herbicide use shall be limited and selective, only to control specific weed infestations that have been identified by the Contractor or the Owner's Representative.

2.12 FUNGICIDES:

- A. No fungicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
- B. Fungicides shall be EPA registered and approved for use in public open spaces. All fungicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
- C. Fungicide use shall be limited and selective, only to control specific fungal pathogenic disease infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.

PART 3 - EXECUTION

3.01 INSTALLATION STRUCTURAL SOIL:

Sub-surface Conditions

- A. Notify the Engineer of subsurface conditions, which will affect the Contractor's ability to complete the work.
- B. Locate and confirm the location of all underground utility lines and structures prior to the start of any excavation.
- C. Repair any underground utilities or foundations damaged by the Contractor during the progress of this work. The cost of all repairs shall be at the Contractor's expense.

Site Preparation

- A. Do not proceed with the installation of the Structural Soil material until all walls, curb footings and utility work in the area has been installed. For site elements dependent on Structural Soil for foundation support, postpone installation until immediately after the installation of Structural Soil.
- B. Excavate and dispose of all existing material required to install structural soil as shown on the plans and as directed by Engineer. Cost for excavating and disposal of all existing material will be included in the unit price of Structural Soil finished and installed. Compact the proposed subgrade to depths, slopes and widths as shown on the

Contract Documents. Maintain all required angles of repose of the adjacent materials as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures.

- C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents.
- D. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants has been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.
- E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
- F. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day. Any damage to the paving or Architectural work caused by the soils installation Contractor shall be repaired by the general Contractor at the General Contractor's expense.
- G. Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

### 3.02 PLANTING MEDIA MIX DESIGN

#### A. Mix Design: Sand-Based Structural Soil

1. The Sand-Based Structural Soil shall consist of a blend of five parts by volume of Sand, one part by volume of Base-Loam and two parts by volume of Organic Amendment. Blending of the components shall be carried out with earth moving equipment prior to placement. The components shall be blended to create a uniform mixture as determined by the Engineer. The final mix shall have an organic content between 2.5 and 3.5 percent and conform to the following gradation requirements for material passing a Number 10 sieve.

- The Structural Soil design mix shall meet the following criteria:

<u>U.S. Sieve Size Number</u>	<u>Percent Passing Minimum</u>	<u>Percent</u>	<u>Passing</u>
			<u>Maximum</u>
10	100		-
18	68		90
35	38		63
60	18		39
140	9		18
270	4		9
002 mm	1		2

- Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.
- The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.5 or less. ( $D70/D20 < 3.5$ )
- Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

### 3.03 PLANTING PIT MEDIUM

- Planting pits shall be backfilled around trees with a blend of two parts by volume of Sand, to one part by volume Base Loam, and one part by volume Organic Amendment. Blending of the components shall be carried out with earth moving equipment prior to placement. The components shall be blended to create a uniform mixture as determined by the Engineer. The final mix shall have an organic content between 4 and 7 percent and conform to the following gradation requirements for material passing a Number 4 sieve.
- The Planting Pit mix shall meet the following criteria:

<u>U.S. Sieve Size Number</u>	<u>Percent Passing Minimum</u>	<u>Percent Passing Maximum</u>
10	100	-
18	73	93
35	55	82
60	28	51
140	18	27
270	11	18
.002 mm	1	4

- Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.

4. The ratio of the particle size for 80% passing (D70) to the particle size for 30% passing (D30) shall be 4.0 or less. ( $D_{80}/D_{30} < 4.0$ )
5. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

### 3.04 PLACEMENT OF SAND BASED STRUCTURAL SOIL

- A. Contractor shall obtain Engineer's written approval of previously completed work of rough grading of subsoil prior to commencing loam borrow or Structural Soil placement work.
- B. Immediately prior to dumping and spreading the Structural Soil, the subgrade shall be cleaned of all debris or rubbish. Such material shall be removed from the site. After subgrade levels have been reached, and immediately prior to placing Sand-Based Structural Soil the entire subgrade area shall be thorough compacted, then loosened to a minimum depth of four inches utilizing the teeth on the bucket of a backhoe or by deep raking.
- C. After loosening, Sand-Based Structural Soil shall be spread in lifts not greater than eight inches and compacted with a minimum of two passes of vibratory compaction equipment to a density between 90 and 94 percent Standard Proctor Maximum Dry Density in accordance with compaction standards of ASTM D1557 Method D. During the compaction process, all depressions caused by settlement or compaction shall be filled with additional Structural Soil and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades. Sand-Based Structural Soil shall be placed to a depth of two feet within the areas shown on the Drawings.
  1. Phase the installation of the Structural Soil such that wheeled equipment does not have to travel over already installed soil. If it is determined by the Engineer that equipment must travel over already installed Structural Soil, provide one-inch thick steel plate ballast over the length and width of travel to cover Structural Soil and protect it from compaction.

### 3.05 PLANTING

- A. Contractor to follow standard planting procedures for deciduous trees as specified, provided, installed, and paid for under Section, PLANTING, unless otherwise noted herein.
- B. Placement of Planting Pit Medium in Tree Pits:
  1. After subgrade levels have been reached in tree pits, a minimum of four inches of Sand-Based Structural Soil shall be placed and compacted as a base for the root ball. After setting root balls in accordance with Section PLANTING, tree pits shall be backfilled with Planting Medium Pit as described in this Section in six-inch lifts and tamped to 84 to 88 percent Modified Proctor Maximum Dry

Density. The surface area of each lift shall be scarified by raking prior to placing the next lift.

- C. All plants shall be watered immediately following placement in their final locations as necessary to thoroughly moisten rootball and planting pit medium and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit and in the Structural Soil. The Contractor shall inspect tree pits in plant bed 24 hours after initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, the Contractor shall immediately notify the Engineer. The Engineer will recommend remedial measures based upon site conditions.
- D. All plants shall be subject to inspection and approval by the Engineer upon delivery to the site. No materials shall be planted until approval is received.
- E. All work shall be performed by skilled workers with a minimum of 2 years planting experience, in accordance with accepted horticultural/nursery practices, under the full-time supervision of a Certified Nurseryman or Arborist.
- F. All balled and burlapped plants that cannot be planted immediately upon delivery shall be set on the ground and the root balls shall be well protected with soil, wet moss, or other acceptable material. All foliage shall be protected and covered with perforated shade materials.
- G. The planting season for shrubs shall extend from the time the soil becomes workable in the spring until new growth appears, and from September 15 until November 30 in the fall. Deciduous trees and shrubs shall be planted only when dormant, either prior to bud break and/or before leaves appear in the spring, or subsequent to their leaf drop in the fall. Ground covers shall be planted only after the last frost in the spring through mid-May. Planting season periods may be extended if weather and soil conditions permit only with the written approval of the Engineer. Extended or out-of-season planting requirements shall include application of antitranspirant and extra water as needed. Plant guarantee periods shall remain as stated below. Planting shall not be permitted in frozen ground.
- H. All plant locations and outlines for planting beds shall be staked out for review and potential adjustment by the Engineer before any excavation is begun. In the event that rock, underground construction work or obstructions are encountered in any proposed planting pit or bed, the Engineer may select alternate locations. Where locations cannot be changed, the obstruction shall be removed, subject to the Engineer's approval, to a depth of not less than 3 feet below grade and not less than 6-inches below the bottom of the root ball when plant is properly set at the required grade. Removal of boulders or obstructions greater than 1 cubic yard in size shall be subject to approval and will be paid for by the Owner. No ledge will be removed to create planting pits or beds
- I. All planting pits shall be excavated with sloped walls, wider at the top than at the bottom, and scarified to eliminate glazing. Tree pits shall be at least 2 feet greater in diameter than the root ball of earth or root system. Shrub pits shall be at least 1 foot

greater than the diameter of the root ball. Planting pits shall not be deeper than the height of the root ball.

- J. When excavation occurs in areas of heavily compacted earth, stones, concrete chunks or other foreign matter, pits shall be dug at least 3 times the width of the rootball. Excavated material from plant pits shall be disposed of as required.
- K. Container plants shall be removed from their growing container before planting. If roots are densely matted, the outer root mass shall be scored, sliced vertically, with a sharp knife to separate roots. All herbaceous plants and groundcovers shall be evenly spaced to produce a uniform effect and staggered in rows at intervals designated on the contract drawings.
- L. Shrubs and trees shall be set in the center of planting pits, plumb and straight, and at such a level that after settlement the crown of the roots will be 1-inch above the surrounding finished grade. Root ball masses shall not be loosened, broken or damaged. When balled and burlapped plants are set, planting mixture shall be compacted around bases of balls to fill all voids. All tying materials, twine and rope shall be cut and removed. Biodegradable burlap shall be laid back or cut away from the top half of the ball. If a wire basket is present, the upper 2/3 of the basket shall be cut away and removed. Do not remove the entire basket. Roots or bare root plants shall be properly spread out and planting mixture carefully worked in among them. Broken or frayed roots shall be cleanly cut.
- M. Backfill plant pits with planting mixture in layers of not more than 9-inches and firmly tamp each layer and water to sufficiently settle the backfilled soil before the next layer is put in place. When the planting pit is 2/3 backfilled, the hole shall be flooded and watered thoroughly so that the water level reaches the top of the planting pit. Allow water to soak in, then complete the backfilling operation. Immediately after planting pit is backfilled, a shallow basin 3-inches deep and slightly larger than the pit shall be formed with a ridge of soil for water retention. Form a common basin for plant materials throughout mass planting beds. After planting, lightly till the soil in planting beds between planting pits and rake smooth to eliminate compaction of soils.
- N. All planting hole basins shall be flooded with water twice within the first 24 hours of planting, and watered not less than twice per week until final acceptance of the work.
- O. Stake trees immediately after planting as detailed. All staking apparatus shall be adequate to hold the tree in a vertical position under severe weather conditions. All staking apparatus and tree trunk wrapping shall be removed and disposed of off-site by the Contractor at the end of one growing season.
- P. Immediately after planting and staking operations are complete, all plant pit basins and plant beds shall be covered with approved mulch to the depths designated on the plans. Mulch shall not contact tree bark, cover tree root flares, or shrub crowns. No mulch shall be applied prior to the first watering.

- Q. The pruning of trees and shrubs shall only be permitted to remove dead or dying branch limbs and tips, sucker growth, water sprouts, crossing or rubbing branches, broken or damaged branches, diseased or insect infested limbs, and to preserve the natural character of the plant. Plant materials shall be pruned in accordance with American Nurserymen Association Standards and as required by the Engineer. Questionable weak limbs and branch removals that may disfigure the plant shall be left to the discretion of the Engineer. The tree leader shall never be permitted to be cut. Pruning shall be done with clean, sharp tools. All large pruning cuts that are ½-inch in diameter or larger shall be made along the bark branch ridge. Pruning cuts shall not breach or otherwise interfere with the branch collar. All pruning cuts less than ¼-inch diameter shall be made with hand pruners as close to the main stem as possible without damaging the cambium or bud. Tree paint shall not be used to cover pruning cuts.
- R. As the work proceeds, the Contractor shall remove all debris from the site, including but not limited to branches, rock, paper, and rubbish. All areas shall be kept clean, neat and in an orderly condition at all times. Prior to final acceptance, the Contractor shall cleanup the entire area to the satisfaction of the Engineer.

### 3.06 MAINTENANCE:

- A. Maintenance shall begin immediately after each plant is planted and shall continue until completion of the guarantee period and final acceptance of the project. Plants shall be watered, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected. Tree guys and stakes shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.
- B. Settled plants shall be reset to proper grade and position, planting pits and common basins restored, and dead materials removed and replaced. Planting beds and individual basins shall be neat in appearance, maintained to their original layout lines and kept free of weeds. Mulch shall be replaced as required to maintain proper depths.
- C. Contractor shall make arrangements to provide sufficient water to maintain all trees, shrubs and plant materials until final acceptance. Plants shall be sprayed with anti-transpirant or anti-desiccant if required by seasonal conditions or as required by the Engineer.
- D. Planting areas shall be protected against trespass and damage of any kind during the maintenance period. This shall include the furnishing and installation of approved temporary fencing if necessary. If any plants become damaged during the maintenance period, they shall be treated or replaced as required by the Engineer at no additional cost to the Owner.

### 3.07 INSPECTION AND PRELIMINARY ACCEPTANCE:

- A. Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of inspection for preliminary acceptance. The Engineer shall recommend preliminary acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.
- B. Inspection and acceptance of plantings may be requested and granted in part, provided the areas for which acceptance is requested are relatively substantial in size, and with clearly definable boundaries. Acceptance and use of these areas by the Owner shall not waive any other provisions of this Contract.

### 3.08 GUARANTEE:

- A. All plant materials shall be guaranteed for a period of one year after the date of completion of the specified maintenance period and preliminary acceptance of the project by the Owner.
- B. When the work is accepted in part, the guarantee period shall extend from each partial acceptance to the terminal date of the last guarantee period. All guarantee periods terminate at one time.
- C. Plants shall be healthy, free of pests and disease. Plants shall exhibit vigorous growth, shall bear foliage of normal density, size and color and shall have no less than seventy-five percent (75%) of their branches alive at the end of the guarantee period. If the leader of any single-leader species is dead, the entire plant shall be considered dead.
- D. Any plant required under this Contract that is dead or unsatisfactory, as determined by the Engineer, shall be removed from the site. These shall be replaced as soon as weather permits during the specified planting season, at no additional cost to the Owner, until the plants live through one year.
- E. All replacements shall be plants of the same kind and size as specified on the Plant List. They shall be furnished and planted as specified above.
- F. The guarantee of all replacement plants shall extend for an additional one-year period from the date of their acceptance as replacement.
- G. Guarantee shall not apply to the replacement of unacceptable plants resulting from the removal, loss, or damage due to occupancy of the project in any part; vandalism or acts of neglect on the part of others; physical damage by animals, vehicles, etc.; and Acts of God, including but not limited to, catastrophic fire, hurricanes, riots, war, etc.
- H. In the instance of curtailment of water by local water authorities (when supply was to be furnished by the Owner), the Contractor shall furnish all necessary water by water tanker, the cost of which will be approved and paid for by the Owner.

3.09 FINAL INSPECTION AND FINAL ACCEPTANCE:

- A. At the end of the guarantee period, the Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of final inspection for final acceptance.
- B. The Engineer shall recommend final acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. Item 751.40, Structural Soil shall be measured per cubic yard, installed complete-in-place all which price and payment shall constitute full compensation for complete compliance with requirements of this item, including providing, testing, amending, placing, spreading, compacting and fine grading.
- B. The cost for excavating and disposal of all existing material required to install Structural Soil as shown on the drawings and as directed by the Engineer will be included in the unit price of Structural Soil finished and installed.
- C. Item 760.00, Aged Pine Bark Mulch shall be measured per cubic yard, installed complete-in-place all which price and payment shall constitute full compensation for complete compliance with requirements of this item, including placing, spreading, compacting and fine raking.
- D. The quantity of trees and shrubs measured as provided above will be paid for at the contract unit prices each for planting of the types, species and sizes called for in the bid schedule. The unit price per planting items shall include furnishing and delivering all plants, furnishing and delivering prepared backfill soil and fertilizer, digging plant pits, planting, pruning, weeding, watering, cleanup, plant establishment work and maintenance including replacements, and for all labor, equipment, tools and incidentals necessary to complete the work prescribed in this section. All screened loam additives required for planting shall be included in the plant costs.

4.02 PAYMENT ITEMS

751.40	Structural Soil	Cubic Yard
760.00	Aged Pine Bark Mulch	Cubic Yard
771.10	Acer rubrum 'Brandywine', Red Maple 'Bandywine', 3"-3 1/2" cal.	Each
771.11	Acer saccharum 'Green Mountain', Sugar Maple 'Green Mountain', 2"-2 1/2" cal.	Each
771.12	Gleditsia triacanthos var. Inermus 'Skyline', Honey Locust Skyline, 3-3 1/2" cal.	Each
771.13	Prunus cerasifera 'Thunder Cloud', Thunder Cloud Cherry, 3"-3 1/2" cal.	Each
771.14	Prunus Sargentii, Sargent Cherry, 2"-2 1/2" cal.	Each
771.15	Prunus kwanzan, Kwanzan Cherry, 2"-2 1/2" cal.	Each
771.16	Quercus palustris, Pin Oak, 3"-3 1/2" cal.	Each
771.17	Ulmus americana 'Valley Forge', American Elm 'Valley Forge', 3"-3 1/2" cal.	Each
771.18	Cornus sericea 'Artic Fire', Arctic Fire Red Osier Dogwood, 24"-30" Spread	Each
771.19	Ilex verticillata 'Winter Gold', Winter Berry Holly 'Winter Gold', 24"-30" Spread	Each
771.20	Ilex verticillata 'Winter Red', Winter Berry Holly, "Winter Red", 24"-30" Spread	Each
771.21	Pachysandra procumbens, Allegheny Spurge, Flats of 50	LS
771.22	Carex flacca 'Blue Zinger', Blue Sedge, #2 pot	LS
771.23	Carex pensylvanica, Pennsylvania Sedge, #2 pot	LS
771.24	Liriodaphne spicata, Creeping Liriodaphne, #2 pot	LS
771.25	Rhus aromatica 'Gro-Low', Gro-Low Sumac, #2 pot	LS

END OF SECTION

SECTION 33 05 26.13

TRACER TAPE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.
- B. Tape samples shall also be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.02 TRACER TAPE:

- A. Tracer tape shall be at least 3-inches wide.
- B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18-inches with ordinary pipe locaters.
- C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.
- D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER", "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30-inches to identify the pipe.
- E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

Electric	Red
Water	Blue
Sewer & Drain	Green

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12-inches below the proposed ground surface.
- B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

### PART 4 – COMPENSATION

#### 4.01 METHOD OF PAYMENT

- A. The bid price for tracer tape and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.
- B. The bid price shall be included in all work necessary to perform the required work of specifications sections but not limited to:
  - a. 33 11 13.13, Ductile Iron Pipe and Fittings
  - b. 33 11 13.16, Water Service Connections
  - c. 33 11 13.31, Polyvinyl Chloride Pressure Pipe and Fittings
  - d. 33 11 13.41, Fittings and Connections to Existing Water Mains
  - e. 33 11 13.43, Insulations for Pipelines
  - f. 33 31 13.16, PVC Gravity Pipe and Fittings
  - g. 33 41 13.22 Corrugated Polyethylene (HDPE) Drainage Pipe

#### 4.02 PAYMENT ITEMS

- A. The bid price for all field tracer tap shall be included in unit bid pricing but not limited to items, 347.10, 347.11, 347.20, 256.XX, 347.20 and all other incidental work necessary for final completion of the items as specified.

END OF SECTION

## SECTION 33 11 13.13

### DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers the furnishing, handling, hauling, laying, jointing, testing and disinfecting of all ductile iron pipe, including fittings and appurtenant work as indicated on the drawings and as specified. The work under these items shall conform to the relevant provisions of Section 300 of the Standard Specifications, the Town of Brookline, Department of Public Works, Water and Sewer Division's "Instructions to Contractors and Engineers for the Installation of Water System Components" (September 2014) and the following: The work shall include the furnishing and installation of all materials required to remove and reset existing hydrants or to relocate existing water pipes in the event the existing pipes are found to conflict with proposed drainage or utility construction.

##### 1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 33 11 13.13, WATER SERVICE CONNECTIONS
- C. Section 33 11 13.16, CONNECTIONS TO EXISTING WATER MAINS
- D. Section 33 11 13.43, INSULATION FOR PIPELINES
- E. Section 33 12 22, HYDRANTS AND VALVES

##### 1.03 QUALITY ASSURANCE:

- A. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates of such tests.
- B. In addition, the Owner reserves the right to have any or all pipe, fittings and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

##### 1.04 REFERENCES:

- A. The following standards, latest version thereof, form a part of this specification as referenced:

American Water Works Association (AWWA)

AWWA	C104	Cement-Mortar Lining for Ductile- Iron Pipe and Fittings
AWWA	C105	Polyethylene Encasement for Ductile Iron Pipe Systems
AWWA	C110	Ductile-Iron and Gray-Iron Fittings Water
AWWA	C111	Rubber Gasket Joints for Ductile- Iron Pressure Pipe and Fittings
AWWA	C116	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
AWWA	C150	Thickness Design of Ductile-Iron Pipe
AWWA	C151	Ductile-Iron Pipe, Centrifugally Cast for Water
AWWA	C153	Ductile-Iron Compact Fitting for Water Service.
AWWA	C600	Installation of Ductile-Iron Water Mains & Their Appurtenances
AWWA	C651	Disinfecting Water Mains

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of all shop drawings shall be submitted to the Engineer for review.
- B. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the ductile iron pipe, type of joint, fittings, couplings, filling rings, restrained joints, and lining and coating in accordance with specifications.

PART 2 - PRODUCTS

2.01 PIPE:

- A. The Contractor shall use push-on joint type ductile iron pipe unless otherwise indicated on the plans or specified herein.
- B. All ductile iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151.
- C. Unless otherwise indicated or specified, ductile iron pipe shall be Thickness Class 52.

2.02 JOINTS:

- A. Joints for ductile iron pipe shall conform to AWWA C111.
- B. Pipe and fittings shall be furnished with approved joint restraining appurtenances as specified herein, or within the limits as indicated on the drawings, to keep the piping from pulling apart under pressure.

2.03 FITTINGS:

- A. Fittings shall conform to the requirements of AWWA C110 or C153 as appropriate and shall be of a pressure classification at least equal to that of the pipe with which they are used.
- B. The Contractor shall use ductile iron fittings. Cast-iron, Class 250 fittings may be substituted, upon approval of the Engineer, for ductile iron fittings.
- C. Unless otherwise indicated, fittings shall have all bell mechanical joint ends.

2.04 GASKETS, GLANDS, NUTS AND BOLTS:

- A. Gaskets, glands, nuts, bolts and accessories shall conform to AWWA C111 or C153 as appropriate.
- B. Gaskets shall be of plain tipped rubber, suitable for exposure to the liquid within the pipe.
- C. Glands shall be ductile or cast iron.
- D. Bolts and nuts shall be high strength alloy.

2.05 LINING AND COATING:

- A. The inside of pipe and fittings shall be given a cement lining and asphaltic seal coat in accordance with AWWA C104. The thickness of the lining shall be double that specified in AWWA C104.
- B. The outside of pipe and fittings shall be coated with the standard asphaltic coating specified under the appropriate AWWA Standard Specification for pipe and fittings.
- C. Machined surfaces shall be cleaned and coated with a suitable rust preventative coating at the shop immediately after being machined.

2.06 FLEXIBLE COUPLINGS:

- A. The Contractor shall use solid sleeve coupling fittings for joining pipe. With the approval of the Engineer, sleeve-type flexible couplings may be substituted.

- B. All sleeve-type couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
- C. Couplings shall be cast or ductile iron and shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
- D. Sleeve-type couplings shall be made by Dresser Mfg. Div., Bradford, PA; Smith-Blair, Inc., San Francisco, CA; Romac Industries Inc., Seattle, WA; Ford Meter Box Co., Wabash, IN; or be an approved equal.
- E. Couplings for buried pipe shall be Dresser 153; Smith-Blair Type 441 or 443; Romac Style 501; Ford Style FC1 or FC2; or approved equal.

2.07 JOINT RESTRAINTS:

- A. Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, anchoring and joint restraint methods shall be utilized. Methods shall be restrained joint systems. The number of joints to be restrained shall be determined in accordance with Table 1, as shown on the construction plans or provided by the Engineer.
- B. Restrained joint systems for standard mechanical joint fittings or push on joint pipe shall be restraining glands (Megalug by EBAA Iron Sales Inc., Eastland, TX; StarGrip by Star Pipe Products, Houston, TX; RomaGrip by Romac Industries, Inc., Sultan, WA; Sigma One-Lok by Sigma Corporation, Cream Ridge, NJ; or approved equal) and restraining gaskets (Fast-grip joint by American Cast Iron Pipe Company, Birmingham, AL; Field Lok 350 Gasket by United States Pipe and Foundry Company, Birmingham, AL; Sure Stop 350 Restrained Joint Gaskets by McWane Ductile, Phillipsburg, NJ; or approved equal). Methods that rely on the use of friction clamps and/or retainer glands with set screws alone are not acceptable.
- C. Restrained joint systems for non-standard or modified joints shall be Flex-Ring or Lok-Ring by American Cast Iron Pipe Company, Birmingham, AL; TR-Flex Joint by United States Pipe and Foundry Company, Birmingham, AL; Super-Lock Joint by Clow Corporation, Bensenville, IL; Fastite Joint by Atlantic States Cast Iron Pipe Company, Phillipsburg, NJ; Snap-Lok or Bolt-Lok by Griffin Pipe Products Company, Oak Brook, IL; or approved equal.
- D. Concrete thrust blocks may only be used for 6-inch, 8-inch, 10-inch, or 12-inch pipe where use of a joint restraint system is not feasible. Use of concrete thrust blocks shall be installed with the minimum bearing area (in square feet) against undisturbed material in accordance with the following:

Size of Main	90° Bends, Tees, Caps and Plugs	45° Bends and Wyes	22-½° Bends	11-¼° Bends
6- & 8-inch	5	4	2	2

10- & 12-inch	12	9	5	2
---------------	----	---	---	---

- D. Tie rods may only be used for 6-inch, 8-inch, 10-inch, or 12-inch pipe where use of a joint restraint system is not feasible. Bolts shall have adequate length to allow nuts on both sides of the gland. Tie bolts shall have the same diameter as the tie rods and be in accordance with the following:
- E.

Pipe Size	Tie Rod	
	Number	Diameter
6	2	½"
8	2	¾"
10	2	¾"
12	4	¾"

- F. Location of restrained joints shall be based on Table 1, as shown on the construction plans or provided by the Engineer. All joints that occur within the restrained length listed in Table 1, for the specific application, shall be restrained. For example, for a 90° bend, 8-inch unwrapped pipe, the restrained length required is 33 feet. Therefore, all joints within 33 feet of the 90° bend must be restrained.

2.08 POLYETHYLENE ENCASUREMENT:

- A. Where called for on the drawings, the pipe shall be encased in polyethylene conforming to AWWA C105.
- B. Polyethylene encasement shall be either linear low density, minimum 8 mils thick or high density, cross-laminated, minimum 4 mils thick. Polyethylene encasement shall be clearly marked at a minimum of every 2-feet along its length with print that does not contain hazardous material. Markings shall contain manufacturer's name, manufacture year, AWWA C105, minimum film thickness, and 'Warning – Corrosion Protection – Repair any damage.'
- C. Adhesive tape shall be dielectric tape, suitable for use with polyethylene encasement. The use of duct tape shall not be accepted.

PART 3 - EXECUTION

3.01 INSPECTION BEFORE INSTALLATION:

Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.

3.02 HANDLING AND CUTTING:

- A. Any pipe or fitting which has a damaged lining, scratched or marred machine surface and/or abrasion of the pipe coating or lining shall be rejected and removed from the job-site.
- B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
- D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting ductile iron pipe. Hydraulic squeeze cutters are not acceptable for cutting ductile iron pipe. Travel type cutters or rotary type abrasive saws may be used. All cut ends shall be examined for possible cracks caused by cutting.
- E. Lined and coated pipe and fittings shall be assembled and installed with approved packing or gaskets of the type recommended by the pipe manufacturer for the particular lining used.

### 3.03 INSTALLATION:

#### A. DEPTH:

1. The pipe shall be installed with a minimum of 5'-0" of cover, unless specifically indicated otherwise on the plans or required by the Engineer.
2. Where pipe is installed at less than the required cover, the Contractor shall furnish and install insulation in accordance with Section 33 11 13.43, INSULATION FOR PIPELINES, or as required by the Engineer.

#### B. PIPE AND FITTINGS:

1. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
2. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
3. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure good alignment both horizontally and vertically.

4. In buried pipelines, each pipe shall have firm bearing along its entire length.
5. Castings to be encased in masonry shall be accurately set, with the bolt holes, if any, carefully aligned.
6. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.
7. Fittings shall not be used to clear beneath or above an existing structure or pipeline unless approved by the Engineer. The water main shall be brought to a depth sufficient to clear the structure or pipeline without the use of bends.

C. TEMPORARY PLUGS:

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

D. PUSH ON JOINTS:

1. Joining of push-on joint pipe shall conform to AWWA C600.
2. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled.
3. Deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in AWWA C600. The tables in AWWA C600 indicate the maximum permissible deflection for 18 and 20-foot pipe lengths. Maximum permissible deflections for other lengths shall be in proportion to such lengths.

E. MECHANICAL JOINTS:

1. All mechanical joint glands shall be restraint glands as manufactured by EBAA Iron "Megalug" or approved equal.
2. Assembling of fittings with mechanical joint ends shall conform to AWWA C600.
3. If effective sealing of the joint is not attained at the maximum torque indicated in the above standard, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be overstressed to tighten a leaking joint.
4. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the following table. These values indicate the maximum

permissible deflection for 18-foot lengths. Maximum permissible deflections for other lengths shall be in proportion to such lengths.

Pipe Deflection Allowances  
Maximum permissible deflection, inches

<u>Diameter of Pipe (inches)</u>	<u>Mechanical-Joint</u>
6	27
8-12	20
16	13.5
20	11
24	9

F. RESTRAINED JOINTS:

1. Joining of restrained joint piping shall conform to the manufacturer's recommendations.
2. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled.
3. Deflection of alignment at a joint shall not exceed the appropriate permissible deflection recommended by the manufacturer.
4. All restraining appurtenances (and tie rods) shall be coated with an approved bituminous paint after assembly. The completed joint shall be inspected and the paint repaired/touched-up as necessary.

G. SLEEVE-TYPE COUPLINGS:

1. Pipe ends shall be cleaned thoroughly prior to installation. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferable by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed 90 foot-lb. for joints up to 24-inches.

3.04 POLYETHYLENE ENCASEMENT:

- A. The pipe to be encased shall be thoroughly cleaned of all soil and debris prior to installation of the polyethylene encasement. No soil or debris shall be allowed to enter the encasement during or after its installation.

- B. Polyethylene encasement shall be installed using Method A as described in AWWA C105, with the encasement joints coincident with pipe joints. Adhesive tape shall be used to secure the encasement.
- C. Minimum overlap of polyethylene encasement shall be 24-inches, 12 inches on each side of pipe joints.
- D. If required, two layers of polyethylene encasement shall be installed. The first layer shall be completely installed on and secured to the length of pipe before the second layer is installed.
- E. Tears, cuts and other damage shall be repaired with a piece of polyethylene covering secured with adhesive tape, when approved by the Engineer. Otherwise, the damaged length of polyethylene shall be replaced at the Contractor's expense.
- F. Care shall be taken when backfilling to avoid damage to the polyethylene encasement.
- G. Service and fitting connections shall be made by making an x-shaped cut in the polyethylene and folding back the cut film. Immediately following completion of the connection, the film shall be secured to the connection with adhesive tape and the cut area repaired. Service connections shall be wrapped with polyethylene encasement for a minimum of 3 feet from the point of connection to the encased pipe.
- H. At the junctions between wrapped and unwrapped pipe the polyethylene encasement shall be extended a minimum of 3 feet beyond the end of the pipe scheduled to be encased and the ends of the encasement securely taped so that no soil can enter the encasement.

### 3.05 TESTING:

- A. Prior to the hydrostatic pressure test, the piping shall be thoroughly flushed clean of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings. Flushing velocity shall be a minimum of 2.5 ft. /sec.
- B. The installed pipe shall be pressure tested in accordance with AWWA Standard C600.

### C. HYDROSTATIC PRESSURE TEST:

1. Unless otherwise approved, all pipelines shall be given a hydrostatic pressure test between line valves. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner or Engineer shall have the privilege of using its own gauges.
2. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when desired.

3. Pipelines intended for buried service shall be tested after backfill and compaction of the trench.
4. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. The Contractor shall follow established procedures for filling the pipe and expelling trapped air to avoid exposing the piping system to water-hammer. If blowoffs are not available at high points for releasing air, the Contractor shall excavate as required and install the necessary taps. If the Contractor changes the grade of pipe installation, he will be responsible for locating the taps at the correct location in the system for testing. Taps shall be installed at the beginning and end of each disinfection run. After completion of the test, if so required by the Engineer, the Contractor shall remove corporations used for testing; plug the holes; and backfill as necessary.
5. The section under test shall be maintained full of water at working pressure for a period of 24 hours prior to the hydrostatic pressure test being applied to stabilize the pipeline with respect to movement under pressure, water absorption by the lining, etc. The pipeline may require several cycles of pressurizing and bleeding trapped air prior to beginning the test.
6. When hydrants are in the pipeline test section, the hydrostatic test shall be made against the main valve in the hydrant. The hydrostatic test shall not be conducted against the branch valve.
7. The hydrostatic test shall consist of raising the water pressure within the test section to a pressure not less than 1.25 times the working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the working pressure of the lowest elevation of the test section. The specified test pressure shall be corrected to the elevation of the test gauge.
8. The hydrostatic test shall be of at least a 2 hour duration. The test pressure shall not vary by more than +/- 5 psi for the duration of the test. Test pressure shall be maintained within this tolerance by adding makeup water through the pressure test pump into the pipeline test section.
9. The amount of makeup water (testing allowance) added to the test section shall be accurately measured by suitable methods and shall not exceed the maximum allowable quantity of makeup water. No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{140,000}$$

Where:

L = makeup water, in gallons per hour  
S = length of test section, in feet  
D = nominal diameter of pipe, in inches  
P = average test pressure, in psi (gauge)

10. If the section fails to pass the hydrostatic pressure test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified hydrostatic test.

### 3.06 DISINFECTION AND FLUSHING:

- A. The Contractor shall disinfect the lines carrying potable water.
- B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto.
- C. In general, the procedure of disinfecting the main shall be to apply the chlorine through a tap in one end of the section and bleed it off through a tap at the other end.
- D. The applied dosage shall be such as to produce a chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours.
- E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- F. Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense.
- G. After treatment, the main shall be flushed with clean water until the residual chlorine concentration is less than 0.2 mg/l. The flushing rate shall be 3.0 ft/sec to achieve full scour of sand particles.
- H. Before disposing of the water used in disinfecting and flushing water mains the Contractor shall thoroughly neutralize it through the application of a reducing agent, as referenced in AWWA C651 and C655.
- I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 (Option A – One sample taken after flushing is complete followed by another sample taken 16 hours after the first sample or Option B – Two samples taken 15 minutes apart after a 16 hour post flushing rest period) for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation

stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.

- J. Bacteriological sampling and testing shall be conducted by a state certified laboratory certified for total and fecal coliform analyses of potable water.
- K. Testing shall be done by a laboratory approved by the Engineer, in accordance with Standard Methods, and shall show the absence of coliform organisms.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

The work under this item shall conform to the relevant provisions of these specifications and the following:

- A. This work shall consist of furnishing and installing 6” Ductile Iron Pipe to the relocated hydrant and main line. Excavating, cutting, removing and disposing of the existing water main and service will be included and paid for under this item
- B. No separate payment will be made for excavation, gravel borrow and crushed stone bedding and backfill, insulation, thrust restraints, sampling, flushing, testing and disinfection, removing existing main, tapping sleeve, valve, gate box, fittings, mechanical joints, but all costs in connection therewith shall be included in the unit prices bid for the respective item.

##### 4.02 PAYMENT ITEMS

Work under this item shall be paid for at the contract unit price per linear foot, which price shall be full compensation for all material, excavation, disposal, hauling, shoring sand backfill, labor, equipment, removing existing main and miscellaneous items to complete the work as specified.

303.60	6” Ductile Iron Pipe	Linear Foot
--------	----------------------	-------------

END OF SECTION

SECTION 33 11 13.16

SERVICE CONNECTIONS (WATER SERVICES)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing and installation of new water service connections and the repair, replacement, and/or transfer of existing water service connections as shown on the drawings, as specified herein, and as required by the Engineer.

1.02 RELATED WORK:

- A. Section 32 91 19, SEEDING
- B. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS

1.03 REFERENCES:

- A. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

ASTM B88 Seamless Copper Water Tube  
ASTM B584 Copper Alloy Sand Castings for General Applications

ASTM D2737 Polyethylene (PE) Plastic Tubing  
American Water Works Association (AWWA)

AWWA C800 Water-Service Line Fittings

AWWA C651 Disinfecting Water Mains

AWWA C901 Polyethylene Pressure Pipe & Tubing, 1/2-inch through 3-inch for Water Service

Federal Specifications (FS)

FS WW-T-799C Tube, Copper, Seamless

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Six sets of manufacturer's literature of the materials of this section for review.

## PART 2 - PRODUCTS

### 2.01 SERVICE PIPING:

- A. Piping for buried copper water services shall be continuous Type K annealed seamless copper water tubing conforming to ASTM B88 Standard Specification for Seamless Copper Water Tube or U.S. Federal Specification WW-T-799C for Tube, Copper, Seamless. Tubing shall be diameter as stated on plans, as required unless otherwise indicated.
- B. Copper service pipe for installation in meter pits, valves, manholes, and backflow preventer cabinets, 2 inch diameter and smaller, shall be ASTM B88, Type "K", hard copper tubing.
- B. Couplings, if required, for existing to new service pipe connections shall have compression connections on the inlet and compression connections on the outlet. Couplings shall be made of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the coupling shall be 5 parts per billion (ppb). Couplings shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.

### 2.02 CORPORATION STOPS:

- A. Corporation stops shall be made of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the corporation stops shall be 5 ppb. Corporation stops shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.
- B. Corporation stops shall be approved for use with copper water service pipe. The inlet shall have AWWA taper thread (CC) connections and the outlet shall have compression connections.

### 2.03 CURB STOPS:

- A. Curb stops shall be of brass as specified in AWWA C800. All brass components that come into contact with potable water shall be made from either CDA/UNS Brass Alloys C89520 or C89833 and shall not contain more than twenty five hundredths of one percent (0.25% or less) total lead content by weight. The lead leach limit of the curb stops shall be 5 ppb. Curb stops shall be NSF/ANSI 61 Annex F and Annex G and NSF/ANSI 372 certified by an ANSI accredited organization and shall be stamped or

embossed with a mark or name indicating that the product is manufactured from a low-lead alloy, as specified above.

- B. Curb stops shall be ball style and the inlet and the outlet shall have compression connections.
- C. Curb stops shall be by **Red Hed Manufacturing Co., Lincoln, RI; Ford Meter Box Co., Inc., Wabash, IN; Mueller Co., Decatur, IL; or approved equal.**

#### 2.04 WATER METER / GATE BOX

- A. Water Meter will be supplied by Town with provisions for a remote ARB reading device to be mounted to the cabinet.
- B. Gate Box will be supplied by the Town

#### 2.05 CABINETS:

- A. Cabinet shall be stainless steel, welded construction, powder coated exterior black color finish with lockable access door on heavy duty hinged, located on two sides of the enclosure.

#### 2.06 BACKFLOW PREVENTER:

- A. Backflow preventer for the water play and irrigations shall be 1-1/2" Reverse Pressure device, Febco #LF825 (1-1/2"), or approved equal

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Where new water mains are being installed and existing water services are to be transferred to the new main, the Contractor shall discontinue the existing water services by shutting down the corporation stop at the old water main, unless specifically otherwise required by the Engineer. The Contractor shall take special care to minimize the interruption of existing water service.
- B. The Contractor shall tap a new corporation stop, cut the existing service piping and connect the new service piping to the old service piping using an approved coupling at a point between the main and the existing curb stop and box.
- C. Where transfers are to be made and the existing curb stop and box cannot be utilized or a new curb stop and box is required, the Contractor shall connect the new service piping to the existing service piping using an approved coupling approximately 12-inches from the curb stop on the building side of the stop.

- D. Where transfers are being made and the existing service is of lead, galvanized steel, or iron, the service shall be replaced to the curb stop and box unless otherwise required. If required, the curb stop and box shall be replaced as specified above.
- E. Curb stops and boxes shall be set plumb, flush with the ground or paved surface, and centered with the box located directly over the stop. The box shall be set on a concrete block or flat stone. Earth fill shall be carefully tamped around the boxes to a distance of 4 feet on all sides of the box or to the undisturbed face of the trench, if less than 4 feet.
- F. Curb stops shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify the proper operation of all curb stops in the presence of the Engineer and/or Owner following completion of the project and prior to the acceptance of substantial completion.
- G. All services shall be installed at **5 feet 0 inches of cover** unless otherwise required by the Engineer.
- H. Service connections shall be tested and disinfected in accordance with AWWA standards.
- I. The installation of all the new backflow preventers and meter and related valves, hangers, straps, clamps and other appurtenances shall be accomplished in a safe, and complete manner by licensed plumbers.
- J. All work in this regard shall be completed in compliance with Municipal standards and industry requirements and to the satisfaction of the project representatives.

### 3.02 CONDUCTING TEST FOR LEAKAGE

#### A. Description

1. Test for leakage shall be conducted on all portions of completed water work. In trenches, the testing shall be conducted with partial backfilling over the barrel of the pipe, but all joints between the pipe, fittings and valves shall be left exposed for the duration of the tests. At the Engineer's direction, temporary backfilling of certain portions of the completed work may be required prior to conducting leakage tests.
2. All air shall be released and the mains completely filled with water, and after allowing twenty-four (24) hours for absorption the internal pressure shall be built up to an equivalent hydrostatic head of three hundred-fifty (350) feet of water of one hundred-fifty (150) pounds per square inch, and so maintained for the full period of tests.
3. All visible leaks in the joints shall be stopped, and any cracks or defective pipe, fitting or valve shall be removed and replaced.
4. The test shall be conducted for a period of at least sixty (60) minutes after

all visible leaks have been stopped, and the inflow of water from a force pump to maintain the required pressure shall not exceed seventy (70) gallons per inch of internal diameter per mile of pipe per day.

5. In case the specified rate of leakage is exceeded, the leaks shall be found and repaired, and the mains shall be re-tested until the required conditions are met.

### 3.04 OTHER DATA

- A. All iron castings shall conform to the latest revisions of ASTM Designation A126 or physical and chemical requirements.
- B. All ironwork shall be thoroughly cleaned and painted with two coats of asphaltum or other varnish or paint that the Engineer may approve. After the valves are assembled and tested, a third coat shall be applied to the exterior. All composition tool-finished work shall be left bright and unpainted.
- C. All connections shall be made permanently watertight.
- D. All other work required to complete the improvements listed in the Contract Documents shall be accomplished in accordance with the requirements of the Town.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

The work under this item shall conform to the relevant provisions of these specifications and the following:

- A. This work shall consist of furnishing and installing ¾" type K copper tubing to the drinking fountains from the water main on Tappen Street and the proposed Plumbing Cabinet. The accepted work will be paid for at the contract unit price per linear foot complete in place and shall include full compensation for furnishing all labor, equipment, curb stops, connections, valves, valve box, excavation of bituminous concrete, sawcutting, working within the roadway, tapping existing main, drainage stone, connection to existing pipe and materials necessary to complete the work in a satisfactory manner. Copper tubing pipe inside water manholes, cabinets and vaults shall be paid for under those items.
- B. This work consist of furnishing and installing the 2" Type K pipe from the water main to the plumbing cabinet. The accepted work will be paid for at the contract unit price per linear foot complete in place and shall include full compensation for furnishing all labor, equipment, curb stops, connection to existing pipe, connections, taps, valves, drainage stone, and materials necessary to complete the work in a satisfactory manner. Copper tubing pipe inside water manholes, cabinets and vaults shall be paid for under those items. .

- C. Backflow Preventers, Water Meter and Cabinet shall be measured and paid as a lump sum item. All materials, equipment, valves, hangers, sleeves, and labor required to complete the work specified herein, shown on the drawings, and directed by the engineer is the responsibility of the contractor to provide under this item.

4.02 PAYMENT ITEMS

Work under these items shall be paid for at the contract unit price per linear foot and lump sum accordingly, which price shall be full compensation for all materials, excavation, backfilling, sawcutting, pavement excavation, placing bituminous concrete, permanent pavement patch, drainage stone, curb stops, gates, valves, sand backfill, labor, placing castings furnished by the Owner, equipment, and miscellaneous items to complete the work as specified.

347.10	¾" Copper 'Type K' Tubing	Linear Foot
347.20	2" Copper 'Type K' Tubing	Linear Foot
374.10	Backflow Preventer, Water Meter And Cabinet	Lump Sum

END OF SECTION

NOT FOR BIDDING

SECTION 33 11 13.31

POLYVINYL CHLORIDE PRESSURE PIPE  
AND FITTINGS (SCHEDULE 80)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers polyvinyl chloride (PVC) Schedule 80 pressure pipe and fittings as shown on the drawings and as specified herein.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 33 05 26.13, TRACER TAPE
- C. Section 33 39 13, PRECAST MANHOLES AND CATCHBASINS

1.03 QUALITY ASSURANCE:

- A. All pipe and fittings shall be inspected and tested at the factory as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Engineer sworn certificates of such tests.
- B. In addition, the Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

1.04 REFERENCES:

- A. The following standards form a part of this work as referenced:

American Society for Testing and Materials (ASTM)

ASTM	D1784	Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
ASTM	D1785	Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM	D2321	Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

ASTM	D2464	Specification for Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM	D2467	Specification for Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM	D2564	Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM	D2855	Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
American Water Works Association (AWWA)		
AWWA	C651	Disinfecting Water Mains

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings shall consist of manufacturer's scale drawings, cut, or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the PVC pressure pipe, type of joints, fittings, and couplings in accordance with specifications.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS:

- A. Unless specifically designated otherwise, PVC pipe and fittings shall be Schedule 80 with solvent weld joints as specified herein.
- B. PVC Schedule 40 pipe shall conform to ASTM D1785.
- C. PVC Schedule 80 socket fittings shall conform to ASTM D2467 and PVC Schedule 80 threaded fittings to ASTM D2464.
- D. Rigid PVC used in the extrusion of the pipe and fittings shall be Type 1, Grade 1 compound as stated in ASTM D1784 with a cell classification of 12454B.
- E. Both pipe and fittings shall be the product of one manufacturer.
- F. Solvent cements shall conform to ASTM D2564.

## PART 3 - EXECUTION

### 3.01 HANDLING AND CUTTING PIPE:

- A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring surfaces, and abrasion of the pipe coating.
- B. Any fittings showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work site.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.
- D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting PVC pipes.

### 3.02 INSTALLING PIPE AND FITTINGS:

- A. Unless specifically otherwise required by the Engineer, all piping shall have not less than 5-feet of cover.
- B. Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.
- C. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
- D. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
- E. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure good alignment both horizontally and vertically.
- F. In buried pipelines, each pipe shall have firm bearing along its entire length.
- G. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as recommended by the manufacturer.
- H. Pipe shall be installed underground in a manner that will ensure that external loads will not subsequently cause a decrease of more than 5 percent in the vertical cross-section dimension (deflection). When installing the pipes, they shall be rotated 180° in order

that the upper quadrant of the pipe which was exposed to direct sunlight will not be backfilled upon.

- I. Except as specifically designated otherwise, installation shall be in accordance with ASTM D2321.
- J. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

### 3.03 JOINTING OF PIPE:

- A. Jointing of pipe shall conform to ASTM D2855.
- B. Except where threaded fittings are required to adapt to metallic pipe, all fittings and pipe shall be solvent welded.
- C. Cementing operations shall not be attempted where the temperature of the pipe, fittings or ambient exceed 100°F. Cementing operations should be done out of direct sunlight.
- D. The following procedures shall be followed:
  - 1. Inspect fitting sockets and pipe ends to make sure there is no chipping, gouging or scratching.
  - 2. Clean pipe ends and fitting sockets carefully, using clean cotton wiping rags.
  - 3. Try fitting sockets on pipe to make sure the pipe will penetrate at least one third of socket depth.
  - 4. Cut pipe to length required. Pipe must be cut at right angle to linear section, deburred on the I.D. and deburred and slightly beveled on the O.D.
  - 5. Apply a coat of primer to fitting socket using a scrubbing motion to ensure penetration. Repeated applications may be necessary.
  - 6. Apply a liberal coating of primer to the end of the pipe, using a scrubbing motion to ensure penetration. Extend this coating slightly beyond fitting socket depth. Be sure the entire surface is well softened.
  - 7. Apply a second coat of primer to fitting socket and without delay apply a coat of cement to pipe end using a scrubbing motion to achieve an even coating.
  - 8. Without delay, apply a uniform, light coating of cement to fitting socket making sure that cement does not penetrate fitting portion of socket.

9. Without delay, apply a second coating of cement to pipe end and immediately insert pipe in fitting. Turn the pipe or fitting 1/4 turn during assembly to distribute the cement evenly, but not after the pipe is bottomed in the socket. Remove all excess cement from around pipe and fitting with clean dry rag. Assembly should be completed within 20 seconds after the last application of cement. Do not hammer or pound fittings or pipe during the assembly process. Socket and pipe surfaces must be soft and wet at time of assembly.
10. Hold socket and pipe in fully bottomed position until cement "sets up." Hold tightly for 30 seconds on sizes up to 4-inches.
11. Assemblies should not be handled excessively until set- up. Allow the following times:
 

30 minutes	at 60° to 100°F
1 hour	at 40° to 60°F
2 hours	at 20° to 40°F
4 hours	at 0° to 20°F

3.04 PRESSURE AND LEAKAGE TESTS:

- A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to the pipe.
- B. Except as otherwise required, all pipelines shall be given combined pressure and leakage tests in sections of approved length. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner/Engineer reserves the right to provide separate gages.
- C. Subject to Engineer approval, the Contractor may schedule the time to make the tests when he desires.
- D. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. The Contractor shall follow established procedures for filling the pipe and expelling trapped air to avoid exposing the piping system to water hammer. If blowoffs are not available at high points for releasing air, the Contractor shall make the necessary excavations and install the necessary taps. If required by the Engineer, the Contractor shall plug said holes after completion of the test and do the necessary backfilling.
- E. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- F. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gage location)

to the pressure rating of the pipe. If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed to pass the pressure test.

- G. Following or during the pressure test, the Contractor shall make a leakage test by metering the flow of water into the pipe, while maintaining a pressure of 150 pounds per square inch in the section being tested. If the average leakage during a two hour period exceeds 1 gallon per hour per 1,000 feet of pipe or 50 joints, the section shall be considered as having failed the leakage test.
- H. If the section fails to pass the pressure and leakage test, the Contractor shall locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- I. If in the judgement of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as required and approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line within the above leakage and pressure requirements.

### 3.05 DISINFECTION AND FLUSHING:

- A. The Contractor shall disinfect the lines carrying potable water.
- B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto.
- C. In general, the procedure of disinfecting the main shall be to apply the chlorine through a tap in one end of the section and bleed it off through a tap at the other end.
- D. The applied dosage shall be such as to produce a chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours.
- E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- F. Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense.
- G. After treatment, the main shall be flushed with clean water until the residual chlorine concentration is less than 0.2 mg/l.
- H. The Contractor shall dispose of the water used in disinfecting and flushing in an approved manner.

- I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.
- J. Testing shall be done by a laboratory approved by the Engineer, in accordance with Standard Methods, and shall confirm the absence of coliform organisms. A standard plate count may be required at the option of the Engineer.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

The work under this item shall conform to the relevant provisions of these specifications and the following:

- A. This work shall consist of furnishing and installing 2” PVC Class 200, SDR 21 pipe from the main line after the backflow to the splash pad vault. Fittings for PVC pipe shall be schedule 80 solvent weld PVC. PVC pipe inside water manholes, cabinets and valve pits shall be paid for under those items.

4.02 PAYMENT ITEMS

Work under these items shall be paid for at the contract unit price per linear foot, which price shall be full compensation for all material, excavation, sand backfill, labor, equipment, and miscellaneous items to complete the work as specified.

347.11	2” PVC PIPE	Linear Foot
--------	-------------	-------------

END OF SECTION

SECTION 33 11 13.34

CONNECTIONS TO EXISTING WATER MAINS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section covers connections to existing water mains, complete.
- B. The Contractor shall furnish all pipe, fittings, valves, tapping machines, if required, and appurtenances. The Contractor shall do all excavation and backfill as required.

1.02 RELATED WORK:

- A. Section 01 51 36, TEMPORARY WATER SERVICE.
- B. Section 03 05 00, FIELD CONCRETE
- C. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS.
- D. Section 33 12 22, HYDRANTS AND VALVES. (Tapping sleeves and valves specified).

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.01 CONTRACTOR OPERATIONS:

- A. The Contractor shall make all connections to the existing mains as indicated on the drawings and as herein specified.
- B. The Contractor shall develop a program for the construction and putting into service of the new work subject to the approval of the Engineer. All work involving cutting into and connecting to the existing work shall be planned so as to interfere with operation of the existing facilities for the shortest possible time and when the demands on the system best permit such interference even to the extent of working outside of normal working hours to meet these requirements.
- C. The Contractor shall have all possible preparatory work done prior to making the connection and shall provide all labor, tools, material, and equipment required to do the work in one continuous operation.

- D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting its operations to the needs of the Owner's water supply. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.
- E. Under no circumstances shall any customers be without water for a period of more than 4 hours without prior approval of the Owner. Should it appear that any customer will be without water for more than 4 hours, the Contractor shall install temporary water service as specified in Section 01 51 36, TEMPORARY WATER SERVICE where required by the Engineer.
- F. Existing pipeline that is not to be abandoned but is damaged by the Contractor during the work shall be replaced by it at its own expense in a manner approved by the Engineer.

### 3.02 TAPPING CONNECTION TO EXISTING MAINS:

- A. Tapping connections to the existing mains, where indicated on the drawings, shall be made with service pressure in the main, using tapping sleeves and valves and a suitable tapping machine.
- B. Other connections to existing mains shall be made with the main out of service, unless otherwise required by the Engineer. Such connections will not require tapping sleeves and valves but connections as indicated on the drawings.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The bid price for connecting to existing water mains and the requirements set herein shall be full compensations for all work including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, tools and all other incidental work necessary for final completion of items as specified.
- B. The bid price shall be included in all work necessary to perform the required work of specifications sections but not limited to:
  - a. 33 11 13.13, Ductile Iron Pipe and Fittings
  - b. 33 11 13.16, Water Service Connections
  - c. 33 12 22, Hydrants and Valves

### 4.02 PAYMENT ITEMS

- A. The bid price for all connections into existing water mains related work shall be included in unit bid pricing for items 376.20, 303.60, 347.10, 347.20 and all other incidental work necessary for final completion of the items as specified.

END OF SECTION

NOT FOR BIDDING

SECTION 33 12 22

HYDRANTS AND VALVES

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers the removal of the existing Hydrant and the furnishing and installation a new hydrants at the proposed location include all valves and appurtenances as indicated on the drawings and as specified herein.
- B. New Pipe shall be paid for under the appropriate pipe sections.
- C. The Contractor shall make all necessary arrangements with the Town of Brookline Water and Fire Departments for the necessary shutdowns of service. The Town of Brookline Water Department may establish the time of shutdown to be within the normal daily low demand period.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS FOR WATER MAINS
- C. Section 33 11 13.34, CONNECTIONS TO EXISTING WATER MAINS

1.03 REFERENCES:

- A. Town of Brookline, Department of Public Works, Water and Sewer Division's "Instructions to Contractors and Engineers for the Installation of Water System Components" (September 2014)
- B. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

ASTM	A48	Gray Iron Castings
ASTM	A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM	A536	Ductile Iron Castings
ASTM	B62	Composition Bronze or Ounce Metal Castings
ASTM	D429	Test Method for Rubber Property Adhesion to Rigid Substrate.

American Water Works Association (AWWA)

AWWA	C500	Metal Seated Gate Valves For Water Supply Service
AWWA	C502	Dry-Barrel Fire Hydrants
AWWA	C504	Rubber-Seated Butterfly Valves
AWWA	C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA	C515	Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service
AWWA	C550	Protective Interior Coatings for Valves and Hydrants
		Federal Specifications (FS)
FS	TT-V-51F	Varnish, Asphalt

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF THE GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings shall be submitted for the hydrants, valves and appurtenances indicating type of joint, and lining and coating, etc., in accordance with the specifications.
- B. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements.
- C. Refer to Paragraph 3.01.A for Affidavit of Compliance required to be submitted.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Valves shall open left (counterclockwise).
- B. Hydrants shall open left (counterclockwise).

2.02 HYDRANTS:

- A. Hydrants shall conform to the requirements of AWWA C502. They shall be equipped with a 5-1/4-inch main valve and 6-inch mechanical joint inlet.
- B. Hydrants shall have one 4-1/2-inch pumper and two 2-1/2- inch hose connections. Threads shall be NST.

- C. Hydrant operating and nozzle cap nuts shall be of pentagonal shape and measure one and one half inches from flat to point. The height of the nut shall not be less than one inch.
- D. All internal operating parts including main valve, main valve seat, drain valve mechanism, operating rod, etc., shall be removable without excavating.
- E. Main valve seat rings shall be made of brass or bronze, and shall screw into a seat retainer ring or sub-seat, which shall also be made of brass or bronze.
- F. Hydrants shall be traffic models with frangible bolts or breakaway couplings. Details of hydrant design shall meet the requirements of the Owner.
- G. For purposes of standardization, hydrants shall be Kennedy K-81-D as manufactured by Kennedy Valve Co., Elmira NY, American AVK 2780 as manufactured by American AVK, Minden NV or Darling B-84-B as manufactured by American Flow Control, Beaumont, TX.

#### 2.03 HYDRANT PAINT:

- A. Hydrants shall have factory epoxy coating. Where epoxy coating does not match Owner's standard colors, hydrants shall additionally be thoroughly cleaned and given two shop or field coats of paint in accordance with AWWA C502 and the instructions of the paint manufacturer. Paint color shall be the standard hydrant color of the Owner as follows:
  - 1. Barrel – Safety Red
  - 2. Bonnet - Reflective White
  - 3. Nozzle Caps – Reflective White
- B. If the hydrants are delivered with the Owner's standard color, they shall be given one matching field coat of an alkyd gloss enamel. If the hydrants are not delivered with the Owner's standard color, they shall be given two coats of an alkyd gloss enamel, colors as indicated above.
- C. Hydrant paint shall be as manufactured by Sherwin-Williams, Cleveland, OH; Tnemec Company, Inc., Kansas City, MO; or Minnesota Mining and Manufacturing Co. (3M), St. Paul, MN; or approval equal.
- D. Alkyd gloss enamel shall be 801 DTM by Sherwin-Williams, 2H-Tneme by Tnemec; or approved equal. Reflective paint shall be Scotchlite #7211 by 3M.

#### 2.04 RESILIENT SEAT GATE VALVES:

- A. Resilient seat, wedge type gate valves shall be manufactured to meet all applicable requirements of AWWA C509 or AWWA C515. All valves shall be bubble-tight at 200 psi water working pressure, tested in both directions.

- B. Valve bodies shall be of cast or ductile iron and shall have non-rising threaded bronze stems acting through a bronze stem nut. Opening nuts shall be 2-inches square and shall open as specified above. All buried valves shall have mechanical joint ends.
- C. Valve wedges shall be of ductile iron with resilient seating surfaces permanently bonded to the wedges in strict accordance with ASTM D429 or attached to the face of the wedges with stainless steel screws. Each valve shall have a smooth, unobstructed water way free from sediment pockets.
- D. Valves shall have low friction, torque-reduction thrust bearings. All O-rings and gaskets shall be removable without taking the valves out of service.
- E. An NSF 61-approved epoxy coating, which is safe for potable water, shall be applied to exterior and interior valve surfaces.
- F. Valves for horizontal applications shall have Delrin wedge covers, and be specifically designed for horizontal installation.
- G. Resilient seat gate valves shall be as manufactured by Clow Valve Co., Oskaloosa, IA; Mueller Co., Decatur, IL; American Valve and Hydrant, Birmingham, AL; Waterous Co., S. St. Paul, MN; MH Valve, Anniston, AL; Kennedy Valve, Elmira, NY; or approved equal.
- H. Post indicating valve assemblies shall have a post and indicator as an integral part of the resilient seated gate valve assembly. The unit shall be provided with a detachable crank which OPENS the valve in a counterclockwise direction. Shafts shall be Type 304 stainless steel. Post indicators and valves shall be UL listed, FM approved. Post indicators and valves shall be as manufactured by Pratt, Clow or approved equal.

#### 2.05 TAPPING SLEEVES AND VALVES:

- A. Tapping sleeves and valves shall consist of a split cast iron or ductile iron sleeve tee with mechanical joint ends on the main and a flange on the branch. Tapping-type gate valves shall have one flange and one mechanical joint end. The valves shall conform to the requirements hereinbefore specified for gate valves and shall be furnished with a 2-inch square operating nut. The Contractor shall be responsible for verifying the outside diameter of the pipe to be tapped.
- B. Oversized valves shall be provided as required to permit the use of full size cutters. Before backfilling, all exposed portions of bolts used to hold the two halves of the sleeve together shall be heavily coated with two coats of bituminous paint comparable to Inertol No. 66, Special Heavy. Sleeves shall be of cast iron furnished with rubber gaskets. Gaskets shall cover the entire area of flange surfaces.
- C. Tapping sleeves and valves shall be as manufactured by Clow Valve Co., Oskaloosa, IA; Mueller Co., Decatur, IL; American Valve and Hydrant, Birmingham, AL; MH Valve, Anniston, AL; Kennedy Valve, Elmira, NY; US Pipe, Chattanooga, TN; or approved equal.

## 2.06 BUTTERFLY VALVES:

- A. Buried butterfly valves shall be Class 150B, iron body, rubber seated, with mechanical joint ends. Butterfly valves shall conform to AWWA C504, except as otherwise specified herein. Butterfly valves shall have valve seats designed to provide bubble-tight shutoff at 150 psi upstream and downstream.
- B. Butterfly valve designs utilizing continuous lining on the internal body surfaces and extending over the flanges, will NOT be acceptable. Valve disks shall seat at an angle of 90 degrees to the axis of the pipe.
- C. Valve seats shall be of molded natural rubber, BUNA-NM or EPDM. Rubber seats may be attached to the body or the disk. If the seat is attached to the disk, the seat ring on the body shall be of stainless steel. Bolts shall extend through the seat.
- D. Seats mounted on the disk shall be securely clamped to the disk. All clamps, retaining rings, and their fasteners shall be Series 300 stainless steel.
- E. The valve disk shall be of either ductile iron conforming to ASTM A536 or Type 304 stainless steel.
- F. The valve shaft shall be Type 300 stainless steel or carbon steel with stainless steel joints. The valve disk and shaft connection shall be by means of mechanically secured taper pins extending through the disk and shaft. Taper pins, lock washers and nuts shall be 18-8 stainless steel. The shaft seals shall be designed for the use of standard chevron type packing or standard O-ring seals.
- G. The manual operation mechanism shall be firm fixed to the valve body. The operator shall be permanently lubricated, and totally enclosed with a cast iron case, and the nut for buried valves shall turn in the direction specified above to open. The operator for buried valves shall be suitable for submersion. The operator shall have adjustable threaded collars at each end of the stroke.
- H. Butterfly valves shall be as manufactured by MH Valve Company, Anniston, AL; Keystone Valves USA, Houston, TX; Henry Pratt Company, Aurora, IL; or approved equal and shall conform to the above specifications.

## 2.07 VALVE BOXES AND EXTENSIONS:

- A. Valve boxes shall be manufactured in North America. The minimum outside diameter of the boxes shall be 5½-inches and the lengths shall be as necessary to suit the ground elevation and the depth of each valve operator, regardless of the depth of cover.
- B. When there is more than 6 feet of cover, valve operators shall have non-rising extension stems which raise the operating nut to a depth of approximately 4 feet below grade. The extension stem shall have a centering support ring at the upper end. The lower socket shall

be tapped with a set screw into the valve nut to prevent the extension stem from lifting off the valve nut.

- C. Each valve shall be provided with a box which has a close fitting 7-1/4-inch diameter cover and is substantially dirt-tight. The top of the cover shall be flush with the top of the box rim. The word "WATER" shall be cast in the top of the cover.
- D. Valve boxes shall be of cast iron and of the adjustable sliding, heavy pattern type. They shall be so designed and constructed as to prevent direct transmission of traffic loads to the pipe or valve. The upper or sliding section of the box shall be provided with a flange on the top of the section (not on the bottom) having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and to rest on the backfill. The boxes shall be adjustable through at least 6 inches vertically without reduction of lap between sections to less than 8-inches.

### PART 3 - EXECUTION

#### 3.01 AFFIDAVIT OF COMPLIANCE

- A. The manufacturer shall furnish as part of the shop drawing submittal the ENGINEER with an affidavit stating that valve(s), hydrants conform to the applicable requirements of the applicable AWWA Standard and the ENGINEER's specifications, and that all tests specified therein have been performed and all test requirements have been met and the test date.
- B. A copy of the Affidavit of Compliance shall be delivered to the construction site attached to each valve and/or hydrant furnished. The Affidavit shall be attached to the valve or hydrant inside a waterproof pouch.
- C. Any valve or hydrant received without the required affidavit shall be removed from the project and replaced at no expense to the Owner.
- D. All materials shall be certified "NEW". No reconditioned or repaired materials are permitted. Any reconditioned or repaired materials furnished or installed shall be removed and replaced with new materials at no expense to the Owner.

#### 3.02 INSTALLATION:

- A. All valves shall be carefully installed and supported in their respective positions free from distortion and strain. Care shall be taken to prevent damage or injury to the valves and appurtenances during handling and installation.
- B. All material shall be carefully inspected for defects in workmanship and all debris and foreign material cleaned out of valve openings and seats. All mechanisms shall be operated to check for proper functioning, and all nuts and bolts checked for tightness.

- C. All equipment including the hydrant, valves, pipe and all shall be furnished new at the Contractor's expense. Existing materials removed will be disposed of by the Contractor
- D. Hydrants shall be set plumb. Earth fill shall be carefully tamped around the hydrants to a distance of 4 feet on all sides of the hydrant, or to the undisturbed trench face, if less than 4 feet. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing main. Hydrants shall be set upon a layer of stone or a slab of concrete not less than 4 inches thick and 15 inches square. The side of the hydrant opposite the pipe connection shall be firmly wedged against the vertical face of the trench with a concrete thrust block, as indicated on the drawings.
- E. Broken stone shall be placed around the base of the hydrant at the location of the drain hole, and backfill around the hydrant shall be thoroughly compacted to the grade line in a satisfactory manner. Hydrants shall have the interiors cleaned of all foreign matter before installation and shall be inspected in both the open and closed positions.
- F. The body of the hydrant shall be of sufficient length to allow the hydrant to be set at the proper elevation, as shown on the drawings. Extensions shall be furnished and installed at the Contractor's expense, when required for greater depths.
- G. Valve boxes shall be set plumb, flush with the ground or paved surface, and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around the valve boxes to a distance of 4 feet on all sides of the boxes or to the undisturbed trench face, if less than 4 feet.
- H. Valves shall be operational and accessible at all times during construction and warranty period. The Contractor shall verify proper operation of all valves in the presence of the Engineer and/or Owner following completion of the project and prior to the acceptance of substantial completion.

#### PART 4 – COMPENSATION

##### 4.01 METHOD OF PAYMENT

- A. Hydrant – Removed and Reset will be paid for at the lump sum price which shall include full compensation for the furnishing and installation the new Hydrant and all materials required to remove the existing Hydrant including excavation, hauling and disposal of materials, compacting, furnishing, and placing all material including forms and equipment, cutting, tools and all other incidental work necessary for final completion of the item as specified. No separate payment will be made for gravel borrow, fittings, tapping sleeves, couplings, crushed stone bedding, backfill, insulation, thrust restraints, sampling, flushing, testing and disinfection, but all costs in connection therewith shall be included in the lump sum unit price for the respective item.
- B. The bid price shall be included in all work necessary to perform the required work of specifications sections but not limited to:

- a. 33 11 13.13, Ductile Iron Pipe and Fittings
- b. 33 11 13.16, Water Service Connections

4.02 PAYMENT ITEMS

376.20

Hydrant – Removed and Reset

Lump Sum

END OF SECTION

NOT FOR BIDDING

SECTION 33 39 13

PRECAST MANHOLES AND CATCH BASINS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all precast manholes and catch basins complete, including, but not limited to, bases, walls, cones, mortar, inverts, frames and covers.

1.02 RELATED WORK:

- A. Section 31 00 00, EARTHWORK
- B. Section 32 12 00, BITUMINOUS CONCRETE RADWAY PAVING
- C. Section 03 05 00, FIELD CONCRETE

1.03 SYSTEM DESCRIPTION:

- A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as required by the Engineer.
- B. All manholes and catch basins shall have concrete bases. Concrete bases shall be precast unless otherwise specified. Invert channels shall be formed of brick and mortar upon the base.
- C. Catch basins shall have a 4-foot deep sump unless otherwise specified. Leaching basins shall have a bottom opening as shown on the drawings.
- D. Riser and cone sections shall be precast concrete.

1.04 REFERENCES:

- A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM A48	Gray Iron Castings
ASTM C32	Sewer and Manhole Brick
ASTM C144	Aggregate for Masonry Mortar
ASTM C207	Hydrated Lime for Masonry Purposes

- ASTM C478            Precast Reinforced Concrete Manhole Sections
- ASTM C923            Specification for Resilient  
Connectors Between Reinforced  
Concrete Manhole Structures and Pipes
- ASTM C1244           Standard Test Method for Concrete Sewer Manholes by the  
Negative Air Pressure (Vacuum) Test.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using  
Flexible Watertight Gaskets

Occupational Safety and Health Administration

OSHA 29 CFR 1910.27      Fall Prevention Protection

- 1.05    SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:
- A.    Six sets of manufacturer literature of the materials of this section shall be submitted to the Engineer for review.
  - B.    Test reports as required shall be submitted to the Engineer.

PART 2 - PRODUCTS

2.01    PRECAST CONCRETE SECTIONS:

- A.    Catch basin grate in the water play area shall be as manufactured by IRONSMITH, INC 41701 Corporate Way #3 Palm Desert, CA 92260 (800) 338-4766. Catch basin grate model "Del Sol 9055DR-24R 24" drain-grate" or approved equal. Shall have ½" Slot Width. Material shall be Cast Grey Iron.
- B.    All other grates shall be E.J. Ironworks 1120M2 or approved equal.
- C.    All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:
  - 1.    The wall thickness of precast sections shall be as designated on the drawings, meeting the following minimum requirements:

<u>Section Diameter (Inches)</u>	<u>Minimum Wall Thickness (Inches)</u>
48	5
60	6

2. Type II cement shall be used except as otherwise approved.
  3. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.
  4. Minimum compressive strength of concrete shall be 4000 psi at 28 days.
  5. No more than two lift holes may be cast or drilled in each section.
  6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
  7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
  8. Circumferential steel reinforcement in walls and bases shall be a minimum of 0.12 sq. in./lin. ft. for 4-foot diameter sections and 0.15 sq. in./lin. ft. for 5- and 6-foot diameter sections. Reinforcing shall extend into tongue and groove.
- D. Conical reducing sections shall have a wall thickness not less than 5-inches at the bottom and wall thickness of 8-inches at the top. Conical sections shall taper from a minimum of 48-inches diameter to 24 or 30-inches diameter at the top, as shown on the drawings.
- E. Except where insufficient depth of cover dictates the use of a shorter base, bases shall be a minimum of 4 feet in height.
- F. Slab top sections and flat riser sections (Grade Rings) shall conform to the contract drawings, with particular attention focused upon the reinforcing steel and be designed to meet or exceed an HS-20 Loading requirement.
- G. The tops of the bases shall be suitably shaped by means of accurate ring forms to receive the riser sections.
- H. Precast sections shall be manufactured to contain wall openings of the minimum size to receive the ends of the pipes, such openings being accurately set to conform with line and grade of the sewer or drain. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as required by the Engineer.
- I. "Drop-over" manholes shall be placed where indicated on the drawings. The Contractor shall accurately measure the diameter of the existing outlet pipe and inform the manufacturer of its size, so that the "Drop-over" type opening can be cut into the precast manhole base. The bottom shall be cast in place by the Contractor in accordance with

Section 03 05 00, FIELD CONCRETE. The invert channel shall be formed of brick and mortar, as specified in this specifications section. The sub-base shall be a compacted, level foundation of crushed stone, at least 6-inches thick, as specified in Section 02300 EARTHWORK, but shall vary to the depth necessary to reach sound undisturbed earth.

- J. The exterior surfaces of all precast manhole bases, walls, and cones shall be given a minimum of one shop coat of bituminous dampproofing.
- K. The Engineer reserves the right to reject any unsatisfactory precast section and the rejected unit shall be tagged and removed from the job site immediately.
- L. The Engineer may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.

#### 2.02 BRICK MATERIALS:

- A. Brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Bricks shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.
- B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.
- C. Mortar shall be composed of portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as required by the Engineer and may vary from 1:1/4 for dense hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; portland cement to hydrated lime to sand.
- D. Cement shall be Type II portland cement as specified for concrete masonry.
- E. Hydrated lime shall be Type S conforming to ASTM C207.
- F. The sand shall comply with ASTM C144 specifications for "Fine Aggregate," except that all of the sand shall pass a No. 8 sieve.

#### 2.03 FRAMES, GRATES, COVERS AND STEPS:

- A. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
- B. All castings shall be thoroughly cleaned and may be subject to a careful hammer inspection at the Engineer's discretion.

- C. Castings shall be ASTM A48 Class 30B or better.
- D. The surface of the manhole covers shall have a diamond pattern with the cast words "WATER," "DRAIN" or "SEWER," whichever is appropriate.
- E. Sewer and Drain frames and cover will be supplied and furnished by the Owner
- F. Watertight type manhole frames with 32-inch diameter covers (bolted and gasketed) shall be EJ, No. 2006APT 2008ZPT; Quality Water Products, Style C47WT; Neenah Foundry Co., R-1916-H or approved equal.
- G. Manhole frames with 26-inch covers for 24-inch openings shall be 475 pounds minimum by EJ No. 2110 (formerly LK110A); Neenah Foundry Co. R1720; Quality Water Products, Style 40; or approved equal.
- H. Watertight type manhole frames with 26-inch diameter covers (bolted and gasketed) shall be EJ No. 1268; Mechanics Iron Foundry Type A2073; Quality Water Products, Style 40WT; or approved equal.
- I. Frostproof manhole frames, with 30-inch diameter covers and inner lids, shall be R-1755 series by Neenah Foundry Co., Neenah, WI; 2006A1 2009Z by EJ, Brockton, MA; B-3045 (or similar) by Mechanics Iron Foundry, Boston, MA; or approved equal.
- J. 2-inch thick polystyrene insulation shall be firmly adhered to all frostproof inner lids.
- K. Catch basin frames and 23-7/8-inch square grates with 2-inch square openings shall be 8-inches in height minimum. They shall be Neenah Foundry Co. No. R3588-A; Quality Water Products No. 45-600; EJ 5548Z 5520M; or approved equal.
- L. Catch basin frames with bar grate openings and 23-7/8-inch square grates shall be 8-inches in height minimum. Bar grates shall not be used in areas where bicycle traffic could be present. They shall be Neenah Foundry Co. No. R-3589; Quality Water Products No. 45; EJ 5521Z 5520M3 BIKE GR LK121; or approved equal.
- M. Catch basin frames with cascade grate openings and 23-7/8-inch square grates shall be 8-inches in height minimum. They shall be Neenah No. R-3589; Quality Water Products LK121; EJ 5548Z 5520M; or approved equal.
- N. Catch basin frames set against curbing shall have three flanges only.

#### 2.04 SEWER MANHOLE ACCESSORIES:

- A. Gasket materials shall be top grade (100% solids, vulcanized) butyl rubber and shall meet or exceed AASHTO M-198.

- B. Couplings at the manhole-pipe interface shall be made with a rubber seal system (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection.
- C. Stubs installed as specified and indicated on the drawings shall be short pieces of the same class pipe as that entering the manhole and shall have either stoppers or end caps as shown on the drawings. Stoppers or end caps shall be especially designed for that application.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

##### A. PRECAST SECTIONS:

1. Precast bases shall be supported on a compacted level foundation of crushed stone, as specified in Section 31 00 00 EARTHWORK, at least 6-inches thick, but shall vary to the depth necessary to reach sound undisturbed earth.
2. Precast reinforced concrete sections shall be set vertical and with sections in true alignment.
3. Butyl rubber joint sealant shall be installed between each concrete section. Catch basin sections do not require joint sealant if so indicated on the drawings.
4. All holes in sections used for handling the sections shall be thoroughly plugged with mortar. Mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

##### B. BRICK WORK:

1. Bricks shall be moistened by suitable means, as required by the Engineer, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
2. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as directed.
3. The brick inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipe.

##### C. CASTINGS:

1. Cast iron frames, grates and covers shall be as specified. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings. Frames shall be adjusted to meet the street surface.
2. Cast iron manhole frames and covers not located in paved areas shall be set 6-inches above finished grade, at a height as required by the Engineer, or as indicated on the drawings. The top of the cone shall be built up with a minimum of 1 course and a maximum of 5 courses of brick and mortar used as headers for adjustment to final grade.
3. Frames shall be set concentric with the top of the concrete section and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.
4. Covers and/or grates shall be left in place in the frames, for safety reasons, except while work is being performed.

D. ACCESSORIES:

1. Accessories shall be installed in accordance with manufacturer's instructions.
2. Stubs shall be set accurately to the dimensions indicated on the drawings. Stubs shall be sealed with suitable watertight plugs.

E. MANHOLE FALL PREVENTION SYSTEM:

Carrier rail shall extend from the manhole invert shelf to within 18-inches of finish grade. The rail and manhole rung clamp assembly shall be rigidly connected utilizing 3/8-inch stainless steel bolts. Assembly shall be clamped to manhole steps at 2-foot centers or as recommended by the manufacturer.

3.02 LEAKAGE TESTS:

A. Leakage tests shall be made by the Contractor and observed by the Engineer on each manhole. The test shall be by vacuum or by water exfiltration as described below:

B. VACUUM TEST:

1. The vacuum test shall be conducted in accordance with ASTM C1244. Test results will be judged by the length of time it takes for the applied vacuum to drop from 10 inches of mercury to 9 inches. If the time is less than that listed in Table 1 of ASTM C1244, the manhole will have failed the test. Test times from Table 1 are excerpted below.

TABLE 1

Minimum Test Times for Various Manhole Diameters

Depth (Feet)	Diameter (Inches)		
	48	60	72
	<u>Times (Seconds)</u>		
0-12	30	39	49
12-16	40	52	67
16-20	50	65	81
20-24	59	78	97
26-30	74	98	121

2. If the manhole fails the initial test, the Contractor shall locate the leaks and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. If the manhole should again fail the vacuum test, additional repairs shall be made, and the manhole water tested as specified below.

C. WATER EXFILTRATION TEST:

1. After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out. The test shall be made prior to placing the shelf and invert. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test.
2. The manhole shall be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above, is unsatisfactory as determined by the Engineer or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption by the manhole. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour loss rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as required by the Engineer to bring the leakage within the allowable rate of one gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for rejection

of the manhole. It shall be the Contractor's responsibility to uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as required by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

- 3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss of water during the test is a result of leaks through joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.
- 4. If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Engineer, such a test can serve to evaluate water-tightness of the manhole. However, if the Engineer is not satisfied with the results, the Contractor shall lower the water table and carry out the test as described hereinbefore.

3.03 CLEANING:

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The accepted work will be paid for at the contract unit price each complete in place, all prices shall include full compensation for providing all labor, materials, and equipment for all mobilization/demobilization, saw cutting, excavation, sheeting/shoring, coring, dewatering, by-pass pumping, removal/disposal of excavate, installation of sewer and drain pipe, rebuilding/installing manholes, backfilling, compacting, milling, overlaying, placing bituminous concrete and/or concrete, loam, seed, permanent pavement patch, placing castings furnished by the Owner, and furnishing and installing all other materials including drainage stone for foundation, gravel backfill, dense graded crushed stone, pre-cast structures, concrete collars, hoods, geotextile fabric, fittings, couplings, necessary to complete the work as shown on the drawings, details, and specified herein.

4.02 PAYMENT ITEMS

201.10	Catch Basin with Frame and ADA Grate	Each
201.30	Manhole, E.C.C.	Each
220.00	Drainage Structure Adjusted	Each

END OF SECTION

SECTION 33 41 13.22

CORRUGATED POLYETHYLENE [HDPE] AND POLYVINYL CHLORIDE (PVC) PIPE

PART 1 – GENERAL

1.01 WORK INCLUDED:

- A. This section includes furnishing all materials, labor and equipment and installing corrugated polyethylene [HDPE] and Polyvinylchloride (PVC) Pipe SDR 35 pipe and fittings as shown on the drawings and as specified herein.
- B. This section include furnishing all materials, labor and equipment and installing a 4” trench drain with and iron ADA grate.

1.02 RELATED WORK:

- A. Section 31 00 00 – EARTHWORK
- B. Section 31 50 00 – SUPPORT OF EXCAVATION

1.03 REFERENCES:

- A. The following standards form a part of this specification, as referenced:

American Society for Testing and Materials (ASTM)

ASTM D2321	Standard for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
ASTM F405	Standard Specification for Corrugated Polyethylene Pipe and Fittings
ASTM F667	Standard Specification for Large Diameter Corrugated Polyethylene Pipe and fittings
ASTM D 1784	Rigid Vinyl Compounds ASTM D 3034 PVC Gravity Sewer Pipe (SDR) 35 PS 46
ASTM D 2564	Solvent Cements for PVC Pipe and Fittings
ASTM D 2321	Underground Installation of Thermoplastic Pipe (non-pressure applications)
ASTM F 477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 656	Primers for PVC Pipe and Fittings
ASTM F 1668	Procedures for Buried Plastic Pipe

American Association Of State Highway and Transportation Officials

AASHTO M294 Standard Specification for Corrugated Polyethylene Pipe

AASHTO MP6 Standard Specification for Corrugated Polyethylene Pipe 42" and 48" Diameter

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature on the materials of this Section shall be submitted to the Engineer for review.
- B. Manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Pipe and structures shall be packaged to withstand shipment without damage and handled carefully on the jobsite. Pipe shall be stored so that it is not exposed to sunlight.

PART 2 – PRODUCTS:

2.01 HDPE MATERIALS:

- A. This Section applies to corrugated polyethylene pipe with an integrally formed smooth interior.
- B. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe.
- C. The pipe and fittings shall be free of foreign inclusions and visible defects. Fittings may be either molded or fabricated. Fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Engineer. The ends of the pipe shall be cut squarely and cleanly so as not to adversely affect joining.
- D. 12" ADS AdvanEdge oblong corrugated pipe with geotextile wrap

2.02 PVC MATERIALS:

Polyvinyl chloride pipe and fittings shall be Type PSM polyvinyl chloride (PVC) SDR 35 with full diameter dimensions conforming to the specifications for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, ASTM Designation D-3034

## 2.02 CHANNEL DRAIN WITH ADA GRATE:

4 Inch Wide channel drain with ADA ductile iron grate an inline catch basin cleanout. KlassikDrain - K100 features a 4" (100 mm) internal width Type 478Q Longitudinal ductile iron grate (ADA) or approved equale.

## 2.02 MANUFACTURERS:

- A. Pipe and fittings shall be manufactured by Ipex, Inc.; Plexco, Division of Chevron Chemical Co.; J-M Pipe Co.; Advanced Drainage Systems, Inc. (ADS) or approved equal.
- B. Channel drain shall be manufactured by ACO Drain (<https://www.acodrain.us/k100.html>) or Approved equale.

## PART 3 – EXECUTION

### 3.01 INSTALLATION:

- A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned before installation. Pipes and fittings shall be maintained clean.
- B. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.
- C. Pipes shall be installed in the locations and to the required lines and grades shown on the drawings and provided in these Specifications, using an approved method of control.
- D. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there be any joints made up in water.
- E. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.
- F. Trench drain with ADA grate will be installed per the manufactures instructions and as directed by the Engineer.

## PART 4 – COMPENSATION

### 4.01 METHOD OF PAYMENT

- A. The accepted quantities of HDPE pipe (solid and perforated), HDPE perforated flat drain pipe, PVC SDR 35 pipe (solid and perforated) shall be paid for at the unit price per linear foot complete in place, which price will include full compensation for providing all labor, materials, equipment, saw cutting, excavation, sheeting/shoring, coring, connection to existing pipe, connection to drainage structures and incidental costs required to complete the work, dewatering, by-pass pumping, removal/disposal of excavate, backfilling, compacting, milling, overlaying, placing bituminous concrete and/or concrete, loam, seed, permanent pavement patch, and furnishing and installing all other materials including drainage stone, gravel backfill, concrete collars, hoods, geotextile fabric, washed stone, fittings, couplings, necessary to complete the work as shown on the drawings, details, and specified herein.
- B. The accepted quantities of clean outs and Area Drain (PVC) with Frame and ADA Grate shall be paid for at the unit price each, complete in place, which price will include full compensation for providing all labor, materials, and equipment, saw cutting, excavation, connection to existing pipe, connection to drainage structures and incidental costs required to complete the work, , removal/disposal of excavate, backfilling, compacting, furnishing and installing all other materials including drainage stone, gravel backfill, concrete collars, hoods, geotextile fabric, washed stone, fittings, couplings, necessary to complete the work as shown on the drawings, details, and specified herein.
- C. The accept quantities of Trench Drain with ADA Grate shall be paid for at the unit price per foot, complete in place, which price will include full compensation for providing all labor, materials, cleanouts, equipment, saw cutting, excavation, connection to existing pipe, connection to drainage structures and incidental costs required to complete the work.

#### 4.02 PAYMENT ITEMS

201.15	Area Drain (PVC) with Frame and ADA Grate	Each
201.20	Trench Drain with ADA Grate	Linear Foot
256.04	4" Diam. PVC Pipe (SDR 35)	Linear Foot
256.06	6" Diam. PVC Pipe (SDR 35)	Linear Foot
256.12	12" HDPE Perforated Flat Drain Pipe	Linear Foot
256.15	8" Diam. HDPE Solid Drain Pipe	Linear Foot
256.16	12" Diam. HDPE Solid Drain Pipe	Linear Foot
256.17	4" Diam. PVC Perforated Pipe (with Stone and Fabric)	Linear Foot
256.18	4" Diam. HDPE Clean Out	Each
256.30	12" Diam. HDPE Perforated Collector Pipe (with Stone and Fabric)	Linear Foot

END OF SECTION

SECTION 33 42 00

UNDERGROUND STORMWATER CHAMBER SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install all underground stormwater chamber systems and appurtenances in accordance with the Drawings and these specifications.

1.02 RELATED WORK:

- A. Section 31 00 00 EARTHWORK  
Section 33 39 13 Precast Manholes and Catch Basins  
Section 33 11 13.31 Polyvinyl Chloride Pressure Pipe and Fittings (Schedule 80)

1.03 QUALITY CONTROL INSPECTION:

- A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.
- B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close textured and free of blisters, cracks, roughness and exposure of reinforcement.
- C. Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop Drawings

Structural design calculations and shop drawings shall be certified by a Professional Engineer retained by the system manufacturer or Contractor and licensed in the state

where the system is to be installed. Six (6) copies of said shop drawings shall be submitted to the Engineer for review and approval.

B. Affidavit on patent infringement

The Contractor shall submit to the Engineer, prior to installation of the stormwater chamber system, an affidavit regarding patent infringement rights stating that any suit or claim against the Owner due to alleged infringement rights shall be defended by the Contractor who will bear all the costs, expenses and attorney's fees incurred thereof.

C. Performance Documentation

The following documentation must be submitted by the Contractor and approved by the Engineer prior to the manufacture and delivery of any materials.

1. Manufacturing Experience

The stormwater chamber supplier shall provide evidence of at least 5 years of successful product design and use. The supplier shall provide an installation list of projects, model sizes installed and installation dates where the same type systems as specified herein have been designed and produced by the supplier.

D. Operations and Maintenance Manuals

Furnish four copies of the operation and maintenance manuals for the stormwater treatment systems.

PART 2 - PRODUCTS

2.01 MATERIALS AND DESIGN:

- A. Chamber, stone and fabric materials and design shall conform to those indicated on the drawings, the installation instructions provided by the system manufacturer, and as approved by the engineer.

2.02 MANUFACTURER:

- A. Each stormwater chamber system shall be of a type that has been installed and used successfully for a minimum of 5 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical collection of stormwater runoff during the aforementioned period.
- B. Each stormwater chamber system shall be as manufactured by StormTech, a division of ADS, Inc., Rocky Hill, CT, 06067, (860) 529-8188, [www.stormtech.com](http://www.stormtech.com) or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Each stormwater chamber system shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise required by the Engineer.
- B. Installation of Chambers, stone and fabric shall be completed as indicated in the manufacturer's installation instructions.
- C. Furnish and Install Brick weir at manhole as directed by the Engineer.

PART 4 – COMPENSATION

4.01 METHOD OF PAYMENT

- A. The accepted underground stormwater chamber system will be paid for at the contract unit lump sum price complete in place, which price shall include all labor, materials, excavation, drainage stone, backfill, geotextile fabric, brick weirs, hauling and disposal of materials, compacting, sheeting/shoring, coring, dewatering, by-pass pumping, and placing all material, equipment, tools and all other incidental work necessary for final completion of items as specified.

4.02 PAYMENT ITEMS

256.60	Stormwater Infiltration System-Davis Street	Lump Sum
256.61	Stormwater Infiltration System-Tappan Street	Lump Sum

END OF SECTION

Appendix A  
Geotechnical Report

NOT FOR BIDDING

Town of Brookline, MA  
Weston & Sampson Project No. 2190095

September 24, 2019

Town of Brookline  
c/o Jeanne Lukenda, ASLA  
Weston & Sampson  
85 Devonshire Street, 3<sup>rd</sup> Floor  
Boston, MA 02109

RE: Geotechnical Engineering Report  
Cypress Street Playground  
Brookline, Massachusetts

## INTRODUCTION

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to present this geotechnical engineering report summarizing our subsurface explorations and geotechnical recommendations for the proposed Cypress Street Playground project in Brookline, Massachusetts. Our project understanding is based on review of a June 2019 Conceptual Plan prepared by Weston & Sampson and our correspondence with the project team.

For important information on the limitations and use of this report, please refer to the **Limitations** section of this report.

## EXISTING CONDITIONS

The Cypress Street Playground (the Site) is located in an urban, residential area of Brookline, Massachusetts. The approximately 5-acre Site is bound by Tappan Street to the south, Cypress Street to the east, Davis Avenue to the north, and Greenough Street to the west, as shown in **Figure 1 – Site Plan**. Brookline High School is located on the west side of Greenough Street. The Site is currently developed with two softball fields on the south side of the site, a grass surfaced soccer field between the softball fields, and a basketball court and playground area east of the easternmost softball field.

A 72-inch by 84-inch Massachusetts Water Resource Authority (MWRA) sewer utility traverses the Site northwest to southeast below the soccer field, among other utilities, including 12 to 24-inch diameter drainage pipes.

The Site is generally flat, with existing grades ranging from approximately El. 46 to El. 50 ft., except along the southeast and eastern sides of the Site where elevations increase at approximately

3.5H:1V (horizontal:vertical) to about El. 60 ft. to meet street grades. Elevations described herein reference the Brookline Town Base datum.

## PROPOSED CONDITIONS

The proposed project includes construction of two new clay surfaced softball fields, a new grass surfaced soccer field, a new basketball court, and a new playground at approximately their existing locations, ten (10) sport light poles around the fields and basketball court, a concrete splash pad in the playground, dugout structures on concrete pads at the softball fields, and asphalt concrete and porous pavement paths. The approximate locations of these features are shown in *Figure 1*.

The sports light poles will range from 60 to 70 ft. tall around the fields and will be 40 ft. tall around the basketball court. Based on our experience with similar projects, we assume the pole foundations will consist of precast concrete piers.

Cuts and fills less than approximately 2 ft. are proposed in the new fields and basketball court and around the splash pad. Cuts up to 3 ft. and fills up to 9 ft. are proposed in the new playground area and south and east of the new basketball court. Cast in place concrete blocks with retained earth heights up to approximately 4 ft. and 3H:1V soil slopes will be constructed south and east of the new basketball court to facilitate new grading.

## SUBSURFACE CONDITIONS

### Geologic Setting

Information from the Massachusetts Office of Geographic Information Systems (MassGIS) indicates the west side of the Site is in an area of glacial till, and the east side of the Site is located in an area of sand and gravel over bedrock at depths less than 50 ft. The Bedrock Geologic Map of Massachusetts indicates bedrock at the Site consists of conglomerate, sandstone, siltstone, argillite and melaphyre of the Roxbury Conglomerate. Bedrock outcrops were not observed during our site reconnaissance.

### Subsurface Explorations

Subsurface conditions at the Site were explored from June 3 to June 6, 2019 by advancing twelve (12) borings (B-1 through B-11, including B-4A/B) to depths ranging from 16 to 41 ft. and by completing two (2) hand excavations (HE-1 and HE-2) in the softball fields to depths ranging from 17 to 18-inches. Approximate exploration locations are shown in *Figure 1*.

The borings were completed by New England Boring Contractors using an ATV-mounted drill rig. Borings B-4A, B-5, and B-6 were advanced using 2-1/4-inch inside-diameter (ID) hollow-stem augers. All other borings were advanced using 4-inch ID flush joint casing and drive-and-wash drilling methods. Standard penetration tests (SPTs) and sampling were conducted in each boring by driving a 24-inch long by 1-3/8-inch inside diameter (2-inch outside diameter) split spoon sampler with blows from a 140 lb. automatic hammer falling 30 in. per blow. Sampling intervals ranged from continuous (every 2 feet) to standard (every 5 feet). The blow counts for the middle 12 in. of sampler penetration are combined and designated as the SPT blow count, which is correlated to soil consistencies and engineering soil properties.

Weston & Sampson geotechnical engineering staff monitored the borings and hand excavations in the field and prepared logs for each exploration. Descriptions of the subsurface conditions encountered are provided in the boring logs included in **Attachment A** and in the hand excavation logs included in **Attachment B**. General descriptions of the subsurface conditions encountered are provided in the following section.

In addition to the explorations described above, five (5) test pits (TP-1, TP-2, TP-3, TP-5, and TP-6) were excavated at the Site to evaluate drainage characteristics of the subsurface soils. A Weston & Sampson licensed soil evaluator observed the test pits in the field and prepared logs for each test pit. The test pit logs are included in **Attachment C**. A summary of subsurface conditions encountered in the test pits are provided under separate cover. Approximate test pit locations are shown in **Figure 1**.

### **Subsurface Conditions**

Subsurface conditions in the borings below surficial topsoil generally consisted of fill material above layers of native sand and silt.

The major strata encountered in the explorations are described below. Variations may occur and should be expected outside and between exploration locations.

**Infield Mix** – Within the softball fields (HE-1 and HE-2) the surficial material was infield mix generally consisting of fine to coarse Sands approximately 12 to 13-inches in thickness.

**Topsoil** – Approximately 0.5 to 2.5 ft. of TOPSOIL was encountered at the ground surface in all borings.

**Fill** – Approximately 2.8 to 10 ft. of very loose to very dense FILL was encountered below the topsoil or infield mix in all explorations. The FILL generally consisted of fine to coarse sand with various amounts of gravel (little to gravelly) and silt (trace to silty) and trace to some debris. Some samples in the FILL contained more silt than sand and were classified as medium stiff to very stiff sandy silt. Debris encountered in the borings included coal, ash, slag, glass, pipe fragments, and asphalt.

An approximately 6-inch thick layer of fine to medium sand with some silt, little gravel, and trace organics (roots) was encountered below the FILL in B-6. This material appeared to be a buried layer of topsoil.

**Sand, and Sand & Gravel** – Loose to very dense, fine to coarse SAND with varying amounts of gravel (trace to gravelly) and silt (trace to silty) was encountered below the fill in all borings. Some samples in this layer contained more gravel than sand and were classified as sandy gravel or gravel. Auger grinding in the SAND suggests the presence of cobbles and/or boulders.

**Silt** – Approximately 2.5 to 9.5 ft. of soft to very stiff SILT with varying amounts of sand (little to sandy) and gravel (trace to some) was encountered between layers of sand and Sand & Gravel in

borings B-1, B-2, B-4B, B-7, B-8, B-9, and B-10. Some samples contained clay and were classified as clayey silt or silty clay.

**Groundwater** - Groundwater was encountered in all borings ranging from approximately 8 to 14 ft. based on observation of wet samples and measurements in the boreholes. We anticipate groundwater levels will fluctuate with season, variations in precipitation, construction in the area, and other factors. Perched groundwater conditions could exist close to the ground surface, especially during and after periods of wet weather.

## GEOTECHNICAL DESIGN RECOMMENDATIONS

### General

Based on the results of our subsurface explorations and geotechnical analyses, the proposed site development is feasible following the recommendations presented in the following sections.

Organic topsoil should be removed below all concrete slab, walkway, and raise-in-grade fill areas, including a 5 ft. perimeter around these areas. The existing granular fill may provide adequate support for these improvements provided the subgrades are prepared and evaluated as recommended in this report.

Undocumented fill is not suitable for support of rigid structures and should be completely removed from within the zone-of-influence beneath such structures. The zone-of-influence (ZOI) is defined as a plane extending horizontally away from the bottom outside edges of footings and retaining wall elements for 2 ft. in all directions then down and away at 1H:1V slopes to the intersection with suitable native soils.

### Shallow Foundations

The proposed playground equipment can be supported by shallow foundations bearing in undisturbed, medium dense (or denser) native sand, or on properly constructed Structural Fill overlying such soils. Footings bearing on these materials can be designed using an allowable bearing pressure of 4,000 pounds per square foot (psf). Resistance to lateral loads can be obtained by a passive equivalent fluid unit weight of 250 pcf, ignoring the top 12 inches of embedment, and by a footing base friction coefficient of 0.5.

Organic topsoil and undocumented fill should be completely removed from the ZOI beneath all foundation areas. All foundation subgrades should be observed by a Weston & Sampson geotechnical engineer prior to placement of overlying fill and foundation forms.

Foundations should be designed in accordance with the provisions of the current edition of the Massachusetts State Building Code. Footings should be embedded at least 4 ft. below the nearest proposed adjacent ground surface exposed to freezing. Shallow foundations constructed as recommend herein are anticipated to undergo total and differential settlements less than 1-inch and ½-inch, respectively. We recommend a minimum factor of safety of 1.5 when using sliding friction alone.

### Concrete Pads

The concrete splash pad and concrete pads supporting dugout structures can bear on properly prepared granular fill or native sand. Based on subgrade preparation procedures recommended in this report and existing soil conditions, a subgrade modulus (k) of 200 pounds per cubic inch (pci) is recommended for concrete pad design. The suitability of the existing granular fill to support concrete pads should be evaluated by a Weston & Sampson geotechnical engineer prior to the placement of overlying fill, reinforcing steel, and foundation forms.

A minimum of 12-inches of 1-1/2-inch crushed stone is recommended as underslab stone below the concrete pads separated by filter fabric along edges meeting in-situ soils. Underslab stone should be placed in 6-inch thick maximum loose lifts with each lift compacted until well keyed. Any areas contaminated with fines or debris should be removed and replaced with clean stone. If the underslab stone is saturated or trapping water, the water should be removed prior to slab placement.

Concrete pads supporting loads up to 250 psf and bearing on materials discussed above are expected to induce less than 1-inch of total settlement.

### Seismic Considerations

In accordance with the International Building Code (IBC) as adapted by the Commonwealth of Massachusetts State Building Code and based on our explorations and analyses, the subject project should be evaluated using parameters associated with Site Class D. Based on soil types and consistencies encountered in our explorations, the risk of structurally damaging ground deformations related to liquefaction is low.

### Retaining Walls

Retaining walls should be designed to accommodate settlement. Granite-block walls, mechanically stabilized earth (MSE) walls, or cast-in-place concrete or precast concrete walls with adequate construction joint spacing are possible wall types that are appropriate for use at the Site.

The following recommendations assume retained earth heights will be less than 5 ft.

**Lateral Earth Pressures** – Lateral earth pressures on retaining walls unrestrained from rotation with level backfill and drainage provided behind the walls should be calculated using an equivalent fluid weight of 40 pounds per cubic foot (pcf). For sloping backfill up to 3H:1V, the equivalent fluid weight should be increased to 60 pcf.

**Lateral Pressures Due to Surcharge** – A uniform lateral pressure of 100 psf should be added to the above pressures and applied over the full backfill height of the walls. The 100 psf lateral pressure is intended to account for vertical surcharge pressures at the tops of walls up to 200 psf. Additional lateral pressures equal to 0.5 times the additional surcharge pressure should be added to walls where surcharge pressures exceed 200 psf.

**Resistance to Lateral Loads** – Driving forces can be resisted by passive pressure at the toe of the wall using an equivalent fluid pressure of 250 pcf, ignoring the top 12 inches of embedment, and by a base block friction coefficient of 0.45.

**Backfill** – Retaining walls should be backfilled with Structural Fill or clean crushed stone wrapped in filter fabric. The fill should be placed in 10-inch maximum loose lifts with each lift compacted to a minimum of 92 percent of the materials maximum dry density as determined by ASTM D1557 (modified proctor). Within 3 ft. of the wall, Structural Fill lifts should be compacted to not more than 90 of the materials maximum dry density as determined by ASTM D1557.

**Drainage** – The retaining walls should include drainage unless designed to resist hydrostatic pressures over the full height of the walls. Wall drains should consist of a minimum 8-inch wide zone of washed 1-1/2-inch stone surrounding a 4-inch diameter perforated pipe (minimum 2-inches all around) with the stone fully encased with a non-woven filter fabric. The crushed stone should have no more than 2 percent passing a No. 200 sieve and should extend to within 1 foot of the ground surface. The geosynthetic should have an AOS of #70 sieve, a minimum permeability of  $1.0 \text{ sec}^{-1}$ , and a minimum puncture resistance of 80 pounds (such as Mirafi 160N or approved equal). The drains should be routed to a suitable, erosion protected discharge.

### Light Pole Foundations

Light pole foundations typically consist of cylindrical precast concrete bases installed in drilled shafts and backfilled with structural concrete. The light pole foundations should be designed in accordance with the provisions of Section 1807.3 (Embedded Posts and Poles) of the 2018 International Building Code (IBC), the provisions of the current edition of the Massachusetts State Building Code and the Technical Specifications provided by the light pole manufacturer.

Precast foundations for the sports light poles should penetrate the undocumented fill and derive base support in native, inorganic soils. Difficult excavation and the presence of cobbles and boulders, caving soils, and groundwater infiltration should be expected. All loose and disturbed materials should be removed from the base of the shaft prior to placement of the precast base. Backfill around the precast base should consist of Portland cement concrete with a minimum (28 day) compressive strength of 3,000 pounds per square inch.

An allowable bearing pressure of 4,000 psf can be used at the base of the shaft to resist axial loads provided all loose material and slough is removed from the bored hole prior to placement of the precast light pole base and concrete backfill. Skin friction along the shaft sidewall should be ignored when calculating resistance to axial loads.

Resistance to lateral loads can be calculated using the soil parameters in the following table. Resistance in the top 2 feet of foundation embedment should be ignored.

Soil Parameter	Sand & Gravel	Silt
Submerged Unit Weight, lb/ft <sup>3</sup>	68	58
Soil Angle of Internal Friction, $\Phi$ , degrees	33	28
Coefficient of Passive Earth Pressure, $K_p$ (Rankine)	3.4	2.8

The foundation designer and contractor should be responsible for selecting appropriate construction methods to assure each foundation is constructed in accordance with project design drawings and specifications. The presence of obstructions (cobbles and boulders) and need for

removal should be anticipated. The presence of caving soils and/or groundwater infiltration in foundation excavations could require the use of casing or drilling slurry to maintain excavation integrity. Cleanout buckets may be required to remove loose and unstable material from the shaft base. A Weston & Sampson geotechnical engineer should observe the base conditions at each foundation location prior to concrete and reinforcing steel placement. Tremie methods should be utilized to install concrete if water is present at the bottom of the excavations.

## CONSTRUCTION CONSIDERATIONS

### Site Preparation

Site preparation for earthwork will require removal of all vegetation, topsoil, and existing site features, from all foundation, retaining wall, concrete pad, walkway, and raise-in-grade fill areas and a 5 ft. perimeter around those areas. Additionally, all undocumented fill should be removed from the ZOI beneath all foundations and rigid retaining wall areas to expose native sand. Fill was encountered to depths up to 10 ft. and should be anticipated in site excavations.

Difficult excavation and the presence of cobbles, boulders, and debris should be expected.

Existing granular, inorganic fill can remain below flexible retaining walls, concrete pad, walkway, basketball court, and raise-in-grade fill areas provided the subgrades are prepared and evaluated as recommended in this report. Subgrades where fill is left in place may require some rework and compaction.

### Excavation Considerations

Excavation will be required for site preparation, grading, and construction of foundations. Surface water should be controlled during construction and prevented from eroding temporary slopes and disturbing excavation and subgrade materials. If excavations encounter groundwater, moderate to severe caving should be expected where seepage is present.

All excavations should be made in accordance with applicable OSHA safety regulations. Temporary excavation support may be required depending on depths of excavations and if excavations need to approach the zone-of-influence beneath existing structures or other site features. Excavation support systems, if necessary, should be the responsibility of the contractor and designed by a Professional Engineer licensed in the Commonwealth of Massachusetts. Foundations and utilities should be designed and constructed so that excavations into zones-of-influences below and adjacent to footings are not required.

Depending on excavation depths and amount of groundwater seepage, dewatering may be necessary. Flow rates for dewatering are likely to vary depending on location, soil type, and the season during which the excavation occurs. The dewatering system should be capable of lowering the groundwater table at least 2 ft. below the anticipated excavation depths and be kept operational until fill placement and compaction and concrete installation have been completed to at least 2 ft. above the groundwater table elevation. The dewatering system should be capable of handling variable flow rates and should be the responsibility of the contractor.

### **Subgrade Preparation and Stabilization**

Following stripping and removal of unsuitable soils, the subgrades in granular fill (concrete pad, walkway, and raise-in-grade fill areas) and native sand (foundation and retaining wall areas) should be compacted until firm and stable with several passes of a minimum 10-ton vibrator roller. Areas with limited access can be compacted using several passes of a 700-pound plate compactor. A Weston & Sampson geotechnical engineer should evaluate exposed subgrades prior to placement of overlying materials.

Soft and/or disturbed areas will require over-excavation and backfilling with compacted angular crushed stone or compacted Structural Fill as recommended by the geotechnical engineer. A geosynthetic separation layer between the excavation subgrade and crushed stone backfill may also be required. We recommend that a geosynthetic used for stabilization consist of a woven geosynthetic with an AOS of #70 to #100 sieve, and a minimum puncture resistance of at least 120 pounds (such as Mirafi FW700 or equivalent).

Soils containing more than trace amounts of silt are susceptible to softening and disturbance by construction activity during wet or freezing weather. Subgrade protection should be the responsibility of the contractor and special precautions and protective measures appropriate for the weather conditions during construction should be used during earthwork and construction to preserve the integrity of subgrade. Construction traffic should not operate directly on prepared subgrades.

If foundation construction occurs during freezing conditions, insulating blankets, heaters, or other suitable measures should be employed to prevent foundation subgrades from freezing until the foundations are backfilled sufficiently to prevent frost from reaching the footing subgrades and penetrating beneath foundation elements.

### **Slopes**

Permanent fill slopes should be formed at 3H:1V or flatter. The face of fill slopes should be overbuilt and cut back into compacted materials with a smooth excavator bucket. If steeper fill slopes are desired, we should be consulted to evaluate use of grid reinforcement or rock blankets.

### **Fill**

Structural Fill should meet the requirements of material specification M1.03.0-type B Gravel Borrow or M2.01.7 Dense-graded Crushed Stone for Subbase in the latest edition of the Massachusetts DOT Standard Specifications for Highways and Bridges. Structural Fill should be used to replace unsuitable soils and as backfill around and above footings.

Fill used to construct the proposed 3H:1V fill slope should meet the requirements of material specification M1.01.0 Ordinary Borrow in the latest edition of the Massachusetts DOT Standard Specifications for Highways and Bridges.

On-site granular soils containing less than approximately 20 percent fines and free of organics, contamination (including metals, VOCs, SVOCs, etc.), debris, and other deleterious materials may be suitable for use as Ordinary Borrow and as fill outside proposed structures if properly moisture conditioned. Moisture conditioning, if required, could consist of drying by scarification and frequent mixing in thin lifts during warm, dry conditions.

All fill should be placed in 10-inch maximum loose lifts with each lift compacted to at least 95 percent of the materials maximum dry density as determined by ASTM D1557. In confined areas and where only hand-guided compaction equipment can be used, the lift thickness should be reduced to not more than 6-inches and the maximum particle size reduced to two inches.

## LIMITATIONS

We have prepared this report for use by the Town of Brookline and members of the design and construction team for the subject project and this site only. The data and report can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions and are not applicable to other sites. Additional information about interpretation and use of this report is included in *Attachment D*.

Soil borings and test pits indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect subsurface conditions that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, reevaluation will be necessary.

Site development plans and design details were considered preliminary at the time this report was prepared. If changes are made in site grades, configuration, design loads, or type of construction for the structure, the conclusions and recommendations may not be applicable. We should be consulted to review final design drawings and specifications to see that our recommendations are suitably followed. If design changes are made, we should be retained to review our conclusions and recommendations and provide a written evaluation or modification. Additional geotechnical engineering analyses and explorations may be necessary.

The recommendations in this report are preliminary as actual subsurface conditions may differ from those interpreted based on our subsurface explorations. In order for our recommendations to be considered final, we must be retained to observe the actual subsurface conditions encountered during construction. Our observations will allow us to interpret the actual conditions present during construction and adapt our recommendations if needed.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, is given.

It has been a pleasure assisting you with this project and we look forward to our continued involvement. Please call if you have any questions.

Sincerely,  
WESTON & SAMPSON ENGINEERS, INC.



Matthew J. Zanchi, EIT  
Engineer II



Thomas J. Strike, PE  
Senior Project Manager



Tulin H. Fuselier, PE  
Geotechnical Practice Leader

**Attachments:**

- Figure 1 – Site Plan
- Attachment A – Boring Logs (16 pages)
- Attachment B – Hand Excavation Logs (2 pages)
- Attachment D – Test Pit Logs (5 pages)
- Attachment C – Important Information about This Geotechnical-Engineering Report

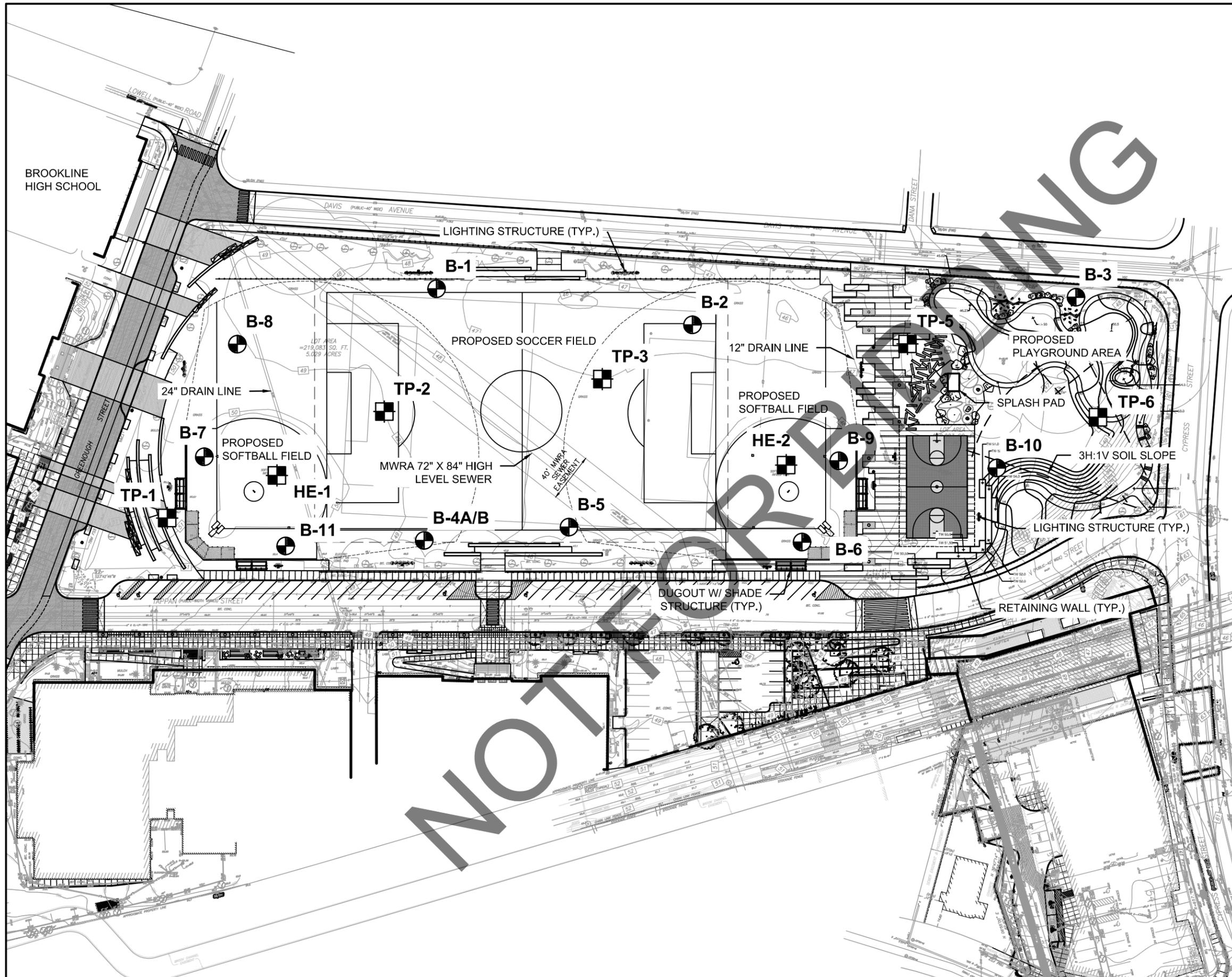
MJZ:TJS:THF

P:\MA\Brookline MA\Cypress Street Playground\Geotech\Report\FINAL Geotech Letter Report - Brookline Cypress St Playground.doc

NOT FOR BIDDING

NOT FOR BIDDING

FIGURE

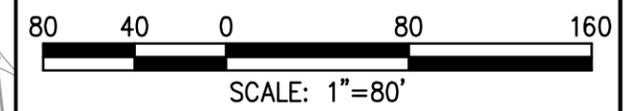
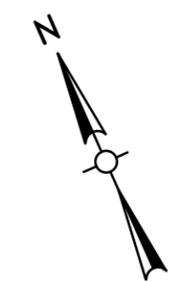


**NOTES:**

1. THIS DRAWING IS BASED ON A JULY 2019 PROPOSED CONDITIONS PLAN PREPARED BY WESTON & SAMPSON.
2. BORINGS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NH BETWEEN JUNE 3 AND 6, 2019 AND OBSERVED BY WESTON & SAMPSON GEOTECHNICAL STAFF.
3. TEST PITS WERE COMPLETED BY THE TOWN OF BROOKLINE DPW ON JUNE 3, 2019 AND OBSERVED BY A WESTON & SAMPSON SOIL EVALUATOR. TEST PIT TP-4 WAS NOT COMPLETED DUE TO UTILITY CONFLICTS.
4. HAND EXCAVATIONS WERE COMPLETED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NH ON JUNE 6, 2019 AND OBSERVED BY WESTON & SAMPSON GEOTECHNICAL STAFF.
5. EXPLORATION LOCATIONS SHOWN ARE APPROXIMATE AND BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES.
6. ELEVATIONS REFERENCE THE BROOKLINE TOWN BASE DATUM.

**LEGEND:**

-  **B-1** BORING DESIGNATION AND APPROXIMATE LOCATION.
-  **TP-1** TEST PIT DESIGNATION AND APPROXIMATE LOCATION.
-  **HE-1** HAND EXCAVATION DESIGNATION AND APPROXIMATE LOCATION.



**FIGURE 1  
SITE PLAN**

CYPRESS STREET  
PLAYGROUND  
BROOKLINE, MASSACHUSETTS

DESIGNED BY: MJZ | CHECKED BY: TJS | DATE: SEPTEMBER 2019



NOT FOR BIDDING

APPENDIX A

*Boring Logs*

CLIENT: Town of Brookline  
PROJECT NUMBER: 2190095

PROJECT NAME: Cypress Street Playground  
PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
CASING DIAMETER: 4 in. ID  
SAMPLING METHODS: Standard penetration test (SPT)  
SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
SAMPLER HAMMER: 140-lb. automatic hammer  
OTHER:

BORING LOCATION: See Site Plan.  
GROUND ELEVATION: 47 ft. +/- DATUM: Brookline Town Base  
DRILLING START DATE: 6/4/2019 END DATE: 6/4/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	8 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0								Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%	Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
47							18" TOPSOIL			- Hand excavated with shovel to 3.5 ft. to avoid utilities.
							FILL	Orange-brown, gravelly fine to coarse SAND, trace silt; moist. [FILL]  Top 12" - Medium dense, orange-brown, gravelly fine to coarse SAND, trace silt; moist. [FILL]		
5	S-1	3.5	16/24	10	25					
				14						
				11						
42	S-2	5.5	13/24	10	22		SAND	Bottom 4" - Orange-brown, fine to medium SAND, little silt; moist. Top 9" - Medium dense, orange-brown, fine to medium SAND, little silt; moist. Bottom 4" - Light brown, fine to medium SAND, trace silt; moist.		- Roller bit grinding from approximately 5 to 7 ft. through possible cobbles/boulders.
				12						
				10						
				9						
10	S-3	9.0	15/24	4	9		SILT	Stiff, gray-brown, fine to medium sandy SILT; wet.		
				5						
				5						
				4						
				5						
15	S-4	14.0	2/24	18	47		SAND & GRAVEL	Dense, gray-brown, GRAVEL, trace fine to coarse sand, trace silt; wet. - gravel in tip of spoon		- Roller bit grinding from approximately 13.5 to 24 ft. through possible cobbles/boulders.
				24						
				23						
				22						
20	S-5	19.0	8/24	15	29			Medium dense, gray-brown, gravelly fine to coarse SAND, some silt; wet.		
				14						
				15						
				12						
25	S-6	24.0	6/24	9	25			Medium dense, brown, GRAVEL, some fine to coarse sand, little silt; wet.		
				10						
				15						
				12						

End of boring at 26 ft.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

**CLIENT:** Town of Brookline  
**PROJECT NUMBER:** 2190095

**PROJECT NAME:** Cypress Street Playground  
**PROJECT LOCATION:** Brookline, Massachusetts

**DRILLER:** Matt Soucy - New England Boring Contractors  
**LOGGED / CHECKED BY:** B. Goffin / M. Zanchi  
**RIG TYPE / DRILLING METHODS:** ATV / cased rotary (drive-and-wash)  
**CASING DIAMETER:** 4 in. ID  
**SAMPLING METHODS:** Standard penetration test (SPT)  
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
**SAMPLER HAMMER:** 140-lb. automatic hammer  
**OTHER:**
**BORING LOCATION:** See Site Plan.  
**GROUND ELEVATION:** 47 ft. +/- **DATUM:** Brookline Town Base  
**DRILLING START DATE:** 6/4/2019 **END DATE:** 6/4/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	10 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0									Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
47								15" TOPSOIL		- Hand excavated with shovel to 3 ft. to avoid utilities.
	S-1	3.0	10/24	10 15 22 29	37			FILL	Brown, gravelly fine to coarse SAND, little silt, occasional cobbles; moist.  Dense, gray-brown, gravelly fine to coarse SAND, trace silt; moist.	
5	S-2	5.0	12/24	40 30 27 21	57			FILL	Very dense, gray-brown, gravelly fine to coarse SAND, trace silt; moist.	- Intermittent roller bit grinding from approximately 5 ft. to 24 ft. through possible cobbles/boulders.
10	S-3	9.0	12/24	33 20 17 15	37			SAND	Dense, orange-brown, gravelly fine to coarse SAND, little silt; moist to wet. ▼	
15	S-4	14.0	9/24	16 10 11 13	21			SILT	Top 5" - Very stiff, gray-brown, SILT with some clay, some fine to coarse sand, some gravel; wet. Bottom 4" - Gray, fine to coarse sandy GRAVEL, little silt; wet.	
20	S-5	19.0	9/24	12 12 9 9	21			SAND	Medium dense, gray-brown, fine to coarse SAND, some gravel, little silt; wet.	
25	S-6	24.0	7/24	10 9 10 13	19			SAND	Medium dense, gray, gravelly fine to coarse SAND, trace silt; wet. - gravel in tip of spoon	

End of boring at 26 ft.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

CLIENT: Town of Brookline  
 PROJECT NUMBER: 2190095

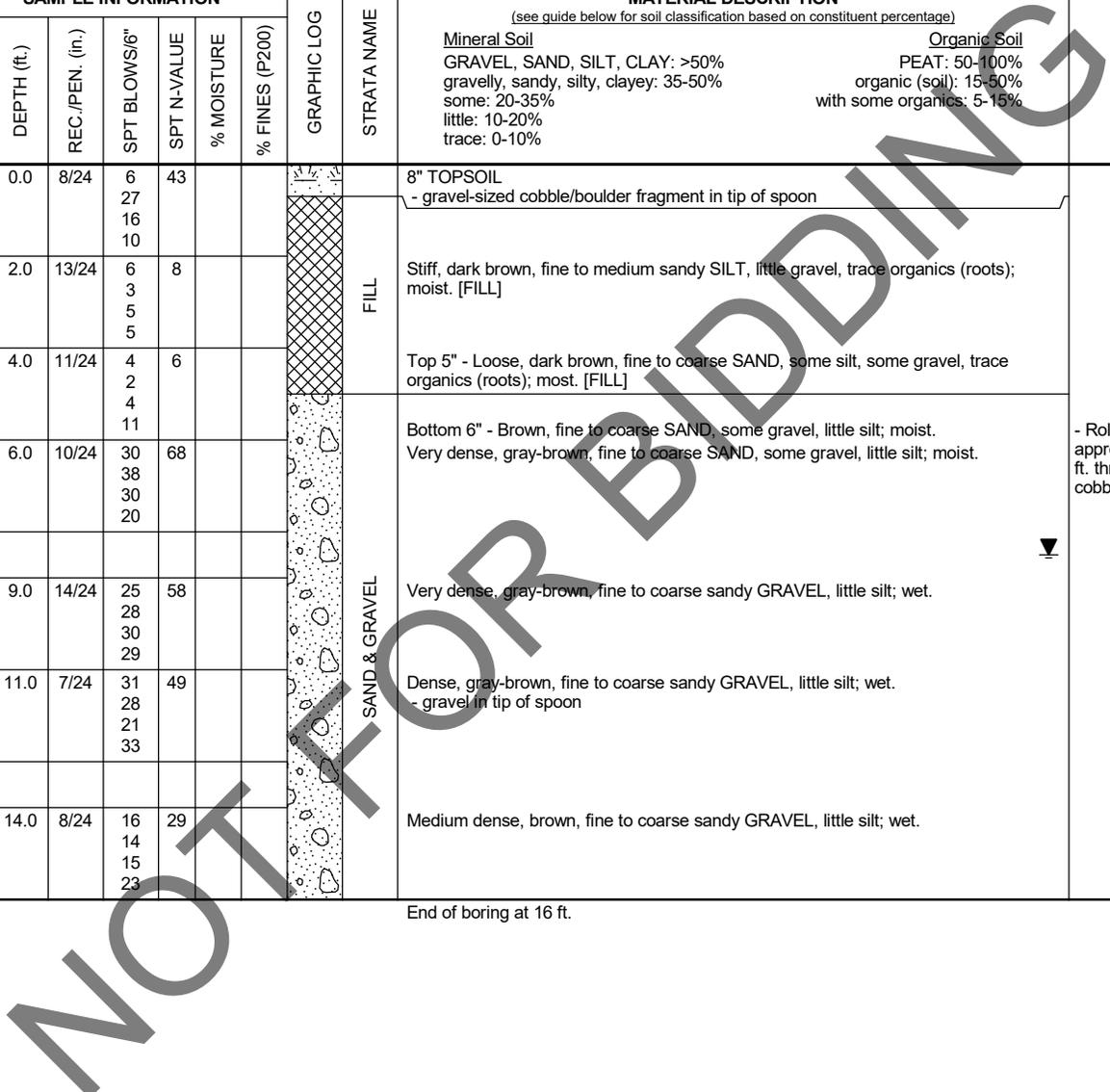
PROJECT NAME: Cypress Street Playground  
 PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
 LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
 RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
 CASING DIAMETER: 4 in. ID  
 SAMPLING METHODS: Standard penetration test (SPT)  
 SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
 SAMPLER HAMMER: 140-lb. automatic hammer  
 OTHER: \_\_\_\_\_

BORING LOCATION: See Site Plan.  
 GROUND ELEVATION: 47 ft. +/- DATUM: Brookline Town Base  
 DRILLING START DATE: 6/6/2019 END DATE: 6/6/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	8.5 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0									Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
47	S-1	0.0	8/24	6 27 16 10	43			8" TOPSOIL - gravel-sized cobble/boulder fragment in tip of spoon		
	S-2	2.0	13/24	6 3 5 5	8		FILL	Stiff, dark brown, fine to medium sandy SILT, little gravel, trace organics (roots); moist. [FILL]		
5	S-3	4.0	11/24	4 2	6			Top 5" - Loose, dark brown, fine to coarse SAND, some silt, some gravel, trace organics (roots); most. [FILL]		
42	S-4	6.0	10/24	30 38 30 20	68		SAND & GRAVEL	Bottom 6" - Brown, fine to coarse SAND, some gravel, little silt; moist. Very dense, gray-brown, fine to coarse SAND, some gravel, little silt; moist.	- Roller bit grinding from approximately 5 ft. to 14 ft. through possible cobbles/boulders.	
10	S-5	9.0	14/24	25 28 30 29	58			Very dense, gray-brown, fine to coarse sandy GRAVEL, little silt; wet.		
37	S-6	11.0	7/24	31 28 21 33	49			Dense, gray-brown, fine to coarse sandy GRAVEL, little silt; wet. - gravel in tip of spoon		
15	S-7	14.0	8/24	16 14 15 23	29			Medium dense, brown, fine to coarse sandy GRAVEL, little silt; wet.		
32								End of boring at 16 ft.		



W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRSS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

**CLIENT:** Town of Brookline  
**PROJECT NUMBER:** 2190095

**PROJECT NAME:** Cypress Street Playground  
**PROJECT LOCATION:** Brookline, Massachusetts

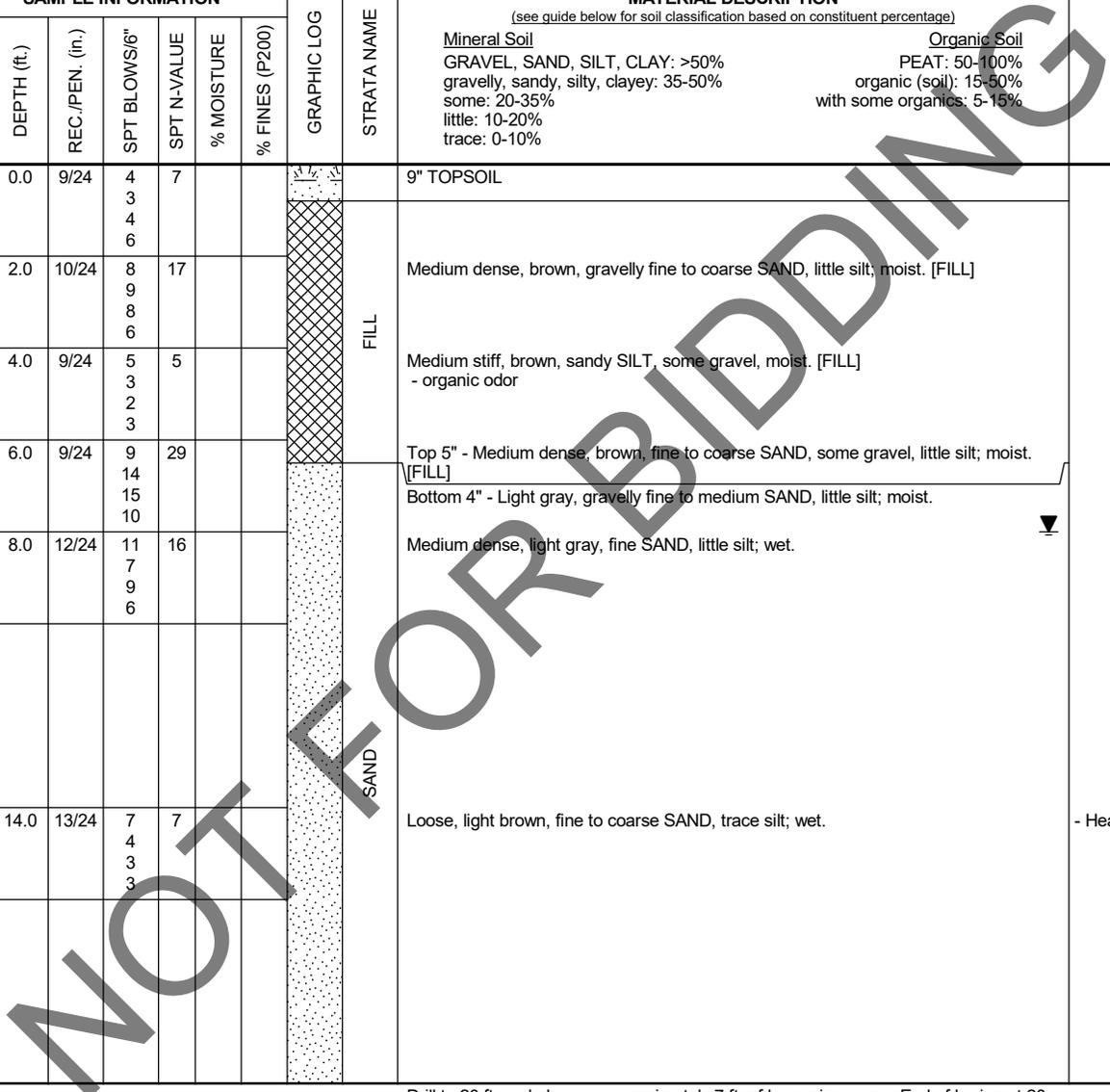
**DRILLER:** Matt Soucy - New England Boring Contractors  
**LOGGED / CHECKED BY:** B. Goffin / M. Zanchi  
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)  
**CASING DIAMETER:** 2.25 in. ID  
**SAMPLING METHODS:** Standard penetration test (SPT)  
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
**SAMPLER HAMMER:** 140-lb. automatic hammer  
**OTHER:**
**BORING LOCATION:** See Site Plan.  
**GROUND ELEVATION:** 49 ft. +/- **DATUM:** Brookline Town Base  
**DRILLING START DATE:** 6/3/2019 **END DATE:** 6/3/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
6/3/2019	8 ft. +/-	Based on wet samples.

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0									Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
49	S-1	0.0	9/24	4	7			9" TOPSOIL		
				3				FILL	Medium dense, brown, gravelly fine to coarse SAND, little silt; moist. [FILL]	
	S-2	2.0	10/24	8	17					
				9						
				6				FILL	Medium stiff, brown, sandy SILT, some gravel, moist. [FILL] - organic odor	
5	S-3	4.0	9/24	5	5					
				3				SAND	Top 5" - Medium dense, brown, fine to coarse SAND, some gravel, little silt; moist. [FILL] Bottom 4" - Light gray, gravelly fine to medium SAND, little silt; moist.	
44	S-4	6.0	9/24	9	29					
				14						
				3				SAND	Medium dense, light gray, fine SAND, little silt; wet.	
	S-5	8.0	12/24	11	16					
				7				SAND	Loose, light brown, fine to coarse SAND, trace silt; wet.	- Heave in augers.
				9						
10				6						
39								SAND		
	S-6	14.0	13/24	7	7					
				4				SAND		
				3						
15				3						
34								SAND		
				7						
20								SAND		
29										

Drill to 20 ft. and observe approximately 7 ft. of heave in augers. End of boring at 20 ft. Offset approximately 4.5 ft. northwest to B-4B and switch to drive and wash methods.

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MARBROOKLINE\MALCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ



SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

**CLIENT:** Town of Brookline  
**PROJECT NUMBER:** 2190095

**PROJECT NAME:** Cypress Street Playground  
**PROJECT LOCATION:** Brookline, Massachusetts

**DRILLER:** Matt Soucy - New England Boring Contractors  
**LOGGED / CHECKED BY:** B. Goffin / M. Zanchi  
**RIG TYPE / DRILLING METHODS:** ATV / cased rotary (drive-and-wash)  
**CASING DIAMETER:** 4 in. ID  
**SAMPLING METHODS:** Standard penetration test (SPT)  
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
**SAMPLER HAMMER:** 140-lb. automatic hammer  
**OTHER:**
**BORING LOCATION:** See Site Plan.  
**GROUND ELEVATION:** 49 ft. +/- **DATUM:** Brookline Town Base  
**DRILLING START DATE:** 6/4/2019 **END DATE:** 6/4/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	8 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0									Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
49									See log for B-4A for soil descriptions for 0 to 14 ft.	B-4B offset approximately 4.5 ft. northwest of B-4A. Drill to 14 ft. with drive and wash methods and continue sampling.
5										
44										
10										
39										
15	S-1	14.0	8/24	7 4 3 5	7			SAND	Loose, light brown, fine to medium SAND, little gravel, little silt; wet.	
20	S-2	19.0	12/24	5 7 7 5	14			SAND	Medium dense, gray, fine SAND, some silt; wet.	
25	S-3	24.0	16/24	WOH 1 2 3	3			SILT	Soft, gray, SILT with some clay, little fine sand; wet.	
24										

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

NOT FOR BIDDING

 ▼  
 - Roller bit grinding from approximately 8 ft. to 11 ft. through possible cobbles/boulders.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

**CLIENT:** Town of Brookline      **PROJECT NAME:** Cypress Street Playground  
**PROJECT NUMBER:** 2190095      **PROJECT LOCATION:** Brookline, Massachusetts

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
30	S-4	29.0	7/24	13	14			Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	- Intermittent roller bit grinding from approximately 27 ft. to 29 ft. through possible cobbles/boulders.	
19				7						

End of boring at 31 ft.

NOT FOR BIDDING

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MARBROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

**CLIENT:** Town of Brookline  
**PROJECT NUMBER:** 2190095

**PROJECT NAME:** Cypress Street Playground  
**PROJECT LOCATION:** Brookline, Massachusetts

**DRILLER:** Matt Soucy - New England Boring Contractors  
**LOGGED / CHECKED BY:** B. Goffin / M. Zanchi  
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)  
**CASING DIAMETER:** 2.25 in. ID  
**SAMPLING METHODS:** Standard penetration test (SPT)  
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
**SAMPLER HAMMER:** 140-lb. automatic hammer  
**OTHER:**
**BORING LOCATION:** See Site Plan.  
**GROUND ELEVATION:** 48 ft. +/- **DATUM:** Brookline Town Base  
**DRILLING START DATE:** 6/3/2019 **END DATE:** 6/3/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
6/3/2019	8 ft. +/-	Based on wet samples.

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0									Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
48								14" TOPSOIL		- Hand excavated with shovel to 3 ft. to avoid utilities.
	S-1	3.0	0/24	3 3 2 2	5			FILL No Recovery		
5										
43	S-2	5.0	9/24	3 6 9 16	15			Top 6" - Medium dense, brown, fine to coarse SAND, some silt, little gravel, little debris (slag); moist. [FILL] Bottom 3" - Gray, GRAVEL, some fine to coarse sand, trace silt; moist. - gravel-sized boulder/cobble fragments in spoon		- Roller bit grinding from approximately 6 ft. to 8 ft. through possible cobbles/boulders.
	S-3	7.0	14/24	9 7 7 7	14			Top 6" - Brown, gravelly fine to coarse SAND, little silt; moist. [FILL] Bottom 6" - Medium dense, gray-brown, fine to medium SAND, little silt; wet.		
10										
38	S-4	9.0	14/24	3 3 3 4	6			Loose, gray-brown, fine to medium SAND, little silt, trace gravel; wet.		
15										
33	S-5	15.0	17/24	3 3 3 7	6			Top 11" - Loose, light gray, fine to coarse SAND, trace silt; wet. Bottom 6" - Gray, fine to medium SAND, little silt; wet.		
20	S-6	19.0	13/24	9 12 9 12	21			Top 5" - Light brown, fine to medium SAND, trace silt; wet. Bottom 8" - Medium dense, gray, GRAVEL, some fine to medium sand, some clay with some silt; wet.		
28										
25	S-7	24.0	12/24	13 11 10 10	21			Medium dense, gray, fine to coarse SAND, trace silt; wet. - gravel in tip of spoon		- Intermittent roller bit grinding from approximately 22 ft. to 25 ft. through possible cobbles/boulders.
23										

End of boring at 26 ft.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

CLIENT: Town of Brookline  
PROJECT NUMBER: 2190095

PROJECT NAME: Cypress Street Playground  
PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
RIG TYPE / DRILLING METHODS: ATV / hollow-stem auger (HSA)  
CASING DIAMETER: 2.25 in. ID  
SAMPLING METHODS: Standard penetration test (SPT)  
SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
SAMPLER HAMMER: 140-lb. automatic hammer  
OTHER:

BORING LOCATION: See Site Plan.  
GROUND ELEVATION: 48 ft. +/- DATUM: Brookline Town Base  
DRILLING START DATE: 6/3/2019 END DATE: 6/3/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
6/3/2019	10 ft. +/-	Based on wet samples.

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0								Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%	Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
48								24" TOPSOIL		- Hand excavated with shovel to 3 ft. to avoid utilities.
	S-1	3.0	11/21	11 41 30	71			Tan, fine to coarse SAND, some gravel, trace silt; moist. [FILL] Very dense, gray, GRAVEL, some fine to medium sand, little silt; moist. [FILL] - gravel-sized cobble fragments in spoon		- Auger grinding from approximately 3 ft. to 6 ft. through possible cobbles/boulders.
5				100/3"						
43	S-2	5.0	17/24	19 36 40 34	76			FILL Very dense, tan to gray, gravelly fine to coarse SAND, trace silt; moist. [FILL]		
	S-3	7.0	13/24	32 27 32 46	59			Very dense, tan to gray, gravelly fine to coarse SAND, trace silt; moist. [FILL]		
10	S-4	9.0	13/24	20 15 23 17	38			Top 8" - Dense, light brown, fine to coarse SAND, some gravel, trace silt; moist. [FILL] Middle 2" - Black, fine to medium SAND, some silt, little gravel, trace organics; wet. [BURIED TOPSOIL] - organic odor Bottom 3" - Light brown, fine to coarse SAND, little gravel, trace silt; wet.		
38										
15										
33	S-5	15.0	11/24	7 14 17 17	31			SAND & GRAVEL Top 6" - Dense, gray-brown, fine to coarse SAND, little silt; wet. Bottom 5" - Gray-brown, GRAVEL, some fine to coarse sand, little silt; wet.		
20										
28	S-6	20.0	7/24	7 3 4 7	7			Top 4" - Loose, gray-brown, fine to medium SAND, little gravel, little silt; wet. Bottom 3" - Gray, GRAVEL, little fine to coarse sand, trace silt; wet.		- Intermittent auger grinding from approximately 18 ft. to 24 ft. through possible cobbles/boulders.
25	S-7	24.0	20/24	7 12 12 11	24			Medium dense, gray-brown, silty fine to medium SAND, little gravel; wet.		
23										

End of boring at 26 ft.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

CLIENT: Town of Brookline  
PROJECT NUMBER: 2190095

PROJECT NAME: Cypress Street Playground  
PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
CASING DIAMETER: 4 in. ID  
SAMPLING METHODS: Standard penetration test (SPT)  
SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
SAMPLER HAMMER: 140-lb. automatic hammer  
OTHER:

BORING LOCATION: See Site Plan.  
GROUND ELEVATION: 50 ft. +/- DATUM: Brookline Town Base  
DRILLING START DATE: 6/4/2019 END DATE: 6/4/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	8.5 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>		COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE			% FINES (P200)	Mineral Soil	
0									GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%	PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
50	S-1	0.0	13/24	3	23		FILL	7" TOPSOIL			
				7				Bottom 6" - Medium dense, brown, fine to coarse SAND, some gravel, little silt; moist. [FILL]			
	S-2	2.0	7/24	13	17			Medium dense, light brown, fine to medium SAND, some gravel, trace silt; moist. [FILL]			
				10				Medium dense, brown, gravelly fine to coarse SAND, little silt, trace organics (roots); moist. [FILL]			
5	S-3	4.0	13/24	7	28		SAND	Top 8" - Brown, fine to coarse SAND, some gravel, little silt, little debris (possible coal); moist. [FILL]			- Roller bit grinding from approximately 6 ft. to 8 ft. through possible cobbles/boulders.
45				9				Bottom 15" - Medium dense, tan, fine to medium SAND, trace silt; moist.			
	S-4	6.0	23/24	15	28			Loose, orange-brown, fine to medium SAND, little silt; wet.			
				13							
10	S-5	9.0	11/24	5	9		SILT				
40				5							
				4							
				8							
15	S-6	14.0	11/24	5	9		SAND & GRAVEL				
35				4				Loose, gray, fine SAND, some silt; wet.			
				5							
				5							
20	S-7	19.0	22/24	2	4		SAND & GRAVEL				
30				1				Medium stiff, gray, SILT, some fine sand; wet.			
				3							
				3							
25	S-8	24.0	6/24	18	20		SAND & GRAVEL				
				9				Medium dense, gray to brown, GRAVEL, some fine to coarse sand, little silt; wet.			
25				11				- Gravel in tip of spoon.			
				16							

End of boring at 26 ft.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

CLIENT: Town of Brookline  
 PROJECT NUMBER: 2190095

PROJECT NAME: Cypress Street Playground  
 PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
 LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
 RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
 CASING DIAMETER: 4 in. ID  
 SAMPLING METHODS: Standard penetration test (SPT)  
 SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
 SAMPLER HAMMER: 140-lb. automatic hammer  
 OTHER: \_\_\_\_\_

BORING LOCATION: See Site Plan.  
 GROUND ELEVATION: 49 ft. +/- DATUM: Brookline Town Base  
 DRILLING START DATE: 6/4/2019 END DATE: 6/4/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	8.5 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0									Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
49								10" TOPSOIL		- Hand excavated with shovel to 3 ft. to avoid utilities.
	S-1	3.0	8/24	2 12 17 16	29			FILL	Gray-brown, fine to coarse SAND, some gravel, some debris (glass, coal, ash, slag, possible clay pipe fragments), trace organics (roots); moist. [FILL]  Dark brown, silty fine to medium SAND, little gravel, trace organics (roots); moist. [FILL] Very stiff, dark brown, fine to medium sandy SILT, trace gravel, trace organics (roots); moist. [FILL]	
5	S-2	5.0	12/24	18 13 18 11	31			Top 6" - Medium dense, orange-brown, fine to coarse SAND, some gravel, little silt; moist. Bottom 6" - Brown, fine to medium SAND, some gravel, trace silt; moist.		- Roller bit grinding from approximately 5 ft. to 8 ft. through possible cobbles/boulders.
	S-3	9.0	11/24	11 12 10 9	22			SAND	Medium dense, brown, fine to medium SAND, trace silt; wet.	
10										
39										
	S-4	14.0	13/24	7 7 7 9	14			SAND	Medium dense, brown, fine to medium SAND, trace silt; wet.	
15										
34										
	S-5	19.0	12/24	6 3 3 2	6			SILT	Top 5" - Gray, fine to medium SAND, little silt, trace gravel; wet. Bottom 7" - Medium stiff, gray, SILT, some fine to medium sand; wet.	
20										
29										
	S-6	24.0	7/24	13 20 15 20	35			SAND & GRAVEL	Dense, gray to orange-brown, GRAVEL, some silt, some fine to medium sand; wet.	
25										
24										

End of boring at 26 ft.

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

CLIENT: Town of Brookline  
 PROJECT NUMBER: 2190095

PROJECT NAME: Cypress Street Playground  
 PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
 LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
 RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
 CASING DIAMETER: 4 in. ID  
 SAMPLING METHODS: Standard penetration test (SPT)  
 SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
 SAMPLER HAMMER: 140-lb. automatic hammer  
 OTHER: \_\_\_\_\_

BORING LOCATION: See Site Plan.  
 GROUND ELEVATION: 48 ft. +/- DATUM: Brookline Town Base  
 DRILLING START DATE: 6/5/2019 END DATE: 6/5/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	14 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION							GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE	% FINES (P200)				
0										Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
48	S-1	0.0	14/24	3	10				8" TOPSOIL		- Intermittent roller bit grinding from approximately 3 ft. to 13 ft. through possible cobbles/boulders.
				5					Bottom 6" - Stiff, dark brown, fine to medium sandy SILT, trace gravel, trace organics (roots); moist. [FILL]		
	S-2	2.0	10/24	9	35				Dense, orange-brown, fine to medium SAND, some gravel, some silt, trace debris (asphalt); moist. [FILL]		
				15							
5	S-3	4.0	14/24	29	69			Very dense, gray-brown, fine to coarse SAND, some gravel, little silt; moist. [FILL]			
43				41							
				28							
				35							
	S-4	6.0	10/24	32	120			Very dense, gray, GRAVEL, some fine to medium sand, little silt; moist. - possible cobble/boulder fragments			
				60							
				60							
				65							
10	S-5	9.0	12/24	25	58			Very dense, gray-brown, fine to coarse SAND, some gravel, little silt; moist.			
38				30							
				28							
				34							
15	S-6	14.0	12/24	13	24			Medium dense, gray-brown, fine to coarse SAND, some gravel, little silt; wet.			
33				10							
				14							
				18							
20	S-7	19.0	12/24	8	20			Medium dense, gray-brown, fine to coarse SAND, some gravel, little silt; wet.			
28				9							
				11							
				10							
25	S-8	24.0	19/24	4	9			SILT	Top 5" - Stiff, gray-brown, clayey SILT, little fine sand, little gravel; wet.		
23				4					Middle 10" - Gray-brown, silty fine to medium SAND; wet.		
				5					Bottom 4" - Gray-brown, clayey SILT, some fine to medium sand; wet.		
				5							

W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRSS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

CLIENT: Town of Brookline PROJECT NAME: Cypress Street Playground  
 PROJECT NUMBER: 2190095 PROJECT LOCATION: Brookline, Massachusetts

DEPTH (ft.) Elevation	SAMPLE INFORMATION							GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE	% FINES (P200)				
30 18	S-9	29.0	16/24	9 11 13 13	24			SILT	Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%	Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	Top 5" - Very stiff, gray-brown, clayey SILT, some fine to coarse sand, trace gravel; wet.  Bottom 11" - Gray-brown, fine to medium SAND, little silt; wet.
35 13	S-10	34.0	9/24	12 66 62 21	128			SAND	Hard, gray, fine to coarse sandy clayey SILT, trace gravel; wet. - Gravel in tip of spoon		

End of boring at 36 ft.

NOT FOR BIDDING

W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30 > 30	Very Stiff Hard	

CLIENT: Town of Brookline  
 PROJECT NUMBER: 2190095

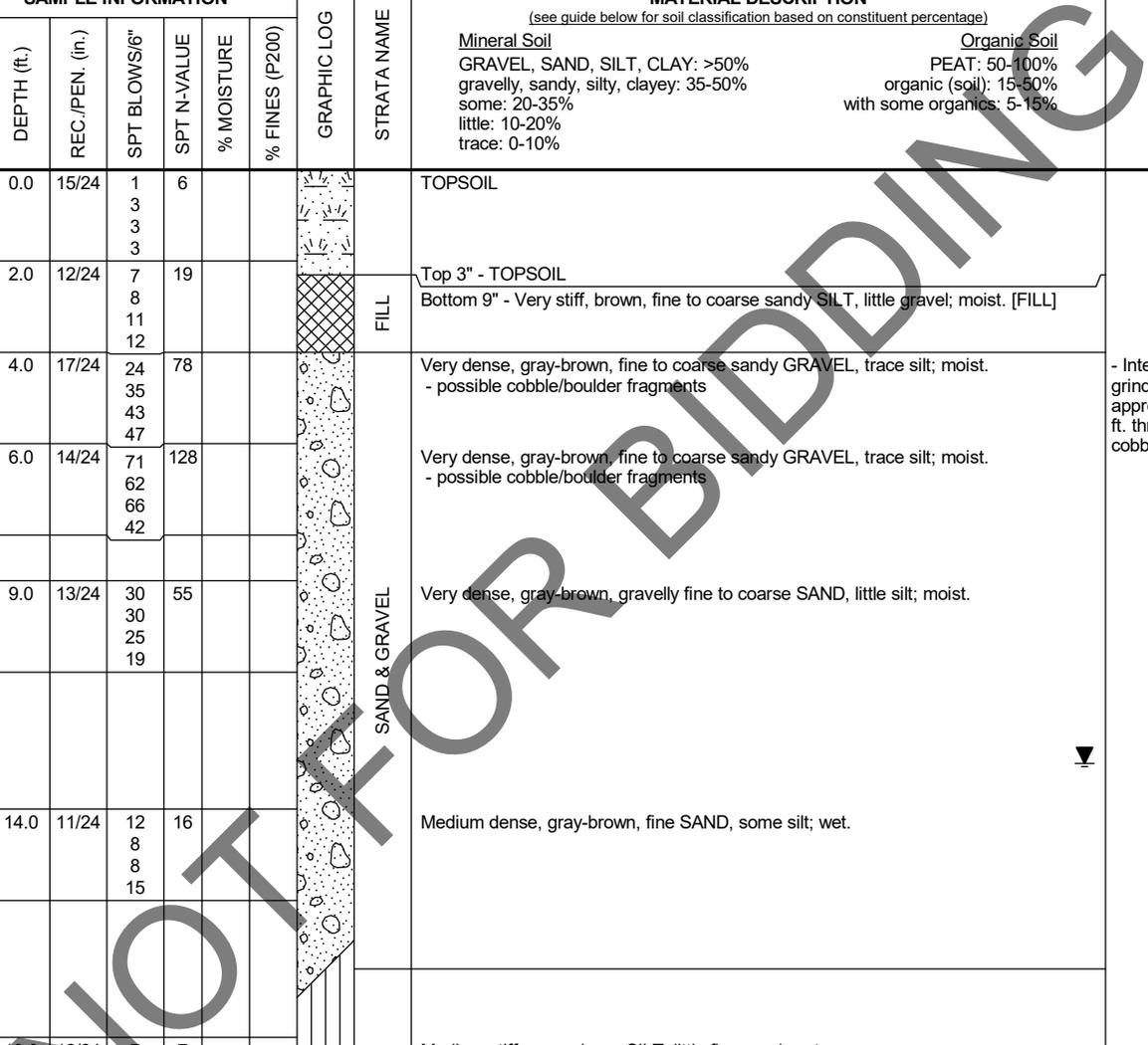
PROJECT NAME: Cypress Street Playground  
 PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
 LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
 RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
 CASING DIAMETER: 4 in. ID  
 SAMPLING METHODS: Standard penetration test (SPT)  
 SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
 SAMPLER HAMMER: 140-lb. automatic hammer  
 OTHER: \_\_\_\_\_

BORING LOCATION: See Site Plan.  
 GROUND ELEVATION: 47 ft. +/- DATUM: Brookline Town Base  
 DRILLING START DATE: 6/5/2019 END DATE: 6/6/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
6/6/2019	13 ft. +/-	Measured in borehole approximately 16 hrs after drilling.

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0								Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%	Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
47	S-1	0.0	15/24	1 3 3	6			TOPSOIL		
	S-2	2.0	12/24	7 8 11 12	19			FILL	Top 3" - TOPSOIL Bottom 9" - Very stiff, brown, fine to coarse sandy SILT, little gravel; moist. [FILL]	
5	S-3	4.0	17/24	24 35 43 47	78			SAND & GRAVEL	Very dense, gray-brown, fine to coarse sandy GRAVEL, trace silt; moist. - possible cobble/boulder fragments	- Intermittent roller bit grinding from approximately 4 ft. to 17 ft. through possible cobbles/boulders.
42	S-4	6.0	14/24	71 62 66 42	128			SAND & GRAVEL	Very dense, gray-brown, fine to coarse sandy GRAVEL, trace silt; moist. - possible cobble/boulder fragments	
10	S-5	9.0	13/24	30 30 25 19	55			SAND & GRAVEL	Very dense, gray-brown, gravelly fine to coarse SAND, little silt; moist.	
37	S-6	14.0	11/24	12 8 8 15	16			SAND & GRAVEL	Medium dense, gray-brown, fine SAND, some silt; wet.	
20	S-7	19.0	12/24	7 3 4 4	7			SILT	Medium stiff, gray, clayey SILT, little fine sand; wet.	
27	S-8	21.0	24/24	3 3 4 7	7			SILT	Medium stiff, gray, silty CLAY, little fine sand; wet.	
25	S-9	24.0	24/24	2 2 2 4	4			SILT	Medium stiff, gray, silty CLAY, little fine sand; wet.	
22										



W&S BORING LOG - DATA TEMPLATE - W&S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MABROOKLINE\MALOCYPRESS STREETS\PLAYGROUND\GEO\TECH\FIELD\CYPRSS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

**CLIENT:** Town of Brookline      **PROJECT NAME:** Cypress Street Playground  
**PROJECT NUMBER:** 2190095      **PROJECT LOCATION:** Brookline, Massachusetts

DEPTH (ft.) Elevation	SAMPLE INFORMATION							GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE	% FINES (P200)				
	S-10	26.0	17/24	4 11 9 10	20				Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%		
											Top 12" - Very stiff, gray-brown, SILT with some clay, little fine sand, trace gravel; wet.  Bottom 4" - Brown, fine to medium SAND, some silt; wet.
30 17	S-11	29.0	/24	10 7 10 6	17				Medium dense, gray-brown, fine SAND, some silt, trace gravel; wet.		

End of boring at 31 ft.

NOT FOR BIDDING

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MARBROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30 > 30	Very Stiff Hard	

CLIENT: Town of Brookline  
 PROJECT NUMBER: 2190095

PROJECT NAME: Cypress Street Playground  
 PROJECT LOCATION: Brookline, Massachusetts

DRILLER: Matt Soucy - New England Boring Contractors  
 LOGGED / CHECKED BY: B. Goffin / M. Zanchi  
 RIG TYPE / DRILLING METHODS: ATV / cased rotary (drive-and-wash)  
 CASING DIAMETER: 4 in. ID  
 SAMPLING METHODS: Standard penetration test (SPT)  
 SAMPLER TYPE: Standard 24" long x 2" OD (1-3/8" ID) split-spoon  
 SAMPLER HAMMER: 140-lb. automatic hammer  
 OTHER: \_\_\_\_\_

BORING LOCATION: See Site Plan.  
 GROUND ELEVATION: 50 ft. +/- DATUM: Brookline Town Base  
 DRILLING START DATE: 6/6/2019 END DATE: 6/6/2019

GROUNDWATER OBSERVATIONS		
DATE	DEPTH	COMMENTS
	8.5 ft. +/-	

DEPTH (ft.) Elevation	SAMPLE INFORMATION						GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC./PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE				
0								Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%	Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%	
50	S-1	0.0	8/24	2	16		FILL	TOPSOIL		
	S-2	2.0	5/24	16	50			5" TOPSOIL - Possible cobble fragment in bottom of spoon Medium dense, brown, gravelly fine to coarse SAND, trace silt; moist. [FILL]		
	S-3	4.0	9/24	7	14			Medium dense, brown, gravelly fine to coarse SAND, little silt; moist. [FILL]		
5				8						
45	S-4	6.0	8/24	6	17			Medium dense, brown, gravelly fine to coarse SAND, little silt; moist. [FILL]		
				7						
				10						
				15						
	S-5	9.0	11/24	7	30			Dense, gray-brown, silty fine to medium SAND; wet. - Gravel in tip of spoon		- Intermittent roller bit grinding from approximately 7 ft. to 39 ft. through possible cobbles/boulders.
10				7						
40	S-6	11.0	9/24	21	34			Dense, gray-brown, fine to medium SAND, little silt, little gravel; wet.		
				17						
				17						
15	S-7	14.0	5/24	9	29		Medium dense, gray-brown, gravelly fine to coarse SAND, little silt; wet.			
35				11						
				18						
	S-8	16.0	0/24	12	18		No Recovery - Gravel in tip of spoon			
				11						
				7						
				11						
20	S-9	19.0	8/24	11	23		Medium dense, gray-brown, fine to coarse sandy GRAVEL, little silt; wet.			
30				11						
				12						
				8						
	S-10	21.0	0/24	13	21		No Recovery - Gravel in tip of spoon			
				11						
				10						
				10						
25	S-11	24.0	0/24	10	21		No Recovery - Gravel in tip of spoon			
				11						
				10						
25				9						

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

**CLIENT:** Town of Brookline  
**PROJECT NUMBER:** 2190095

**PROJECT NAME:** Cypress Street Playground  
**PROJECT LOCATION:** Brookline, Massachusetts

DEPTH (ft.) Elevation	SAMPLE INFORMATION							GRAPHIC LOG	STRATA NAME	MATERIAL DESCRIPTION <small>(see guide below for soil classification based on constituent percentage)</small>	COMMENTS
	TYPE - NO.	DEPTH (ft.)	REC/PEN. (in.)	SPT BLOWS/6"	SPT N-VALUE	% MOISTURE	% FINES (P200)				
	S-12	26.0	0/24	12 12 7 12	19			 SAND & GRAVEL	Mineral Soil GRAVEL, SAND, SILT, CLAY: >50% gravelly, sandy, silty, clayey: 35-50% some: 20-35% little: 10-20% trace: 0-10%  Organic Soil PEAT: 50-100% organic (soil): 15-50% with some organics: 5-15%		
30 20	S-13	29.0	5/24	14 14 20 14	34						No Recovery - Gravel in tip of spoon
											Dense, gray-brown, GRAVEL, some fine to coarse sand, little silt; wet.
35 15	S-14	34.0	3/24	19 18 11 20	29						Medium dense, gray-brown, GRAVEL, some fine to coarse sand, little silt; wet.
40 10	S-15	39.0	3/24	49 51 17 16	68						Very dense, gray-brown, fine to coarse sandy GRAVEL, little silt; wet. - Gravel in tip of spoon
End of boring at 41 ft.											

NOT FOR BIDDING

W&amp;S BORING LOG - DATA TEMPLATE - W&amp;S STANDARD LOGS.GDT - 9/24/19 10:23 - P:\MARBROOKLINE\MALOCYPRESS STREET PLAYGROUND\GEO\TECH\FIELD\CYPRESS ST PLAYGROUND GINT BORING LOGS.GPJ

SAMPLE		GRANULAR SOILS		COHESIVE SOILS		GENERAL NOTES:
SYMBOL	TYPE	N-Value	Density	N-VALUE	CONSISTENCY	
S	Split spoon	0-4	Very Loose	< 2	Very Soft	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.
ST	Shelby tube	4-10	Loose	2-4	Soft	
AG	Auger grab	10-30	Med. Dense	4-8	Med. Stiff	2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.
NX	Rock core	30-50	Dense	8-15	Stiff	
GP	Direct push	> 50	Very Dense	15-30	Very Stiff	
				> 30	Hard	

NOT FOR BIDDING

APPENDIX B

*Hand Excavation Logs*

CLIENT: Town of Brookline PROJECT: Cypress Street Playground LOGGED BY: B. Goffin  
 PROJECT NUMBER: 2190095 LOCATION: Brookline, Massachusetts CHECKED BY: M. Zanchi  
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: BORING LOCATION: See attached plan.  
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: GROUND ELEV: 50 ft. +/- (NAVD88)  
 DRILL RIG TYPE: Hand excavation SAMPLING METHOD: START DATE: 6/6/2019  
 OTHER EQUIPMENT: SAMPLER HAMMER: END DATE: 6/6/2019

Depth, ft. Elevation	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots			Remarks and Additional Tests																	
						Soil Classification Name Guide based on Constituent Percentages		Laboratory Test Data:			Groundwater Observations																	
0.5					0-12" Tan, fine to coarse SAND, little gravel, little silt, with occasional cobbles; moist. (Infield mix) [FILL]	<table border="1"> <tr><td>GRAVEL, SAND, SILT, CLAY</td><td>&gt; 50%</td></tr> <tr><td>gravelly, sandy, silty, clayey</td><td>35 - 50%</td></tr> <tr><td>some</td><td>20 - 35%</td></tr> <tr><td>little</td><td>10 - 20%</td></tr> <tr><td>trace</td><td>0 - 10%</td></tr> </table>	GRAVEL, SAND, SILT, CLAY	> 50%	gravelly, sandy, silty, clayey	35 - 50%	some	20 - 35%	little	10 - 20%	trace	0 - 10%	<table border="1"> <tr><td>PEAT</td><td>&gt; 50%</td></tr> <tr><td>organic (soil name)</td><td>15 - 50%</td></tr> <tr><td>(soil name) with some organics</td><td>5 - 15%</td></tr> <tr><td>trace organics</td><td>&lt; 5%</td></tr> </table>	PEAT	> 50%	organic (soil name)	15 - 50%	(soil name) with some organics	5 - 15%	trace organics	< 5%	Laboratory Test Data: PL = Plastic limit, % MC = Moisture content, % LL = Liquid limit, % In-Situ Test Data ● SPT N-Value	WOR = Weight of rods WOH = Weight of hammer P200 = Percent passing the #200 sieve OC = Organic content, % LVSS = Shear strength from laboratory vane shear test, tsf	Date: 6/6/2019 Depth: Not observed
GRAVEL, SAND, SILT, CLAY	> 50%																											
gravelly, sandy, silty, clayey	35 - 50%																											
some	20 - 35%																											
little	10 - 20%																											
trace	0 - 10%																											
PEAT	> 50%																											
organic (soil name)	15 - 50%																											
(soil name) with some organics	5 - 15%																											
trace organics	< 5%																											
1.0					12"-18" Dark brown, fine to coarse SAND, some gravel, little silt, trace debris (slag), with occasional cobbles; moist; organic odor. [FILL]																							
1.5					End of hand excavation at 18 in.																							

NOT FOR BIDDING

WAS BORING LOG - MODIFIED - DATA TEMPLATE - WISE STANDARD LOGS.GDT - 7/31/19 14:19 - P:\MABROOKLINE\MA\CYPRSS STREET PLAYGROUND\GINT\FIELD\CYPRSS ST PLAYGROUND\_GINT\_TP\_LOGS.GPJ

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft		
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft		
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff		
		30 - 50	Dense	8 - 15	Stiff		
		> 50	Very Dense	15 - 30	Very Stiff		
				> 30	Hard		

CLIENT: Town of Brookline PROJECT: Cypress Street Playground LOGGED BY: B. Goffin  
 PROJECT NUMBER: 2190095 LOCATION: Brookline, Massachusetts CHECKED BY: M. Zanchi  
 CONTRACTOR: New England Boring Contractors DRILLING METHOD: BORING LOCATION: See attached plan.  
 FOREMAN/DRILLER: Matt Soucy CASING/AUGER SIZE: GROUND ELEV: 48 ft. +/- (NAVD88)  
 DRILL RIG TYPE: Hand excavation SAMPLING METHOD: START DATE: 6/6/2019  
 OTHER EQUIPMENT: SAMPLER HAMMER: END DATE: 6/6/2019

Depth, ft. Elevation	Sample Type	Blows on Sampler/6" Blows on Casing/12"	N-Value, Blows/ft.	Sample Recovery, in. Sampler Penetration, in.	Strata Description and Graphic Log	Sample Description		Data Plots			Remarks and Additional Tests																		
						General Format: Density/consistency, color, classification name (secondary PRIMARY, additional); moisture, additional information. [UNIT NAME and/or ORIGIN]		Laboratory Test Data: PL = Plastic limit, % MC = Moisture content, % LL = Liquid limit, %			WOR = Weight of rods WOH = Weight of hammer P200 = Percent passing the #200 sieve OC = Organic content, % LVSS = Shear strength from laboratory vane shear test, tsf																		
						Soil Classification Name Guide based on Constituent Percentages		In-Situ Test Data ● SPT N-Value			Groundwater Observations Date: 6/6/2019 Depth: Not observed																		
						<table border="1"> <tr><td>GRAVEL, SAND, SILT, CLAY</td><td>&gt; 50%</td></tr> <tr><td>gravelly, sandy, silty, clayey</td><td>35 - 50%</td></tr> <tr><td>some</td><td>20 - 35%</td></tr> <tr><td>little</td><td>10 - 20%</td></tr> <tr><td>trace</td><td>0 - 10%</td></tr> </table>	GRAVEL, SAND, SILT, CLAY	> 50%	gravelly, sandy, silty, clayey	35 - 50%	some	20 - 35%	little	10 - 20%	trace	0 - 10%	<table border="1"> <tr><td>PEAT</td><td>&gt; 50%</td></tr> <tr><td>organic (soil name)</td><td>15 - 50%</td></tr> <tr><td>(soil name) with some organics</td><td>5 - 15%</td></tr> <tr><td>trace organics</td><td>&lt; 5%</td></tr> </table>	PEAT	> 50%	organic (soil name)	15 - 50%	(soil name) with some organics	5 - 15%	trace organics	< 5%				
GRAVEL, SAND, SILT, CLAY	> 50%																												
gravelly, sandy, silty, clayey	35 - 50%																												
some	20 - 35%																												
little	10 - 20%																												
trace	0 - 10%																												
PEAT	> 50%																												
organic (soil name)	15 - 50%																												
(soil name) with some organics	5 - 15%																												
trace organics	< 5%																												

0.5					0-13" Tan, fine to coarse SAND, little gravel, little silt, with few cobbles; moist. (Infield mix) [FILL]						
1.0					13"-17" Dark brown, fine to coarse SAND, some gravel, some silt, trace debris (tile), with occasional cobbles; moist; organic odor. [FILL]						

End of hand excavation at 17 in.

NOT FOR BIDDING

END OF BORING LOG

SAMPLE LEGEND		N-VALUE RELATIONSHIPS				GENERAL NOTES	
	Standard split spoon sampler driven w/ 140-lb. hammer (24" long, 2" OD, 1-3/8" ID)	N-VALUE BLOWS/FT.	DENSITY OF GRANULAR SOILS	N-VALUE BLOWS/FT.	CONSISTENCY OF COHESIVE SOILS	1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.	
	Thin-walled tube sampler pushed w/ rig hydraulics (30" long, 3" ID)	0 - 4	Very Loose	< 2	Very Soft		
	NX rock core sampler advanced using rotary drilling methods (5' long, 3" ID)	4 - 10	Loose	2 - 4	Soft		
	Modified split spoon sampler driven w/ 140-lb. hammer (24" long, 3" OD, 2-3/8" ID)	10 - 30	Medium Dense	4 - 8	Medium Stiff		
		30 - 50	Dense	8 - 15	Stiff		
		> 50	Very Dense	15 - 30	Very Stiff		
				> 30	Hard		

NOT FOR BIDDING

APPENDIX C

*Test Pit Logs*

<b>TEST PIT LOG</b>			
PROJECT NAME/NO.	<u>Cypress St. Playground - 2190095</u>	<b>TEST PIT NUMBER</b>	
LOCATION	<u>Brookline, MA</u>	TP-1	
CLIENT	<u>Town of Brookline</u>	GROUND SURFACE	
CONTRACTOR	<u>Town of Brookline DPW</u>	FOREMAN:	<u>See Site Plan</u>
OBSERVED BY	<u>Kyle Elmy</u>	DATE	<u>6/3/19</u>
CHECKED BY	_____	DATE	_____
		ELEVATION	
		DEPTH TO GROUNDWATER BELOW	
		SURFACE	
		Not Encountered	
DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION		
32" (2.7')	Fill - Very dark brown sandy loam (10YR2/2)		
56" (4.7')	Fill - Yellowish brown sand (10YR5/4) 5% Gravel and Cobbles		
70" (5.8')	Ab - Dark brown sand loam (10YR3/3)		
109" (9.1')	C1 - Yellowish brown medium sand (10YR5/4)		
138" (11.5')	C2 - Gray very fine sand (10YR5/1)		
	- End of Exploration -		
<b>NOTES:</b>		<b>TEST PIT NUMBER</b>	
1. Redox features 5% at 98"		TP-1	
2. Sample taken at 24-inches		<b>WESTON &amp; SAMPSON ENGINEERS, INC.</b>	

**TEST PIT LOG**

PROJECT NAME/NO.	<u>Cypress St. Playground - 2190095</u>	<b>TEST PIT NUMBER</b>	
LOCATION	<u>Brookline, MA</u>	TP-1	
CLIENT	<u>Town of Brookline</u>	GROUND SURFACE	
CONTRACTOR	<u>Town of Brookline DPW</u>	FOREMAN:	<u>See Site Plan</u>
OBSERVED BY	<u>Kyle Elmy</u>	DATE	<u>6/3/19</u>
CHECKED BY	_____	DATE	_____
		DEPTH TO GROUNDWATER BELOW SURFACE <u>Not Encountered</u>	

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
----------------------------------	---------------------------------------



**NOTES:**

1. Redox features 5% at 98"
2. Sample taken at 24-inches

<b>TEST PIT NUMBER</b>
TP-1
<b>WESTON &amp; SAMPSON ENGINEERS, INC.</b>



**TEST PIT LOG**

PROJECT NAME/NO.	<u>Cypress St. Playground - 2190095</u>	<b>TEST PIT NUMBER</b>	
LOCATION	<u>Brookline, MA</u>	TP-2	
CLIENT	<u>Town of Brookline</u>	GROUND SURFACE	
CONTRACTOR	<u>Town of Brookline DPW</u>	FOREMAN:	<u>See Site Plan</u>
OBSERVED BY	<u>Kyle Elmy</u>	DATE	<u>6/3/19</u>
CHECKED BY	_____	DATE	_____
		DEPTH TO GROUNDWATER BELOW SURFACE <u>Not Encountered</u>	

DEPTH BELOW  
GROUND  
SURFACE (in.)

TEST PIT DIAGRAM AND SOIL DESCRIPTION



**NOTES:**

1. Redox features 5% at 85"
2. Sample taken at 14-inches

**TEST PIT NUMBER**

TP-2

**WESTON & SAMPSON  
ENGINEERS, INC.**



**TEST PIT LOG**

PROJECT NAME/NO.	Cypress St. Playground - 2190095	<b>TEST PIT NUMBER</b>	TP-3
LOCATION	Brookline, MA	GROUND SURFACE	
CLIENT	Town of Brookline	ELEVATION	See Site Plan
CONTRACTOR	Town of Brookline DPW	FOREMAN:	
OBSERVED BY	Kyle Elmy	DATE	6/3/19
CHECKED BY		DATE	
		DEPTH TO GROUNDWATER BELOW SURFACE	108

DEPTH BELOW  
GROUND  
SURFACE (in.)

TEST PIT DIAGRAM AND SOIL DESCRIPTION



**NOTES:**

1. Redox features 5% at 28"
2. Sample taken at 20-inches
3. Standing water at 108-inches

**TEST PIT NUMBER**

TP-3

**WESTON & SAMPSON  
ENGINEERS, INC.**









NOT FOR BIDDING

APPENDIX D

*Important Information about This Geotechnical-Engineering Report*

# Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## **Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects**

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

## **Read this Report in Full**

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

## **You Need to Inform Your Geotechnical Engineer about Change**

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

## **This Report May Not Be Reliable**

*Do not rely on this report* if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

## **Most of the "Findings" Related in This Report Are Professional Opinions**

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

## This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

## This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

## Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

## Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

## Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



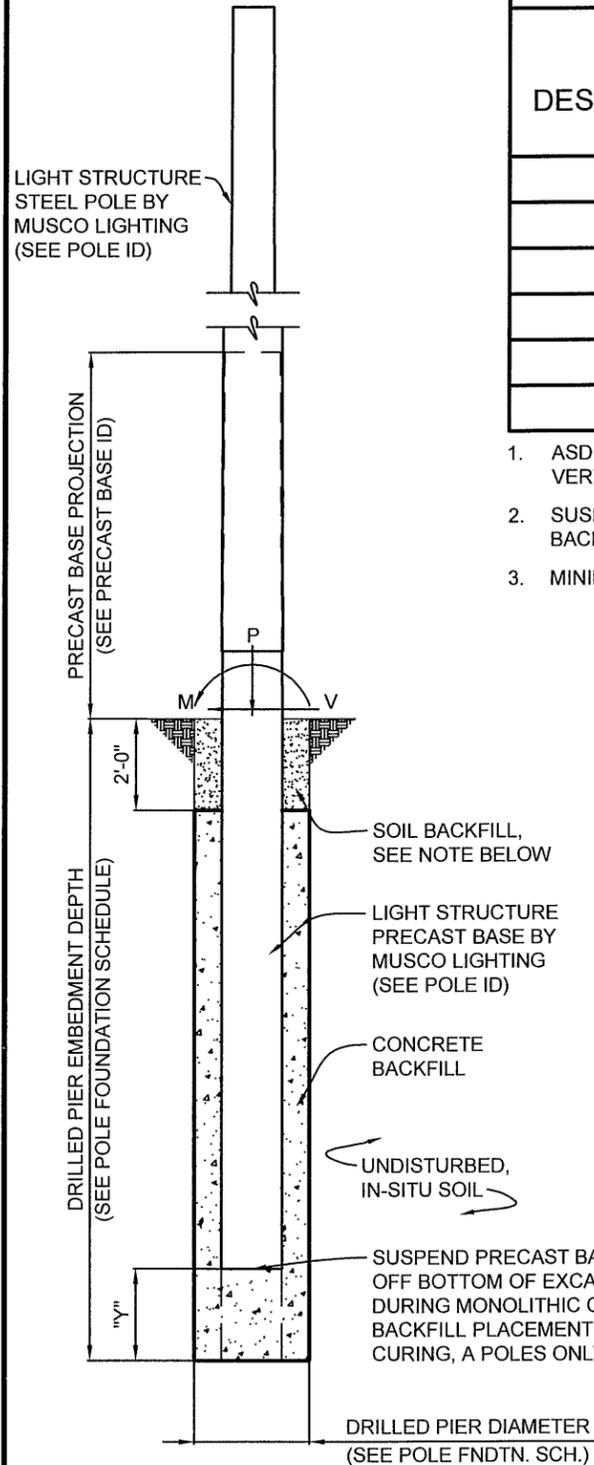
Telephone: 301/565-2733

e-mail: [info@geoprofessional.org](mailto:info@geoprofessional.org) [www.geoprofessional.org](http://www.geoprofessional.org)

Appendix B

MUSCO Light Pole Base Foundation

NOT FOR BIDDING



**POLE FOUNDATION ELEV.**

SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:  
 THE TOP TWO FEET OF ANNULUS SHALL BE BACKFILLED WITH SOIL, WITH A CLASSIFICATION OF CLASS 5 (TABLE 1806.2) OR BETTER. COMPACTION, 95% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D698).

POLE FOUNDATION SCHEDULE							
POLE DESIGNATION	FORCES (1.)			DRILLED PIER			
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	DIAMETER INCHES	EMBEDMENT DEPTH	SUSPENSION "Y" (2.)	CONCRETE BACKFILL YD <sup>3</sup> (3.)
A1, A2	33,890	998	1,075	30	12'-0"	2'-0"	1.6
A3, A4	33,144	979	1,005	30	12'-0"	2'-0"	1.6
B1, B4	74,467	1,788	2,099	30	14'-0"	NA	1.6
B2, B3	95,587	2,206	3,152	30	16'-0"	NA	1.7
P1, P2	24,109	849	718	30	10'-0"	NA	1.3
S1, S2	100,945	2,248	3,218	30	16'-0"	NA	1.7

- ASD LOAD COMBINATION D + 0.6W. VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT)
- SUSPEND PRECAST BASE "Y" OFF THE BOTTOM OF THE EXCAVATION DURING MONOLITHIC CONCRETE BACKFILL PLACEMENT AND CURING. NA = NOT APPLICABLE, SUSPENSION NOT REQUIRED.
- MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.

PRECAST BASE IDENTIFICATION					
PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER
2B	1,690 LBS	17'-3"	7'-3"	10'-0"	12.00"
4B	3,490 LBS	22'-0"	8'-0"	14'-0"	15.75"
5B	4,580 LBS	23'-11"	7'-11"	16'-0"	18.25"

POLE IDENTIFICATION				
POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT <sup>2</sup> )
A1, A2	LSS60A	2B	3 (2)	7.0
A3, A4	LSS60A	2B	3 (2)	7.2
B1, B4	LSS70C	4B	6 (4)	14.9
B2, B3	LSS70D	5B	8 (6)	21.4
P1, P2	LSS50AB	2B	2 (2)	4.2
S1, S2	LSS70D	5B	8 (7)	21.4

- A & S POLES HAVE (1) MUSCO LED FIXTURE AT 15'-6" AGL INCLUDED ABOVE.
- B POLES HAVE (2) MUSCO LED FIXTURES AT 15'-6" AGL INCLUDED ABOVE.

**DESIGN NOTES**

DESIGN PARAMETERS:  
 WIND:  $V_{ult} = 128$  MPH,  $V_{asd} = 99$  MPH (EXPOSURE C, RISK CATEGORY II) PER MASSACHUSETTS STATE BUILDING CODE - 780 CMR, 9TH EDITION (IBC 2015 / ASCE 7-10).

GEOTECHNICAL PARAMETERS:  
 ALLOWABLE END BEARING SOIL PRESSURE: 4,000 PSF  
 LATERAL SOIL RESISTANCE PARAMETERS:  
 AS PROVIDED IN SOIL REPORT PAGE 6 (NEGLECT TOP 2'-0")  
 IN ACCORDANCE WITH MASSACHUSETTS STATE BUILDING CODE - 780 CMR, 9TH EDITION, CHAPTER 18.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, PROJECT NO. 2190095, PREPARED BY WESTON & SAMPSON; READING, MA.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 6'-0".

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

CONCRETE:  
 CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A MINIMUM COMPRESSIVE DESIGN STRENGTH AT 28 DAYS OF 3,000 PSI. 3,000 PSI CONCRETE SPECIFIED FOR EARLY POLE ERECTION, ACTUAL REQUIRED MINIMUM ALLOWABLE CONCRETE STRENGTH IS 1,000 PSI. ALL PIERS AND CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM UNDISTURBED SOIL.

GENERAL NOTES:  
 FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



CYPRESS  
 PLAYGROUND  
 FIELD LIGHTING  
 BROOKLINE, MA



STRUCTURAL  
 ENGINEERS, P.C.  
 114 NICHOLAS DRIVE  
 MARSHALLTOWN, IOWA 50158  
 PHONE NUMBER: 641-752-6334  
 EMAIL: MSL.INFO@SEPC.BIZ

DRAWING TITLE:  
 POLE AND FOUNDATION  
 SCALE: SEE PLAN  
 NOTES:  
 SCAN #187762C

PROJECT NUMBER  
 187762

DATE  
 23 JANUARY 2020

DRAWING NUMBER  
 C1

OF ONE

Appendix C  
Environmental Soil Investigations

NOT FOR BIDDING

April 29, 2020

Erin Gallentine  
Director of Parks  
Department of Public Works – Parks and Open Space Division  
333 Washington Street  
Town of Brookline, Massachusetts

Re: **Summary of Environmental Assessment  
Cypress Street Playground & Athletic Field Improvements  
Brookline, Massachusetts**

Dear Ms. Gallentine:

Weston & Sampson has prepared this letter to summarize the results of environmental assessment for the Cypress Street Playground & Athletic Field Improvements Project in Brookline, Massachusetts (the Project). The assessment was performed to pre-characterize surplus soils for off-site reuse/recycling, or disposal. The letter includes a summary of the following:

- Project Description;
- Project Area and Listed Environmental Site;
- Summary of 2020 Environmental Assessment; and
- Findings and Recommendations.

#### **Project Description**

The Project will generate surplus soils from construction activities including excavating and amending of existing surface loam and installing stormwater infiltration galleries, light poles, walking paths, and subsurface utilities. The soils will be generated from the following areas to the approximate excavation depths listed below:

- Surface loam and walking paths: 1 to 2 feet below ground surface (ft. bgs);
- Utility trenches: 3 ft. bgs;
- Stormwater infiltration galleries: 7.5 ft. bgs; and
- Light poles: 13 ft. bgs.

#### **Project Area & Listed Environmental Sites**

The Cypress Playground and Athletic Field is bounded to the northeast by Davis Ave, to the northwest by Greenough Street, to the south by Tappan Street, and to the east by Cypress Street. A Massachusetts Department of Environmental Protection (MassDEP)-listed disposal site is present adjacent to the Project area at 46 Tappan Street, where 40 gallons of #2 fuel oil was released from the vent pipe of an underground storage tank. In January 2005, the MassDEP issued Release Tracking Number (RTN) 3-24561 for the release. Fuel oil constituent concentrations in soil at the property were found to be below the Massachusetts Contingency Plan (MCP) cleanup standards and the site achieved regulatory closure in March 2005. It is unlikely this property impacted the Project area.

#### **Summary of 2020 Environmental Assessment**

Based on the estimated volume of surplus soil for the Project, Weston & Sampson performed an environmental assessment to pre-characterize soil. On April 6, 2020, Weston & Sampson with assistance from the Town of Brookline Department of Public Works (DPW) advanced nine (9) test pits to assess subsurface conditions. Weston & Sampson also hand-excavated 42 locations to a depth of 1-2 ft. bgs to collect surficial soil samples. Please see Figure 1 for a depiction of soil sampling locations and the table below for test pit locations and depths.

Test Pit ID	Depth (ft.)	Proposed Feature
TP-101	7.5	Stormwater Infiltration Gallery
TP-102A/102B	7.0	Stormwater Infiltration Gallery
TP-103	7.5	Stormwater Infiltration Gallery
TP-104	8	Utility Trench/Light Pole
TP-105	2.5	Utility Trench
TP-106	2.5	Utility Trench
TP-107	2.5	Utility Trench
TP-108	7	Light Pole
TP-109	7	Light Pole

Based on current design requirements, up to 5,000 cubic yards (7,500 tons) of surplus soil may be generated for the Project. Weston & Sampson collected ten (10) disposal characterization soil samples at a frequency of one (1) sample per 500 cubic yards, or per 750 tons. The samples were analyzed for MassDEP Policy COMM-97 *Reuse and Disposal of Contaminated Soil in Massachusetts* parameters<sup>1</sup>.

Weston & Sampson field screened soil for olfactory evidence (odor, staining, etc.) and volatile compounds using a photoionization detector (PID). We did not observe staining, sheen, or odors and the PID readings were low with no readings higher than 0.1 parts per million by volume (ppmv). Soils were typically silty sand with gravel. Groundwater was not encountered. The table below summarizes the composite samples generated from test pit locations. Please refer to Attachment A for test pit logs.

Composite Soil Sample ID Proposed Construction Feature	Associated Grab Samples
COMP-UT (0-2.5') Utility trench	TP-104 (0-2.5'), TP-105, TP-106, TP-107
COMP-SW (0-7.5') Stormwater infiltration galleries	TP-101, TP-102B, TP-103
COMP-LP (0-8') Light pole foundations	TP-104 (0-8'), TP-108, TP-109

All other composite samples were developed from six grab soil samples collected via hand excavation. VOC samples were collected from grab locations as depicted on Figure 1.

### **Findings & Recommendations**

Volatile Organic Compounds (VOCs), polychlorinated biphenyls (PCBs) and herbicides were not detected in soil. Total petroleum hydrocarbons (TPH), two (2) pesticides, few metals and several semi-volatile organic compounds (SVOCs) were detected in soil but the concentrations are below the applicable Massachusetts Contingency Plan (MCP) Reportable Concentration RCS-1; therefore, reporting to MassDEP under the MCP is not required. In addition, the compounds detected are below the MassDEP Similar Soils Provision Guidance WSC#-13-500 and the in-state landfill disposal limits (See Table 1 and the laboratory reports in Attachment B).

Unrestricted re-use of soil is allowed for the surplus soils represented by the ten soil samples collected by Weston & Sampson. However, as a more conservative option, the Project surplus soil may also be reused/recycled or disposed of at in-state reuse facilities or landfills.

<sup>1</sup> Resource Conservation and Recovery Act (RCRA) 8 Metals; volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), pH, ignitability, conductivity, reactivity, herbicides and pesticides. Herbicide analysis was run on four of the ten samples.

If you have any questions regarding the environmental assessment, please contact the undersigned at 978-532-1900.

Sincerely,

WESTON & SAMPSON

  
Daron G. Kurkjian, PE (MA)  
Project Manager

  
Prasanta K. Bhunia, Ph.D., LSP  
Vice President

*Attachments: Table 1 – Soil Analytical Results  
Figure – Environmental Sampling Plan  
Attachment A: Test Pit Logs  
Attachment B: Laboratory Analytical Reports*

Filepath: \\wse03.local\WSE\Projects\MA\Brookline MA\Cypress Street Playground\Environmental\Summary Letter\Brookline - Cypress St Summary Letter 04.29.20.docx

NOT FOR BIDDING

TABLE 1  
SOIL ANALYTICAL RESULTS  
CYPRESS PLAYGROUND  
BROOKLINE, MA

Parameter	Units	Reportable Concentrations (RCs)	Comm 97 Contaminant Levels for Soil Reuse		Similar Soil Policy	SAMPLING LOCATION									
			RCS-1	Lined Landfill		Unlined Landfill	Limit for RCS-1 Receiving Location	Comp-East-1 (0-2') 4/6/2020	Comp-East-2 (0-1') 4/6/2020	Comp-Field-1 (0-1') 4/6/2020	Comp-Field-2 (0-1') 4/6/2020	Comp-Field-3 (0-4') 4/6/2020	Comp-LP (0-8') 4/6/2020	Comp-SW (0-7.5') 4/6/2020	Comp-VT (0-2.5') 4/6/2020
Sample Depth (feet)						0-2	0-1	0-1	0-1	0-4	0-8	0-7.5	0-2.5	0-2	0-2
<b>Total Metals</b>															
ARSENIC	mg/kg	20	40	40	<20	9.2	9.1	7.3	7.8	10	4.7	6.8	6.1	6.9	7.4
BARIUM	mg/kg	1000	~	~	<375	52	51	47	50	40	31	39	41	38	41
CADMIUM	mg/kg	70	80	30	<20	<0.41	<0.40	<0.39	<0.37	<0.37	<0.37	<0.36	<0.37	<0.38	<0.37
CHROMIUM	mg/kg	100	1000	1000	<100	19	15	14	14	16	15	13	14	17	17
LEAD	mg/kg	200	2000	1000	<200	99	94	79	91	8.6	18	40	51	66	61
MERCURY	mg/kg	20	10	10	<3	0.27	0.32	0.27	0.31	<0.028	0.056	0.41	0.21	0.17	0.24
SELENIUM	mg/kg	400	~	~	<5	<4.1	<4.0	<3.9	<3.7	<3.7	<3.7	<3.6	<3.7	<3.8	<3.7
SILVER	mg/kg	100	~	~	<6	<0.41	<0.40	<0.39	<0.37	<0.37	<0.37	<0.36	<0.37	<0.38	<0.37
<b>Pesticides</b>															
4,4'-DDE	mg/kg	6	~	~	~	0.035	0.043	0.033	0.027	<0.0043	0.0045	<0.022	0.012	0.029	0.019
4,4'-DDT	mg/kg	6	~	~	~	0.047	0.058	0.036	0.039	<0.0043	0.0046	<0.022	0.015	0.034	0.022
<b>Herbicides</b>															
Herbicides	mg/kg	~	~	~	~	NT	ND	ND	ND	NT	NT	NT	NT	ND	NT
<b>Polychlorinated Biphenyls (PCBs)</b>															
TOTAL PCBs	mg/kg	1	2	2	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>Volatile Organic Compounds (VOCs)</b>															
TOTAL VOCs	mg/kg	~	10	4	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>Semivolatile Organic Compounds (SVOCs)</b>															
BENZO(A)ANTHRACENE	mg/kg	7	~	~	<7	<0.22	<0.21	0.21	0.3	<0.19	<0.19	<0.19	0.26	<0.20	<0.20
BENZO(A)PYRENE	mg/kg	2	~	~	<2	<0.22	0.22	0.23	0.32	<0.19	<0.19	<0.19	0.26	<0.20	<0.20
BENZO(B)FLUORANTHENE	mg/kg	7	~	~	<7	0.23	0.27	0.26	0.39	<0.19	<0.19	<0.19	0.29	0.22	0.21
BENZO(G,H,I)PERYLENE	mg/kg	1000	~	~	<10	<0.22	<0.21	<0.20	0.25	<0.19	<0.19	<0.19	<0.19	<0.20	<0.20
CHRYSENE	mg/kg	70	~	~	<20	<0.22	0.22	0.23	0.32	<0.19	<0.19	<0.19	0.27	<0.20	<0.20
FLUORANTHENE	mg/kg	1000	~	~	<40	0.37	0.38	0.39	0.59	<0.19	<0.19	0.2	0.52	0.31	0.28
INDENO(1,2,3)-CDPYRENE	mg/kg	7	~	~	<7	<0.22	<0.21	<0.20	0.27	<0.19	<0.19	<0.19	<0.19	<0.20	<0.20
PHENANTHRENE	mg/kg	10	~	~	<10	<0.22	<0.21	0.21	0.29	<0.19	<0.19	<0.19	0.35	<0.20	<0.20
PYRENE	mg/kg	1000	~	~	<40	0.45	0.46	0.47	0.68	<0.19	<0.19	0.23	0.62	0.36	0.32
TOTAL SVOCs	mg/kg	~	100	100	~	1.05	1.55	2	3.41	ND	ND	0.43	2.57	0.89	0.81
<b>Total Petroleum Hydrocarbons (TPH)</b>															
TPH	mg/kg	1000	5000	2500	~	80	84	73	100	15	19	21	60	160	90
<b>General Chemistry Parameters</b>															
% Solids	~	~	~	~	~	77.1	81.8	83.7	86.1	89.5	87.3	88.4	87.4	84.6	85.3
PH	SU	~	~	~	~	6.3	6.6	6.6	6.8	6.5	6.2	6.7	7.1	6.0	6.7
REACTIVE CYANIDE	mg/kg	~	~	~	~	<4.0	<3.9	<4.0	<3.9	<3.9	<4.0	<3.9	<3.9	<4.0	<4.0
REACTIVE SULFIDE	mg/kg	~	~	~	~	<20	<20	<20	<20	<20	<20	<20	<19	<20	<20
SPECIFIC CONDUCTANCE	µmhos/cm	~	8000	4000	~	3.9	2.2	3.2	4.2	4.5	5.1	3.3	3.3	3.1	3.6
IGNITABILITY	Present/ Absent	~	~	~	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

NOTES & ABBREVIATIONS::

~ = No standard available.

**BOLD**

= Parameter detected above laboratory detection limit.

NT = Not tested.

ND = Non-detect

< = Parameter not detected above limit.

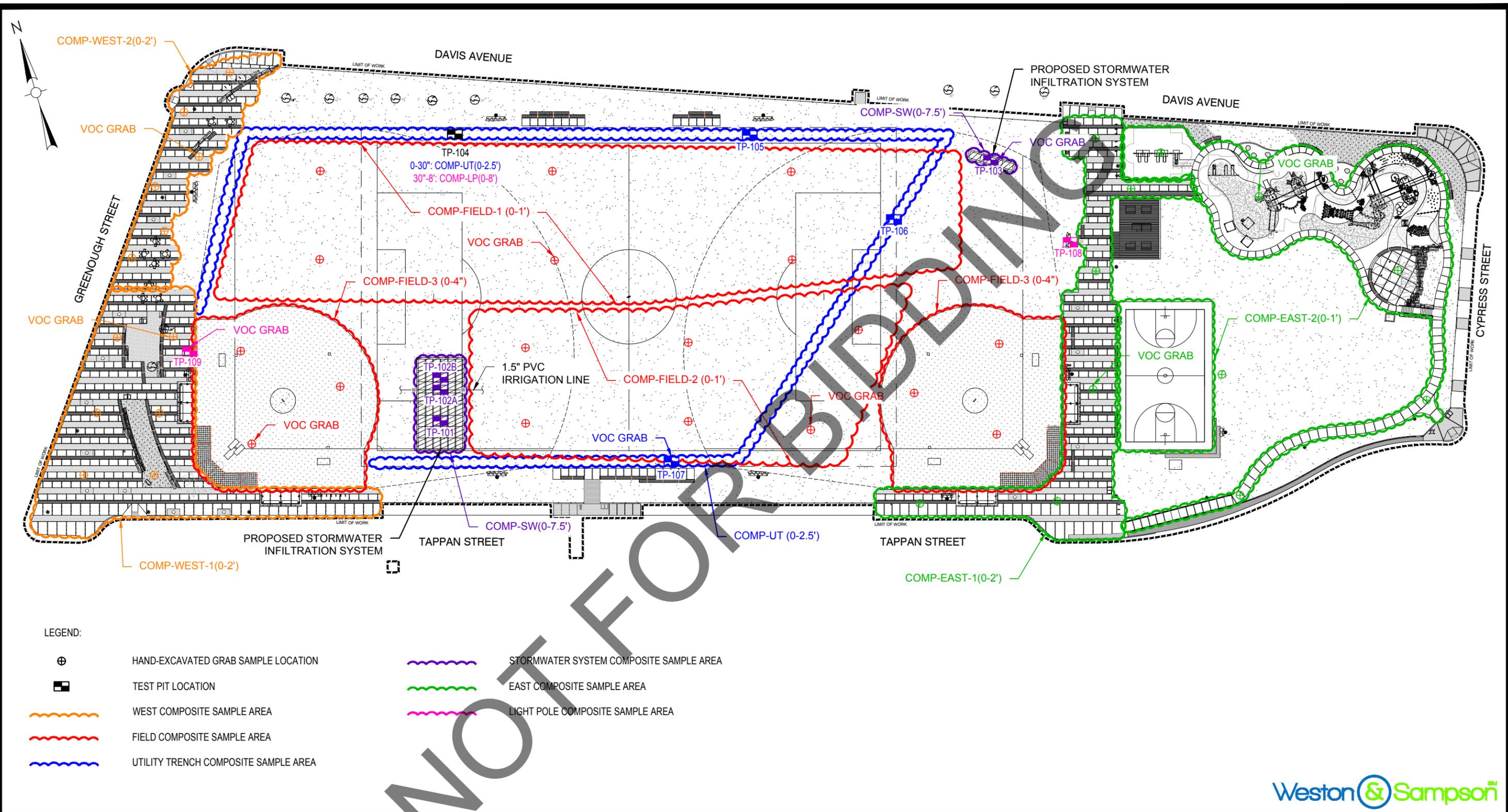
mg/kg = milligram per kilogram

umhos/cm = micromhos per centimeter

SU = standard units

NOT FOR BIDDING

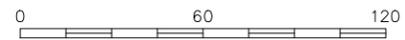
I:\we03\local\WSE\Projects\MA\Brookline\MA\Cypress Street Playground\CAD\0\_Current\Figures\Environmental Sampling Plan REV1.dwg



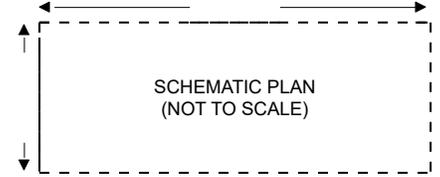
- LEGEND:
- ⊕ HAND-EXCAVATED GRAB SAMPLE LOCATION
  - ⊞ TEST PIT LOCATION
  - WEST COMPOSITE SAMPLE AREA
  - FIELD COMPOSITE SAMPLE AREA
  - UTILITY TRENCH COMPOSITE SAMPLE AREA
  - STORMWATER SYSTEM COMPOSITE SAMPLE AREA
  - EAST COMPOSITE SAMPLE AREA
  - LIGHT POLE COMPOSITE SAMPLE AREA

NOTE:  
 1. SOIL SAMPLES WERE COLLECTED BY WESTON & SAMPSON ON APRIL 6, 2020.

FIGURE 1  
 BROOKLINE, MA  
 CYPRESS STREET PLAYGROUND  
 ENVIRONMENTAL SAMPLING PLAN  
 SCALE: 1"=60'



CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 7.0 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A

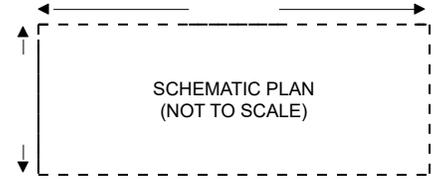


DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field. Topsoil- 12 inches thick.		
			<b>Silty sand with gravel (SM)</b> - Brown; moist; mostly fine to medium SAND, little fine to medium gravel, little non plastic fines. <b>[FILL]</b>  Ash, brick and glass pieces		
5			<b>Poorly graded sand with silt and gravel (SP-SM)</b> - Brown; moist; mostly fine to coarse SAND, little fine to coarse gravel, few non plastic fines.	-5	
					Exploration ended at 7.0 ft.

NOT FOR BIDDING



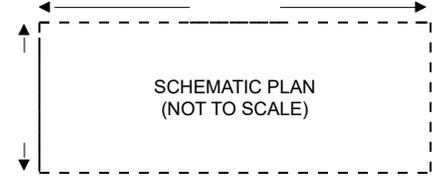
CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 7.5 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A



DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field. Topsoil- 12 inches thick.		
			<b>Silty sand with gravel (SM)</b> - Brown; moist; mostly fine to medium SAND, little coarse gravel, little non plastic fines. [FILL]  <i>Ash and pavement pieces observed between 2 and 5 ft.</i>		
5			<b>Poorly graded sand with gravel (SP)</b> - Brown; moist; mostly fine to coarse SAND, little coarse gravel, trace non plastic fines.	5	
					Exploration ended at 7.5 ft.

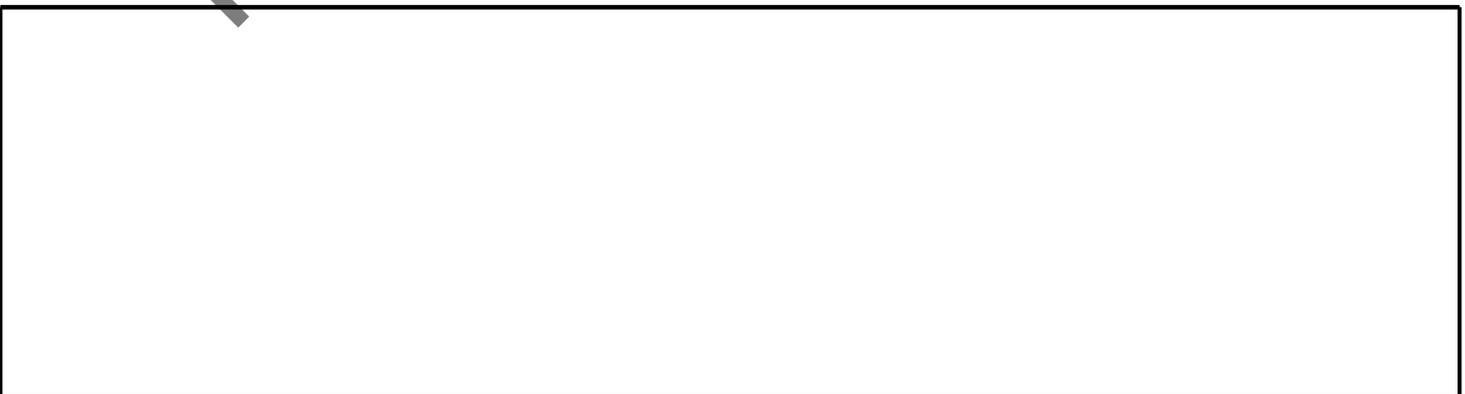
NOT FOR BIDDING

CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: DRAFT      FINAL DEPTH: 3.0 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A

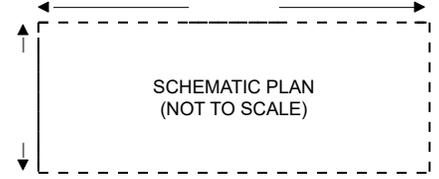


DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field. Topsoil- 12 inches thick.		
			<b>Silty sand with gravel (SM)</b> - Brown; moist; mostly fine to medium SAND, little coarse gravel, little non plastic fines. [FILL]		
			Irrigation pipe at 3 feet. Line was broken, moved 6 feet NE and continued excavation.		
5				-5	Exploration ended at 3.0 ft.

NOT FOR BIDDING



CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 7.5 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A

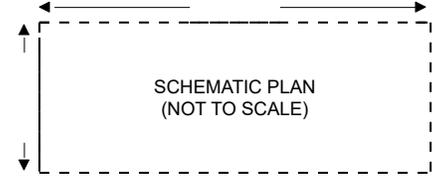


DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field. Topsoil- 12 inches thick.		
5			<b>Silty sand with gravel (SM)</b> - Light brown to brown; moist; mostly fine to coarse SAND, little fine to coarse gravel, little non plastic fines.	-5	
					Exploration ended at 7.5 ft.

NOT FOR BIDDING



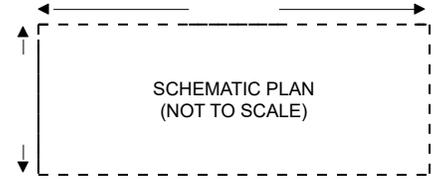
CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: DRAFT      FINAL DEPTH: 8.0 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A



DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field. Topsoil- 12 inches thick.		
			<b>Silty sand (SM)</b> - Dark brown to black; moist; mostly fine to medium SAND, some non plastic fines, few fine to medium gravel. <b>[FILL]</b>		
			<b>Silty sand (SM)</b> - Light brown; moist; mostly fine to coarse SAND, little non plastic fines, trace fine to medium gravel.		
5			<b>Sandy silt (ML)</b> - Gray; moist; mostly non plastic FINES, some fine to medium sand, few fine gravel.	-5	
			<b>Silty sand with gravel (SM)</b> - Brown; moist; mostly fine to coarse SAND, some fine to medium gravel, little non plastic fines.		
					Exploration ended at 8.0 ft.

NOT FOR BIDDING

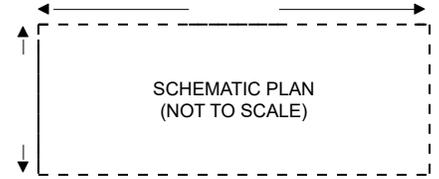
CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 2.5 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A



DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field.		
			TP-105 was advanced to 30" and encountered similar soils to TP-104.		
5				-5	Exploration ended at 2.5 ft.

NOT FOR BIDDING

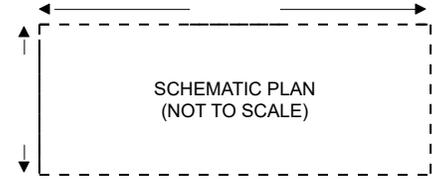
CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 2.5 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A



DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field.		
			TP-106 was advanced to 30" and encountered similar soils to TP-104.		
5				-5	Exploration ended at 2.5 ft.

NOT FOR BIDDING

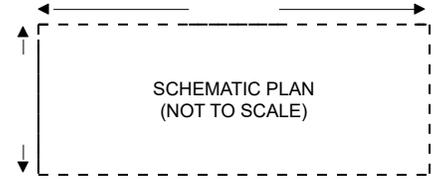
CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 2.5 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A



DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field.		
			TP-107 was advanced to 30" and encountered similar soils to TP-104.		
5				-5	Exploration ended at 2.5 ft.

NOT FOR BIDDING

CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 7.0 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A

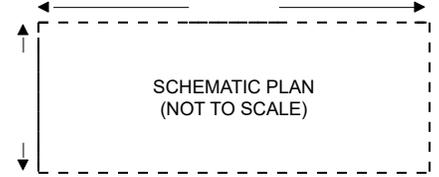


DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field.		
			Topsoil- 12 inches thick.		
			<b>Silty sand (SM)</b> - Dark brown to black; moist; mostly fine to medium SAND, some non plastic fines, few fine to medium gravel. [FILL]		
			<b>Silty sand with gravel (SM)</b> - Brown to light brown; moist; mostly fine to coarse SAND, some fine to medium gravel, little non plastic fines.		
5				-5	
					Exploration ended at 7.0 ft.

NOT FOR BIDDING



CONTRACTOR: Excavated by Town DPW      DATE START: April 6, 2020  
 OPERATOR: Doug      DATE FINISH: April 6, 2020  
 LOGGED BY: JW/NA      GROUND EL: Not Available  
 CHECKED BY: \_\_\_\_\_      FINAL DEPTH: 7.0 ft.  
 EQUIPMENT: Hydraulic Excavator, Medium      GRID COORDS: \_\_\_\_\_  
 BUCKET TYPE: Toothed, 24-in. (6.4 cubic-ft.)      GRID SYSTEM: N/A



DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass field.		
			Topsoil- 12 inches thick.		
			<b>Silty sand with gravel (SM)</b> - Dark brown to light brown; moist; mostly fine to coarse SAND, little non plastic fines, little fine to coarse gravel. [FILL]		
			Topsoil- Former topsoil.		
5			<b>Silty sand with gravel (SM)</b> - Brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines.	-5	
					Exploration ended at 7.0 ft.

NOT FOR BIDDING



April 16, 2020

Daron Kurkjian  
Weston & Sampson Engineers MA  
55 Walkers Brook Drive  
Reading, MA 01867

Project Location: Brookline, MA  
Client Job Number:  
Project Number: [none]  
Laboratory Work Order Number: 20D0289

Enclosed are results of analyses for samples received by the laboratory on April 7, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Michelle Koch". The signature is written in a cursive style and is placed on a light gray rectangular background.

Michelle M. Koch  
Project Manager

NOT FOR BIDDING

## Table of Contents

Sample Summary	4
Case Narrative	8
Sample Results	12
20D0289-01	12
20D0289-02	22
20D0289-03	30
20D0289-04	40
20D0289-05	50
20D0289-06	58
20D0289-07	66
20D0289-08	76
20D0289-09	84
20D0289-10	92
Sample Preparation Information	100
QC Data	104
Volatile Organic Compounds by GC/MS	104
B255863	104
Semivolatile Organic Compounds by GC/MS	109
B255868	109
Organochloride Pesticides by GC/ECD	116
B255866	116
Herbicides by GC/ECD	119
B256076	119
Polychlorinated Biphenyls with 3540 Soxhlet Extraction	121
B255907	121

## Table of Contents (continued)

Petroleum Hydrocarbons Analyses	122
B255869	122
B255970	122
Metals Analyses (Total)	123
B255893	123
B255973	123
Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)	125
B255839	125
B255871	125
B255874	125
B256103	125
Pesticides Degradation Report	126
Dual Column RPD Report	127
Flag/Qualifier Summary	139
Certifications	140
Chain of Custody/Sample Receipt	148

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Weston & Sampson Engineers MA  
 55 Walkers Brook Drive  
 Reading, MA 01867  
 ATTN: Daron Kurkjian

REPORT DATE: 4/16/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 20D0289

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Brookline, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB					
Comp-West-1 (0-2)	20D0289-01	Soil		SM 2540G						
				SW-846 1030						
				SW-846 6010D						
				SW-846 7471B						
				SW-846 8081B						
				SW-846 8082A						
				SW-846 8100 Modified						
				SW-846 8151A						
				SW-846 8260C-D						
				SW-846 8270D-E						
				SW-846 9014						
				SW-846 9030A						
				SW-846 9045C						
Comp-West-2 (0-2)	20D0289-02	Soil		SM 2540G						
				SW-846 1030						
				SW-846 6010D						
				SW-846 7471B						
				SW-846 8082A						
				SW-846 8100 Modified						
				SW-846 8260C-D						
				SW-846 8270D-E						
				SW-846 9014						
				SW-846 9030A						
				SW-846 9045C						
				Comp-Field-1 (0-1)		20D0289-03	Soil		SM 2540G	
									SW-846 1030	
SW-846 6010D										
SW-846 7471B										
SW-846 8081B										
SW-846 8082A										
SW-846 8100 Modified										
SW-846 8151A										
SW-846 8260C-D										
SW-846 8270D-E										
SW-846 9014										
SW-846 9030A										
SW-846 9045C										

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Weston & Sampson Engineers MA  
 55 Walkers Brook Drive  
 Reading, MA 01867  
 ATTN: Daron Kurkjian

REPORT DATE: 4/16/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 20D0289

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Brookline, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB				
Comp-Field-2 (0-1)	20D0289-04	Soil		SM 2540G					
				SW-846 1030					
				SW-846 6010D					
				SW-846 7471B					
				SW-846 8081B					
				SW-846 8082A					
				SW-846 8100 Modified					
				SW-846 8151A					
				SW-846 8260C-D					
				SW-846 8270D-E					
				SW-846 9014					
				SW-846 9030A					
				SW-846 9045C					
Comp-Field-3 (0-4)	20D0289-05	Soil		SM 2540G					
				SW-846 1030					
				SW-846 6010D					
				SW-846 7471B					
				SW-846 8082A					
				SW-846 8100 Modified					
				SW-846 8260C-D					
				SW-846 8270D-E					
				SW-846 9014					
				SW-846 9030A					
				SW-846 9045C					
				Comp-East-1 (0-2)	20D0289-06	Soil		SM 2540G	
								SW-846 1030	
SW-846 6010D									
SW-846 7471B									
SW-846 8082A									
SW-846 8100 Modified									
SW-846 8260C-D									
SW-846 8270D-E									
SW-846 9014									
SW-846 9030A									
SW-846 9045C									

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Weston & Sampson Engineers MA  
 55 Walkers Brook Drive  
 Reading, MA 01867  
 ATTN: Daron Kurkjian

REPORT DATE: 4/16/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 20D0289

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Brookline, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB				
Comp-East-2 (0-1)	20D0289-07	Soil		SM 2540G					
				SW-846 1030					
				SW-846 6010D					
				SW-846 7471B					
				SW-846 8081B					
				SW-846 8082A					
				SW-846 8100 Modified					
				SW-846 8151A					
				SW-846 8260C-D					
				SW-846 8270D-E					
				SW-846 9014					
				SW-846 9030A					
				SW-846 9045C					
				Comp-VT (0-2.5)	20D0289-08	Soil		SM 2540G	
SW-846 1030									
SW-846 6010D									
SW-846 7471B									
SW-846 8082A									
SW-846 8100 Modified									
SW-846 8260C-D									
SW-846 8270D-E									
SW-846 9014									
SW-846 9030A									
SW-846 9045C									
Comp-LP (0-8)	20D0289-09	Soil						SM 2540G	
								SW-846 1030	
								SW-846 6010D	
				SW-846 7471B					
				SW-846 8082A					
				SW-846 8100 Modified					
				SW-846 8260C-D					
				SW-846 8270D-E					
				SW-846 9014					
				SW-846 9030A					
				SW-846 9045C					

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Weston & Sampson Engineers MA  
 55 Walkers Brook Drive  
 Reading, MA 01867  
 ATTN: Daron Kurkjian

REPORT DATE: 4/16/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 20D0289

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Brookline, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
Comp-SW (0-7.5)	20D0289-10	Soil		SM 2540G SW-846 1030 SW-846 6010D SW-846 7471B SW-846 8082A SW-846 8100 Modified SW-846 8260C-D SW-846 8270D-E SW-846 9014 SW-846 9030A SW-846 9045C	

NOT FOR BIDDING

**CASE NARRATIVE SUMMARY**

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

For method 6010, only RCRA 8 metals were requested and reported.

For method 8151 samples were derivatized on 04/15/20.

For method 8151 sample analysis bracketed by LCS to monitor esterification. All recoveries in the bracketing LCS met method criteria.

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332  
SW-846 8082A

**Qualifications:****O-32**

A dilution was performed as part of the standard analytical procedure.

**Analyte & Samples(s) Qualified:**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)],  
20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)]

**SW-846 8100 Modified****Qualifications:****MS-07A**

Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery.

Possibility of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.

**Analyte & Samples(s) Qualified:****TPH (C9-C36)**

20D0289-02[Comp-West-2 (0-2)], B255869-MS1, B255869-MSD1

**SW-846 8151A****Qualifications:****DL-03**

Elevated reporting limit due to matrix interference.

**Analyte & Samples(s) Qualified:**

20D0289-01[Comp-West-1 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-07[Comp-East-2 (0-1)]

**V-06**

Continuing calibration verification (CCV) did not meet method specifications and was biased on the high side for this compound.

**Analyte & Samples(s) Qualified:****Dinoseb**

B256076-BS1, B256076-BSD1

**Dinoseb [2C]**

B256076-BS1, B256076-BSD1

**V-20**

Continuing calibration verification (CCV) did not meet method specifications and was biased on the high side. Data validation is not affected since sample result was "not detected" for this compound.

**Analyte & Samples(s) Qualified:****Dinoseb**

20D0289-01[Comp-West-1 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-07[Comp-East-2 (0-1)], B256076-BLK1

**Dinoseb [2C]**

20D0289-01[Comp-West-1 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-07[Comp-East-2 (0-1)], B256076-BLK1

**SW-846 8260C-D****Qualifications:****V-05**

Continuing calibration verification (CCV) did not meet method specifications and was biased on the low side for this compound.

**Analyte & Samples(s) Qualified:****1,2-Dibromo-3-chloropropane (DBP)**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)],  
20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)],  
B255863-BLK1, B255863-BS1, B255863-BSD1, S047429-CCV1

**Dichlorodifluoromethane (Freon 12)**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)],  
20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)],  
B255863-BLK1, B255863-BS1, B255863-BSD1, S047429-CCV1

**V-16**

Response factor is less than method specified minimum acceptable value. Reduced precision and accuracy may be associated with reported result.

**Analyte & Samples(s) Qualified:****1,4-Dioxane**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)], 20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)], B255863-BLK1, B255863-BS1, B255863-BSD1

**V-34**

Initial calibration verification (ICV) did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.

**Analyte & Samples(s) Qualified:****Bromomethane**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)], 20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)], B255863-BLK1, B255863-BS1, B255863-BSD1, S047429-CCV1

**SW-846 8270D-E****Qualifications:****MS-09**

Matrix spike recovery and/or matrix spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.

**Analyte & Samples(s) Qualified:****3,3-Dichlorobenzidine**

20D0289-01[Comp-West-1 (0-2)], B255868-MS1, B255868-MSD1

**4-Chloroaniline**

20D0289-01[Comp-West-1 (0-2)], B255868-MS1, B255868-MSD1

**Aniline**

20D0289-01[Comp-West-1 (0-2)], B255868-MS1, B255868-MSD1

**Pyridine**

20D0289-01[Comp-West-1 (0-2)], B255868-MS1, B255868-MSD1

**V-34**

Initial calibration verification (ICV) did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.

**Analyte & Samples(s) Qualified:****3,3-Dichlorobenzidine**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)], 20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)], B255868-BLK1, B255868-BS1, B255868-BSD1, B255868-MS1, B255868-MSD1, S047461-CCV1

**4-Chloroaniline**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)], 20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)], B255868-BLK1, B255868-BS1, B255868-BSD1, B255868-MS1, B255868-MSD1, S047461-CCV1

**SW-846 9045C****Qualifications:****H-03**

Sample received after recommended holding time was exceeded.

**Analyte & Samples(s) Qualified:****pH**

20D0289-01[Comp-West-1 (0-2)], 20D0289-02[Comp-West-2 (0-2)], 20D0289-03[Comp-Field-1 (0-1)], 20D0289-04[Comp-Field-2 (0-1)], 20D0289-05[Comp-Field-3 (0-4)], 20D0289-06[Comp-East-1 (0-2)], 20D0289-07[Comp-East-2 (0-1)], 20D0289-08[Comp-VT (0-2.5)], 20D0289-09[Comp-LP (0-8)], 20D0289-10[Comp-SW (0-7.5)], B255839-DUP2

**SW-846 8100 Modified**

TPH (C9-C36) is quantitated against a calibration made with a diesel standard.

NOT FOR BIDDING

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.

I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington  
Technical Representative

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Benzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Bromobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Bromochloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Bromodichloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Bromoform	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Bromomethane	ND	0.0070	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
2-Butanone (MEK)	ND	0.028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
n-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
sec-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
tert-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Carbon Disulfide	ND	0.0042	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Carbon Tetrachloride	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Chlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Chlorodibromomethane	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Chloroethane	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Chloroform	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Chloromethane	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
2-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
4-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0014	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2-Dibromoethane (EDB)	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Dibromomethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,3-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,4-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0070	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1-Dichloroethylene	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
cis-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
trans-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,3-Dichloropropane	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
2,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1-Dichloropropene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
cis-1,3-Dichloropropene	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
trans-1,3-Dichloropropene	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Diethyl Ether	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Diisopropyl Ether (DIPE)	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,4-Dioxane	ND	0.070	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Ethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
2-Hexanone (MBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Isopropylbenzene (Cumene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Methylene Chloride	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Naphthalene	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
n-Propylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Styrene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1,1,2-Tetrachloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Tetrachloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Tetrahydrofuran	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Toluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2,3-Trichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2,4-Trichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1,1-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,1,2-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Trichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2,3-Trichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,2,4-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
1,3,5-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
Vinyl Chloride	ND	0.0070	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
m+p Xylene	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF
o-Xylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:20	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual
1,2-Dichloroethane-d4	102	70-130	4/8/20 8:20
Toluene-d8	101	70-130	4/8/20 8:20
4-Bromofluorobenzene	97.5	70-130	4/8/20 8:20

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Acenaphthylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Acetophenone	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Aniline	ND	0.40	mg/Kg dry	1	MS-09	SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Benzo(a)anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Benzo(a)pyrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Benzo(b)fluoranthene	0.22	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Benzo(g,h,i)perylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Benzo(k)fluoranthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Bis(2-chloroethoxy)methane	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Bis(2-chloroethyl)ether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Bis(2-chloroisopropyl)ether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
4-Bromophenylphenylether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Butylbenzylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
4-Chloroaniline	ND	0.78	mg/Kg dry	1	MS-09, V-34	SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2-Chloronaphthalene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2-Chlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Chrysene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Dibenz(a,h)anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Dibenzofuran	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Di-n-butylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
1,2-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
1,3-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
1,4-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
3,3-Dichlorobenzidine	ND	0.20	mg/Kg dry	1	MS-09, V-34	SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,4-Dichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Diethylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,4-Dimethylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Dimethylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,4-Dinitrophenol	ND	0.78	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,4-Dinitrotoluene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,6-Dinitrotoluene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Di-n-octylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Fluoranthene	0.31	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Fluorene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Hexachlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Hexachlorobutadiene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Hexachloroethane	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Indeno(1,2,3-cd)pyrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Isophorone	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2-Methylnaphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
3/4-Methylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Naphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Nitrobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2-Nitrophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
4-Nitrophenol	ND	0.78	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Pentachlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Phenanthrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Phenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Pyrene	0.36	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Pyridine	ND	0.40	mg/Kg dry	1	MS-09	SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
1,2,4-Trichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,4,5-Trichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
2,4,6-Trichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 1:54	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		56.5	30-130					4/9/20 1:54	
Phenol-d6		59.1	30-130					4/9/20 1:54	
Nitrobenzene-d5		53.4	30-130					4/9/20 1:54	
2-Fluorobiphenyl		65.3	30-130					4/9/20 1:54	
2,4,6-Tribromophenol		47.0	30-130					4/9/20 1:54	
p-Terphenyl-d14		59.8	30-130					4/9/20 1:54	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
alpha-BHC [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
beta-BHC [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
delta-BHC [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
gamma-BHC (Lindane) [1]	ND	0.0023	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Chlordane [1]	ND	0.023	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
4,4'-DDD [1]	ND	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
4,4'-DDE [1]	0.029	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
4,4'-DDT [1]	0.034	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Dieldrin [1]	ND	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Endosulfan I [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Endosulfan II [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Endosulfan sulfate [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Endrin [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Endrin ketone [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Heptachlor [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Heptachlor epoxide [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Hexachlorobenzene [1]	ND	0.0069	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB
Methoxychlor [1]	ND	0.057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 19:43	JMB

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	69.5	30-150	4/10/20 19:43
Decachlorobiphenyl [2]	65.8	30-150	4/10/20 19:43
Tetrachloro-m-xylene [1]	71.1	30-150	4/10/20 19:43
Tetrachloro-m-xylene [2]	68.2	30-150	4/10/20 19:43

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: **Comp-West-1 (0-2)**

Sampled: 4/6/2020 10:00

Sample ID: **20D0289-01**

Sample Matrix: Soil

Sample Flags: DL-03

**Herbicides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2,4-D [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
2,4-DB [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
2,4,5-TP (Silvex) [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
2,4,5-T [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
Dalapon [1]	ND	370	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
Dicamba [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
Dichloroprop [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
Dinoseb [1]	ND	74	µg/kg dry	5	V-20	SW-846 8151A	4/13/20	4/15/20 16:53	JMB
MCPA [1]	ND	15000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
MCPP [1]	ND	15000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 16:53	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2,4-Dichlorophenylacetic acid [1]		61.7	30-150					4/15/20 16:53	
2,4-Dichlorophenylacetic acid [2]		81.6	30-150					4/15/20 16:53	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1221 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1232 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1242 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1248 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1254 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1260 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1262 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Aroclor-1268 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 1:57	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		102	30-150					4/11/20 1:57	
Decachlorobiphenyl [2]		99.4	30-150					4/11/20 1:57	
Tetrachloro-m-xylene [1]		102	30-150					4/11/20 1:57	
Tetrachloro-m-xylene [2]		102	30-150					4/11/20 1:57	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	160	9.8	mg/Kg dry	1		SW-846 8100 Modified	4/9/20	4/11/20 5:39	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	64.8		40-140					4/11/20 5:39	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	6.9	3.8	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW
Barium	38	1.9	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW
Cadmium	ND	0.38	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW
Chromium	17	0.76	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW
Lead	66	0.57	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW
Mercury	0.17	0.030	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:30	CJV
Selenium	ND	3.8	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW
Silver	ND	0.38	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:52	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0289-01

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	84.6		% Wt	1		SM 2540G	4/11/20	4/13/20 9:13	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.7°C	6.0		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	4.0	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Benzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Bromobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Bromochloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Bromodichloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Bromoform	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Bromomethane	ND	0.0073	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
2-Butanone (MEK)	ND	0.029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
n-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
sec-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
tert-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Carbon Disulfide	ND	0.0044	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Carbon Tetrachloride	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Chlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Chlorodibromomethane	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Chloroethane	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Chloroform	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Chloromethane	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
2-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
4-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0015	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2-Dibromoethane (EDB)	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Dibromomethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,3-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,4-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0073	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1-Dichloroethylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
cis-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
trans-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,3-Dichloropropane	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
2,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1-Dichloropropene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
cis-1,3-Dichloropropene	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
trans-1,3-Dichloropropene	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Diethyl Ether	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Diisopropyl Ether (DIPE)	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,4-Dioxane	ND	0.073	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Ethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
2-Hexanone (MBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Isopropylbenzene (Cumene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Methylene Chloride	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Naphthalene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
n-Propylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Styrene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1,1,2-Tetrachloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Tetrachloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Tetrahydrofuran	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Toluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2,3-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2,4-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1,1-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,1,2-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Trichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2,3-Trichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,2,4-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
1,3,5-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
Vinyl Chloride	ND	0.0073	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
m+p Xylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF
o-Xylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 8:44	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual
1,2-Dichloroethane-d4	102	70-130	4/8/20 8:44
Toluene-d8	100	70-130	4/8/20 8:44
4-Bromofluorobenzene	96.9	70-130	4/8/20 8:44

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Acenaphthylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Acetophenone	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Aniline	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Benzo(a)anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Benzo(a)pyrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Benzo(b)fluoranthene	0.21	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Benzo(g,h,i)perylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Benzo(k)fluoranthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Bis(2-chloroethoxy)methane	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Bis(2-chloroethyl)ether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Bis(2-chloroisopropyl)ether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
4-Bromophenylphenylether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Butylbenzylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
4-Chloroaniline	ND	0.77	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2-Chloronaphthalene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2-Chlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Chrysene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Dibenz(a,h)anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Dibenzofuran	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Di-n-butylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
1,2-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
1,3-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
1,4-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
3,3-Dichlorobenzidine	ND	0.20	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,4-Dichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Diethylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,4-Dimethylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Dimethylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,4-Dinitrophenol	ND	0.77	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,4-Dinitrotoluene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,6-Dinitrotoluene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Di-n-octylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Fluoranthene	0.28	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Fluorene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Hexachlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Hexachlorobutadiene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Hexachloroethane	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Indeno(1,2,3-cd)pyrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Isophorone	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2-Methylnaphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
3/4-Methylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Naphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Nitrobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2-Nitrophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
4-Nitrophenol	ND	0.77	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Pentachlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Phenanthrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Phenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Pyrene	0.32	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Pyridine	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
1,2,4-Trichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,4,5-Trichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
2,4,6-Trichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:18	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		56.9	30-130					4/9/20 2:18	
Phenol-d6		60.8	30-130					4/9/20 2:18	
Nitrobenzene-d5		54.9	30-130					4/9/20 2:18	
2-Fluorobiphenyl		67.8	30-130					4/9/20 2:18	
2,4,6-Tribromophenol		50.0	30-130					4/9/20 2:18	
p-Terphenyl-d14		65.7	30-130					4/9/20 2:18	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1221 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1232 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1242 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1248 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1254 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1260 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1262 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Aroclor-1268 [1]	ND	0.088	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:15	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		112	30-150					4/11/20 2:15	
Decachlorobiphenyl [2]		109	30-150					4/11/20 2:15	
Tetrachloro-m-xylene [1]		108	30-150					4/11/20 2:15	
Tetrachloro-m-xylene [2]		110	30-150					4/11/20 2:15	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	90	9.7	mg/Kg dry	1	MS-07A	SW-846 8100 Modified	4/8/20	4/9/20 0:36	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	40.4		40-140					4/9/20 0:36	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	7.4	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW
Barium	41	1.9	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW
Cadmium	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW
Chromium	17	0.74	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW
Lead	61	0.56	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW
Mercury	0.24	0.029	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:31	CJV
Selenium	ND	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW
Silver	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 20:56	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0289-02

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	85.3		% Wt	1		SM 2540G	4/11/20	4/13/20 9:13	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.7°C	6.7		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	4.0	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Benzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Bromobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Bromochloromethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Bromodichloromethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Bromoform	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Bromomethane	ND	0.0080	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
2-Butanone (MEK)	ND	0.032	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
n-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
sec-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
tert-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Carbon Disulfide	ND	0.0048	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Carbon Tetrachloride	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Chlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Chlorodibromomethane	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Chloroethane	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Chloroform	ND	0.0032	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Chloromethane	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
2-Chlorotoluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
4-Chlorotoluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0016	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2-Dibromoethane (EDB)	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Dibromomethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,3-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,4-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0080	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1-Dichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2-Dichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1-Dichloroethylene	ND	0.0032	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
cis-1,2-Dichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
trans-1,2-Dichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2-Dichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,3-Dichloropropane	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
2,2-Dichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1-Dichloropropene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
cis-1,3-Dichloropropene	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
trans-1,3-Dichloropropene	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Diethyl Ether	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Diisopropyl Ether (DIPE)	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,4-Dioxane	ND	0.080	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Ethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
2-Hexanone (MBK)	ND	0.016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Isopropylbenzene (Cumene)	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0032	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Methylene Chloride	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Naphthalene	ND	0.0032	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
n-Propylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Styrene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1,1,2-Tetrachloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Tetrachloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Tetrahydrofuran	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Toluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2,3-Trichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2,4-Trichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1,1-Trichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,1,2-Trichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Trichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2,3-Trichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,2,4-Trimethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
1,3,5-Trimethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Vinyl Chloride	ND	0.0080	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
m+p Xylene	ND	0.0032	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
o-Xylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:09	MFF
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
1,2-Dichloroethane-d4		102	70-130					4/8/20 9:09	
Toluene-d8		99.6	70-130					4/8/20 9:09	
4-Bromofluorobenzene		99.0	70-130					4/8/20 9:09	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Acenaphthylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Acetophenone	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Aniline	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Benzo(a)anthracene	0.21	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Benzo(a)pyrene	0.23	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Benzo(b)fluoranthene	0.26	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Benzo(g,h,i)perylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Benzo(k)fluoranthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Bis(2-chloroethoxy)methane	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Bis(2-chloroethyl)ether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Bis(2-chloroisopropyl)ether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
4-Bromophenylphenylether	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Butylbenzylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
4-Chloroaniline	ND	0.78	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2-Chloronaphthalene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2-Chlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Chrysene	0.23	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Dibenz(a,h)anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Dibenzofuran	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Di-n-butylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
1,2-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
1,3-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
1,4-Dichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
3,3-Dichlorobenzidine	ND	0.20	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,4-Dichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Diethylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,4-Dimethylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Dimethylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,4-Dinitrophenol	ND	0.78	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,4-Dinitrotoluene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,6-Dinitrotoluene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Di-n-octylphthalate	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Fluoranthene	0.39	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Fluorene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Hexachlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Hexachlorobutadiene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Hexachloroethane	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Indeno(1,2,3-cd)pyrene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Isophorone	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2-Methylnaphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
3/4-Methylphenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Naphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Nitrobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2-Nitrophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
4-Nitrophenol	ND	0.78	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Pentachlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Phenanthrene	0.21	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Phenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Pyrene	0.47	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Pyridine	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
1,2,4-Trichlorobenzene	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,4,5-Trichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
2,4,6-Trichlorophenol	ND	0.40	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 2:42	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		58.3	30-130					4/9/20 2:42	
Phenol-d6		61.4	30-130					4/9/20 2:42	
Nitrobenzene-d5		54.1	30-130					4/9/20 2:42	
2-Fluorobiphenyl		70.1	30-130					4/9/20 2:42	
2,4,6-Tribromophenol		55.3	30-130					4/9/20 2:42	
p-Terphenyl-d14		69.6	30-130					4/9/20 2:42	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
alpha-BHC [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
beta-BHC [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
delta-BHC [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
gamma-BHC (Lindane) [1]	ND	0.0024	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Chlordane [1]	ND	0.024	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
4,4'-DDD [1]	ND	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
4,4'-DDE [1]	0.033	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
4,4'-DDT [1]	0.036	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Dieldrin [1]	ND	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Endosulfan I [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Endosulfan II [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Endosulfan sulfate [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Endrin [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Endrin ketone [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Heptachlor [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Heptachlor epoxide [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Hexachlorobenzene [1]	ND	0.0071	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB
Methoxychlor [1]	ND	0.059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:10	JMB

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	66.6	30-150	
Decachlorobiphenyl [2]	60.8	30-150	
Tetrachloro-m-xylene [1]	63.4	30-150	
Tetrachloro-m-xylene [2]	64.4	30-150	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: **Comp-Field-1 (0-1)**

Sampled: 4/6/2020 07:30

Sample ID: **20D0289-03**

Sample Matrix: Soil

Sample Flags: DL-03

**Herbicides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2,4-D [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
2,4-DB [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
2,4,5-TP (Silvex) [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
2,4,5-T [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
Dalalpon [1]	ND	370	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
Dicamba [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
Dichloroprop [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
Dinoseb [1]	ND	74	µg/kg dry	5	V-20	SW-846 8151A	4/13/20	4/15/20 17:33	JMB
MCPA [1]	ND	15000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
MCPP [1]	ND	15000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 17:33	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2,4-Dichlorophenylacetic acid [1]		74.5	30-150					4/15/20 17:33	
2,4-Dichlorophenylacetic acid [2]		98.3	30-150					4/15/20 17:33	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1221 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1232 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1242 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1248 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1254 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1260 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1262 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Aroclor-1268 [1]	ND	0.094	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:32	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		114	30-150					4/11/20 2:32	
Decachlorobiphenyl [2]		110	30-150					4/11/20 2:32	
Tetrachloro-m-xylene [1]		108	30-150					4/11/20 2:32	
Tetrachloro-m-xylene [2]		110	30-150					4/11/20 2:32	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	73	9.9	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 23:15	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	43.8		40-140					4/8/20 23:15	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	7.3	3.9	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW
Barium	47	2.0	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW
Cadmium	ND	0.39	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW
Chromium	14	0.78	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW
Lead	79	0.59	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW
Mercury	0.27	0.030	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:33	CJV
Selenium	ND	3.9	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW
Silver	ND	0.39	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:00	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0289-03

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	83.7		% Wt	1		SM 2540G	4/11/20	4/13/20 9:13	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.9°C	6.6		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	4.0	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Benzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Bromobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Bromochloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Bromodichloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Bromoform	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Bromomethane	ND	0.0074	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
2-Butanone (MEK)	ND	0.030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
n-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
sec-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
tert-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Carbon Disulfide	ND	0.0044	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Carbon Tetrachloride	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Chlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Chlorodibromomethane	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Chloroethane	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Chloroform	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Chloromethane	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
2-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
4-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0015	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2-Dibromoethane (EDB)	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Dibromomethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,3-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,4-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0074	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1-Dichloroethylene	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
cis-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
trans-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,3-Dichloropropane	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
2,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1-Dichloropropene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
cis-1,3-Dichloropropene	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
trans-1,3-Dichloropropene	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Diethyl Ether	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Diisopropyl Ether (DIPE)	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,4-Dioxane	ND	0.074	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Ethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
2-Hexanone (MBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Isopropylbenzene (Cumene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Methylene Chloride	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Naphthalene	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
n-Propylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Styrene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1,1,2-Tetrachloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Tetrachloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Tetrahydrofuran	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Toluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2,3-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2,4-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1,1-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,1,2-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Trichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2,3-Trichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,2,4-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
1,3,5-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
Vinyl Chloride	ND	0.0074	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
m+p Xylene	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF
o-Xylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:34	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual
1,2-Dichloroethane-d4	101	70-130	4/8/20 9:34
Toluene-d8	101	70-130	4/8/20 9:34
4-Bromofluorobenzene	98.6	70-130	4/8/20 9:34

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Semivolatle Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Acenaphthylene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Acetophenone	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Aniline	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Benzo(a)anthracene	0.30	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Benzo(a)pyrene	0.32	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Benzo(b)fluoranthene	0.39	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Benzo(g,h,i)perylene	0.25	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Benzo(k)fluoranthene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Bis(2-chloroethoxy)methane	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Bis(2-chloroethyl)ether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Bis(2-chloroisopropyl)ether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
4-Bromophenylphenylether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Butylbenzylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
4-Chloroaniline	ND	0.76	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2-Chloronaphthalene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2-Chlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Chrysene	0.32	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Dibenz(a,h)anthracene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Dibenzofuran	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Di-n-butylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
1,2-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
1,3-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
1,4-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
3,3-Dichlorobenzidine	ND	0.20	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,4-Dichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Diethylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,4-Dimethylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Dimethylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,4-Dinitrophenol	ND	0.76	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,4-Dinitrotoluene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,6-Dinitrotoluene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Di-n-octylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Fluoranthene	0.59	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Fluorene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Hexachlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Hexachlorobutadiene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Hexachloroethane	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Indeno(1,2,3-cd)pyrene	0.27	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Isophorone	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2-Methylnaphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
3/4-Methylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Naphthalene	ND	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Nitrobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2-Nitrophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
4-Nitrophenol	ND	0.76	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Pentachlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Phenanthrene	0.29	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Phenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Pyrene	0.68	0.20	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Pyridine	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
1,2,4-Trichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,4,5-Trichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
2,4,6-Trichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:07	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		59.3	30-130					4/9/20 3:07	
Phenol-d6		62.9	30-130					4/9/20 3:07	
Nitrobenzene-d5		56.3	30-130					4/9/20 3:07	
2-Fluorobiphenyl		69.4	30-130					4/9/20 3:07	
2,4,6-Tribromophenol		55.3	30-130					4/9/20 3:07	
p-Terphenyl-d14		72.5	30-130					4/9/20 3:07	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
alpha-BHC [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
beta-BHC [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
delta-BHC [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
gamma-BHC (Lindane) [1]	ND	0.0023	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Chlordane [1]	ND	0.023	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
4,4'-DDD [1]	ND	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
4,4'-DDE [1]	0.027	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
4,4'-DDT [1]	0.039	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Dieldrin [1]	ND	0.0046	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Endosulfan I [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Endosulfan II [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Endosulfan sulfate [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Endrin [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Endrin ketone [1]	ND	0.0092	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Heptachlor [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Heptachlor epoxide [1]	ND	0.0057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Hexachlorobenzene [1]	ND	0.0069	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Methoxychlor [1]	ND	0.057	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 20:37	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		64.0	30-150					4/10/20 20:37	
Decachlorobiphenyl [2]		60.7	30-150					4/10/20 20:37	
Tetrachloro-m-xylene [1]		65.7	30-150					4/10/20 20:37	
Tetrachloro-m-xylene [2]		63.7	30-150					4/10/20 20:37	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Sample Flags: DL-03

**Herbicides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2,4-D [1]	ND	140	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
2,4-DB [1]	ND	140	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
2,4,5-TP (Silvex) [1]	ND	14	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
2,4,5-T [1]	ND	14	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
Dalapon [1]	ND	360	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
Dicamba [1]	ND	14	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
Dichloroprop [1]	ND	140	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
Dinoseb [1]	ND	72	µg/kg dry	5	V-20	SW-846 8151A	4/13/20	4/15/20 18:12	JMB
MCPA [1]	ND	14000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
MCPP [1]	ND	14000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:12	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2,4-Dichlorophenylacetic acid [1]		76.2	30-150					4/15/20 18:12	
2,4-Dichlorophenylacetic acid [2]		95.4	30-150					4/15/20 18:12	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1221 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1232 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1242 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1248 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1254 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1260 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1262 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Aroclor-1268 [1]	ND	0.093	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 2:50	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		107	30-150					4/11/20 2:50	
Decachlorobiphenyl [2]		105	30-150					4/11/20 2:50	
Tetrachloro-m-xylene [1]		105	30-150					4/11/20 2:50	
Tetrachloro-m-xylene [2]		106	30-150					4/11/20 2:50	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	100	9.6	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 23:35	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	42.2		40-140					4/8/20 23:35	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	7.8	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW
Barium	50	1.9	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW
Cadmium	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW
Chromium	14	0.75	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW
Lead	91	0.56	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW
Mercury	0.31	0.029	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:34	CJV
Selenium	ND	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW
Silver	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:04	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0289-04

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	86.1		% Wt	1		SM 2540G	4/11/20	4/13/20 9:13	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.9°C	6.8		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	3.9	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Benzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Bromobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Bromochloromethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Bromodichloromethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Bromoform	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Bromomethane	ND	0.0061	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
2-Butanone (MEK)	ND	0.024	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
n-Butylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
sec-Butylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
tert-Butylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Carbon Disulfide	ND	0.0037	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Carbon Tetrachloride	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Chlorobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Chlorodibromomethane	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Chloroethane	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Chloroform	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Chloromethane	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
2-Chlorotoluene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
4-Chlorotoluene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0012	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2-Dibromoethane (EDB)	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Dibromomethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2-Dichlorobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,3-Dichlorobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,4-Dichlorobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0061	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1-Dichloroethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2-Dichloroethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1-Dichloroethylene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
cis-1,2-Dichloroethylene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
trans-1,2-Dichloroethylene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2-Dichloropropane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,3-Dichloropropane	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
2,2-Dichloropropane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1-Dichloropropene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
cis-1,3-Dichloropropene	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
trans-1,3-Dichloropropene	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Diethyl Ether	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Diisopropyl Ether (DIPE)	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,4-Dioxane	ND	0.061	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Ethylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
2-Hexanone (MBK)	ND	0.012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Isopropylbenzene (Cumene)	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Methylene Chloride	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Naphthalene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
n-Propylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Styrene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1,1,2-Tetrachloroethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Tetrachloroethylene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Tetrahydrofuran	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Toluene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2,3-Trichlorobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2,4-Trichlorobenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1,1-Trichloroethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,1,2-Trichloroethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Trichloroethylene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2,3-Trichloropropane	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,2,4-Trimethylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
1,3,5-Trimethylbenzene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
Vinyl Chloride	ND	0.0061	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
m+p Xylene	ND	0.0024	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF
o-Xylene	ND	0.0012	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 9:58	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual
1,2-Dichloroethane-d4	102	70-130	4/8/20 9:58
Toluene-d8	101	70-130	4/8/20 9:58
4-Bromofluorobenzene	102	70-130	4/8/20 9:58

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Acenaphthylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Acetophenone	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Aniline	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Benzo(a)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Benzo(a)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Benzo(b)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Benzo(g,h,i)perylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Benzo(k)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Bis(2-chloroethoxy)methane	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Bis(2-chloroethyl)ether	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Bis(2-chloroisopropyl)ether	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
4-Bromophenylphenylether	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Butylbenzylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
4-Chloroaniline	ND	0.74	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2-Chloronaphthalene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2-Chlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Chrysene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Dibenz(a,h)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Dibenzofuran	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Di-n-butylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
1,2-Dichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
1,3-Dichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
1,4-Dichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
3,3-Dichlorobenzidine	ND	0.19	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,4-Dichlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Diethylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,4-Dimethylphenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Dimethylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,4-Dinitrophenol	ND	0.74	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,4-Dinitrotoluene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,6-Dinitrotoluene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Di-n-octylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Fluorene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Hexachlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Hexachlorobutadiene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Hexachloroethane	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Indeno(1,2,3-cd)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Isophorone	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2-Methylnaphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
3/4-Methylphenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Naphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Nitrobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2-Nitrophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
4-Nitrophenol	ND	0.74	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Pentachlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Phenanthrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Phenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Pyridine	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
1,2,4-Trichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,4,5-Trichlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
2,4,6-Trichlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:30	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		63.8	30-130					4/9/20 3:30	
Phenol-d6		69.7	30-130					4/9/20 3:30	
Nitrobenzene-d5		60.2	30-130					4/9/20 3:30	
2-Fluorobiphenyl		78.6	30-130					4/9/20 3:30	
2,4,6-Tribromophenol		64.9	30-130					4/9/20 3:30	
p-Terphenyl-d14		84.2	30-130					4/9/20 3:30	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1221 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1232 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1242 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1248 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1254 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1260 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1262 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Aroclor-1268 [1]	ND	0.084	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:07	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		115	30-150					4/11/20 3:07	
Decachlorobiphenyl [2]		112	30-150					4/11/20 3:07	
Tetrachloro-m-xylene [1]		106	30-150					4/11/20 3:07	
Tetrachloro-m-xylene [2]		107	30-150					4/11/20 3:07	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	15	9.3	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 21:53	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	45.6		40-140					4/8/20 21:53	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	10	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW
Barium	40	1.8	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW
Cadmium	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW
Chromium	16	0.73	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW
Lead	8.6	0.55	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW
Mercury	ND	0.028	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:40	CJV
Selenium	ND	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW
Silver	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:08	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0289-05

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	89.5		% Wt	1		SM 2540G	4/11/20	4/13/20 9:13	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.7°C	8.5		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	3.9	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Benzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Bromobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Bromochloromethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Bromodichloromethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Bromoform	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Bromomethane	ND	0.0078	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
2-Butanone (MEK)	ND	0.031	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
n-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
sec-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
tert-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Carbon Disulfide	ND	0.0047	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Carbon Tetrachloride	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Chlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Chlorodibromomethane	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Chloroethane	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Chloroform	ND	0.0031	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Chloromethane	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
2-Chlorotoluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
4-Chlorotoluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0016	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2-Dibromoethane (EDB)	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Dibromomethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,3-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,4-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0078	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1-Dichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2-Dichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1-Dichloroethylene	ND	0.0031	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
cis-1,2-Dichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
trans-1,2-Dichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2-Dichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,3-Dichloropropane	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
2,2-Dichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1-Dichloropropene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
cis-1,3-Dichloropropene	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
trans-1,3-Dichloropropene	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Diethyl Ether	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Diisopropyl Ether (DIPE)	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,4-Dioxane	ND	0.078	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Ethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
2-Hexanone (MBK)	ND	0.016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Isopropylbenzene (Cumene)	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0031	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Methylene Chloride	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Naphthalene	ND	0.0031	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
n-Propylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Styrene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1,1,2-Tetrachloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Tetrachloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Tetrahydrofuran	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Toluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2,3-Trichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2,4-Trichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1,1-Trichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,1,2-Trichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Trichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2,3-Trichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,2,4-Trimethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
1,3,5-Trimethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Vinyl Chloride	ND	0.0078	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
m+p Xylene	ND	0.0031	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
o-Xylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:23	MFF
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
1,2-Dichloroethane-d4		101	70-130					4/8/20 10:23	
Toluene-d8		98.5	70-130					4/8/20 10:23	
4-Bromofluorobenzene		93.8	70-130					4/8/20 10:23	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Acenaphthylene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Acetophenone	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Aniline	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Anthracene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Benzo(a)anthracene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Benzo(a)pyrene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Benzo(b)fluoranthene	0.23	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Benzo(g,h,i)perylene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Benzo(k)fluoranthene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Bis(2-chloroethoxy)methane	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Bis(2-chloroethyl)ether	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Bis(2-chloroisopropyl)ether	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
4-Bromophenylphenylether	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Butylbenzylphthalate	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
4-Chloroaniline	ND	0.85	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2-Chloronaphthalene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2-Chlorophenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Chrysene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Dibenz(a,h)anthracene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Dibenzofuran	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Di-n-butylphthalate	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
1,2-Dichlorobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
1,3-Dichlorobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
1,4-Dichlorobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
3,3-Dichlorobenzidine	ND	0.22	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,4-Dichlorophenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Diethylphthalate	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,4-Dimethylphenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Dimethylphthalate	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,4-Dinitrophenol	ND	0.85	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,4-Dinitrotoluene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,6-Dinitrotoluene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Di-n-octylphthalate	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Fluoranthene	0.37	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Fluorene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Hexachlorobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Hexachlorobutadiene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Hexachloroethane	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Indeno(1,2,3-cd)pyrene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Isophorone	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2-Methylnaphthalene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
3/4-Methylphenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Naphthalene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Nitrobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2-Nitrophenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
4-Nitrophenol	ND	0.85	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Pentachlorophenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Phenanthrene	ND	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Phenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Pyrene	0.45	0.22	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Pyridine	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
1,2,4-Trichlorobenzene	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,4,5-Trichlorophenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
2,4,6-Trichlorophenol	ND	0.44	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 3:54	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		65.6	30-130					4/9/20 3:54	
Phenol-d6		70.2	30-130					4/9/20 3:54	
Nitrobenzene-d5		62.7	30-130					4/9/20 3:54	
2-Fluorobiphenyl		77.5	30-130					4/9/20 3:54	
2,4,6-Tribromophenol		60.1	30-130					4/9/20 3:54	
p-Terphenyl-d14		81.0	30-130					4/9/20 3:54	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1221 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1232 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1242 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1248 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1254 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1260 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1262 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Aroclor-1268 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:25	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		107	30-150					4/11/20 3:25	
Decachlorobiphenyl [2]		104	30-150					4/11/20 3:25	
Tetrachloro-m-xylene [1]		109	30-150					4/11/20 3:25	
Tetrachloro-m-xylene [2]		109	30-150					4/11/20 3:25	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	80	11	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 22:55	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	45.4		40-140					4/8/20 22:55	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	9.2	4.1	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW
Barium	52	2.1	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW
Cadmium	ND	0.41	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW
Chromium	19	0.82	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW
Lead	99	0.62	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW
Mercury	0.27	0.032	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:42	CJV
Selenium	ND	4.1	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW
Silver	ND	0.41	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:12	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0289-06

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	77.1		% Wt	1		SM 2540G	4/11/20	4/13/20 9:13	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.8°C	6.3		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	4.0	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Benzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Bromobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Bromochloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Bromodichloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Bromoform	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Bromomethane	ND	0.0076	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
2-Butanone (MEK)	ND	0.030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
n-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
sec-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
tert-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Carbon Disulfide	ND	0.0045	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Carbon Tetrachloride	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Chlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Chlorodibromomethane	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Chloroethane	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Chloroform	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Chloromethane	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
2-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
4-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0015	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2-Dibromoethane (EDB)	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Dibromomethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,3-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,4-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0076	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1-Dichloroethylene	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
cis-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
trans-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,3-Dichloropropane	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
2,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1-Dichloropropene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
cis-1,3-Dichloropropene	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
trans-1,3-Dichloropropene	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Diethyl Ether	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Diisopropyl Ether (DIPE)	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,4-Dioxane	ND	0.076	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Ethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
2-Hexanone (MBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Isopropylbenzene (Cumene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Methylene Chloride	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Naphthalene	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
n-Propylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Styrene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1,1,2-Tetrachloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Tetrachloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Tetrahydrofuran	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Toluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2,3-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2,4-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1,1-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,1,2-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Trichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2,3-Trichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,2,4-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
1,3,5-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Vinyl Chloride	ND	0.0076	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
m+p Xylene	ND	0.0030	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
o-Xylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 10:48	MFF
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
1,2-Dichloroethane-d4		102	70-130					4/8/20 10:48	
Toluene-d8		101	70-130					4/8/20 10:48	
4-Bromofluorobenzene		99.4	70-130					4/8/20 10:48	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Semivolatle Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Acenaphthylene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Acetophenone	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Aniline	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Anthracene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Benzo(a)anthracene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Benzo(a)pyrene	0.22	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Benzo(b)fluoranthene	0.27	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Benzo(g,h,i)perylene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Benzo(k)fluoranthene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Bis(2-chloroethoxy)methane	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Bis(2-chloroethyl)ether	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Bis(2-chloroisopropyl)ether	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
4-Bromophenylphenylether	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Butylbenzylphthalate	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
4-Chloroaniline	ND	0.80	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2-Chloronaphthalene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2-Chlorophenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Chrysene	0.22	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Dibenz(a,h)anthracene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Dibenzofuran	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Di-n-butylphthalate	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
1,2-Dichlorobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
1,3-Dichlorobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
1,4-Dichlorobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
3,3-Dichlorobenzidine	ND	0.21	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,4-Dichlorophenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Diethylphthalate	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,4-Dimethylphenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Dimethylphthalate	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,4-Dinitrophenol	ND	0.80	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,4-Dinitrotoluene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,6-Dinitrotoluene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Di-n-octylphthalate	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Fluoranthene	0.38	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Fluorene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Hexachlorobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Hexachlorobutadiene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Hexachloroethane	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Indeno(1,2,3-cd)pyrene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Isophorone	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2-Methylnaphthalene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
3/4-Methylphenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Naphthalene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Nitrobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2-Nitrophenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
4-Nitrophenol	ND	0.80	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Pentachlorophenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Phenanthrene	ND	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Phenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Pyrene	0.46	0.21	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Pyridine	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
1,2,4-Trichlorobenzene	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,4,5-Trichlorophenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
2,4,6-Trichlorophenol	ND	0.41	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:17	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		62.8	30-130					4/9/20 4:17	
Phenol-d6		67.2	30-130					4/9/20 4:17	
Nitrobenzene-d5		59.3	30-130					4/9/20 4:17	
2-Fluorobiphenyl		76.3	30-130					4/9/20 4:17	
2,4,6-Tribromophenol		60.6	30-130					4/9/20 4:17	
p-Terphenyl-d14		79.4	30-130					4/9/20 4:17	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
alpha-BHC [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
beta-BHC [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
delta-BHC [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
gamma-BHC (Lindane) [1]	ND	0.0024	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Chlordane [1]	ND	0.024	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
4,4'-DDD [2]	ND	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
4,4'-DDE [1]	0.043	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
4,4'-DDT [1]	0.058	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Dieldrin [1]	ND	0.0047	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Endosulfan I [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Endosulfan II [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Endosulfan sulfate [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Endrin [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Endrin ketone [1]	ND	0.0095	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Heptachlor [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Heptachlor epoxide [1]	ND	0.0059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Hexachlorobenzene [1]	ND	0.0071	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Methoxychlor [1]	ND	0.059	mg/Kg dry	1		SW-846 8081B	4/8/20	4/10/20 21:05	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		72.1	30-150					4/10/20 21:05	
Decachlorobiphenyl [2]		67.3	30-150					4/10/20 21:05	
Tetrachloro-m-xylene [1]		76.3	30-150					4/10/20 21:05	
Tetrachloro-m-xylene [2]		71.9	30-150					4/10/20 21:05	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Sample Flags: DL-03

**Herbicides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2,4-D [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
2,4-DB [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
2,4,5-TP (Silvex) [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
2,4,5-T [1]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
Dalalpon [1]	ND	380	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
Dicamba [2]	ND	15	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
Dichloroprop [1]	ND	150	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
Dinoseb [1]	ND	76	µg/kg dry	5	V-20	SW-846 8151A	4/13/20	4/15/20 18:51	JMB
MCPA [1]	ND	15000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
MCPA [1]	ND	15000	µg/kg dry	5		SW-846 8151A	4/13/20	4/15/20 18:51	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2,4-Dichlorophenylacetic acid [1]		88.3	30-150					4/15/20 18:51	
2,4-Dichlorophenylacetic acid [2]		88.8	30-150					4/15/20 18:51	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1221 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1232 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1242 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1248 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1254 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1260 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1262 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Aroclor-1268 [1]	ND	0.095	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 3:42	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		111	30-150					4/11/20 3:42	
Decachlorobiphenyl [2]		108	30-150					4/11/20 3:42	
Tetrachloro-m-xylene [1]		110	30-150					4/11/20 3:42	
Tetrachloro-m-xylene [2]		111	30-150					4/11/20 3:42	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	84	10	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 23:55	RMW
Surrogates	% Recovery		Recovery Limits		Flag/Qual				
2-Fluorobiphenyl	44.5		40-140					4/8/20 23:55	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	9.1	4.0	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW
Barium	51	2.0	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW
Cadmium	ND	0.40	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW
Chromium	15	0.80	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW
Lead	94	0.60	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW
Mercury	0.32	0.031	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:28	CJV
Selenium	ND	4.0	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW
Silver	ND	0.40	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:27	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0289-07

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	81.8		% Wt	1		SM 2540G	4/11/20	4/13/20 9:14	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.5°C	6.6		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	3.9	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Benzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Bromobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Bromochloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Bromodichloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Bromoform	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Bromomethane	ND	0.0071	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
2-Butanone (MEK)	ND	0.028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
n-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
sec-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
tert-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Carbon Disulfide	ND	0.0042	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Carbon Tetrachloride	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Chlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Chlorodibromomethane	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Chloroethane	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Chloroform	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Chloromethane	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
2-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
4-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0014	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2-Dibromoethane (EDB)	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Dibromomethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,3-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,4-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0071	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1-Dichloroethylene	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
cis-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
trans-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,3-Dichloropropane	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
2,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1-Dichloropropene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
cis-1,3-Dichloropropene	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
trans-1,3-Dichloropropene	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Diethyl Ether	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Diisopropyl Ether (DIPE)	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,4-Dioxane	ND	0.071	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Ethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
2-Hexanone (MBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Isopropylbenzene (Cumene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Methylene Chloride	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Naphthalene	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
n-Propylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Styrene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1,1,2-Tetrachloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Tetrachloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Tetrahydrofuran	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Toluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2,3-Trichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2,4-Trichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1,1-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,1,2-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Trichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2,3-Trichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,2,4-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
1,3,5-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
Vinyl Chloride	ND	0.0071	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
m+p Xylene	ND	0.0028	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF
o-Xylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:12	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual
1,2-Dichloroethane-d4	101	70-130	4/8/20 11:12
Toluene-d8	100	70-130	4/8/20 11:12
4-Bromofluorobenzene	99.1	70-130	4/8/20 11:12

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Acenaphthylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Acetophenone	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Aniline	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Benzo(a)anthracene	0.26	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Benzo(a)pyrene	0.26	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Benzo(b)fluoranthene	0.29	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Benzo(g,h,i)perylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Benzo(k)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Bis(2-chloroethoxy)methane	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Bis(2-chloroethyl)ether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Bis(2-chloroisopropyl)ether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
4-Bromophenylphenylether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Butylbenzylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
4-Chloroaniline	ND	0.75	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2-Chloronaphthalene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2-Chlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Chrysene	0.27	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Dibenz(a,h)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Dibenzofuran	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Di-n-butylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
1,2-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
1,3-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
1,4-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
3,3-Dichlorobenzidine	ND	0.19	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,4-Dichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Diethylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,4-Dimethylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Dimethylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,4-Dinitrophenol	ND	0.75	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,4-Dinitrotoluene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,6-Dinitrotoluene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Di-n-octylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Fluoranthene	0.52	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Fluorene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Hexachlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Hexachlorobutadiene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Hexachloroethane	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Indeno(1,2,3-cd)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Isophorone	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2-Methylnaphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
3/4-Methylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Naphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Nitrobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2-Nitrophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
4-Nitrophenol	ND	0.75	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Pentachlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Phenanthrene	0.35	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Phenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Pyrene	0.62	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Pyridine	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
1,2,4-Trichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,4,5-Trichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
2,4,6-Trichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 4:42	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		66.9	30-130					4/9/20 4:42	
Phenol-d6		72.4	30-130					4/9/20 4:42	
Nitrobenzene-d5		63.3	30-130					4/9/20 4:42	
2-Fluorobiphenyl		79.6	30-130					4/9/20 4:42	
2,4,6-Tribromophenol		64.2	30-130					4/9/20 4:42	
p-Terphenyl-d14		86.3	30-130					4/9/20 4:42	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1221 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1232 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1242 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1248 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1254 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1260 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1262 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Aroclor-1268 [1]	ND	0.090	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:00	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		110	30-150					4/11/20 4:00	
Decachlorobiphenyl [2]		107	30-150					4/11/20 4:00	
Tetrachloro-m-xylene [1]		102	30-150					4/11/20 4:00	
Tetrachloro-m-xylene [2]		104	30-150					4/11/20 4:00	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	60	9.5	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/9/20 0:15	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	46.2		40-140					4/9/20 0:15	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	6.1	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW
Barium	41	1.9	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW
Cadmium	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW
Chromium	14	0.74	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW
Lead	51	0.56	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW
Mercury	0.21	0.029	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:43	CJV
Selenium	ND	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW
Silver	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:31	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0289-08

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	87.4		% Wt	1		SM 2540G	4/11/20	4/13/20 9:14	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17°C	7.1		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	3.9	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	19	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Benzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Bromobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Bromochloromethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Bromodichloromethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Bromoform	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Bromomethane	ND	0.0064	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
2-Butanone (MEK)	ND	0.026	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
n-Butylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
sec-Butylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
tert-Butylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Carbon Disulfide	ND	0.0038	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Carbon Tetrachloride	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Chlorobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Chlorodibromomethane	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Chloroethane	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Chloroform	ND	0.0026	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Chloromethane	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
2-Chlorotoluene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
4-Chlorotoluene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0013	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2-Dibromoethane (EDB)	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Dibromomethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2-Dichlorobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,3-Dichlorobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,4-Dichlorobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0064	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1-Dichloroethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2-Dichloroethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1-Dichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
cis-1,2-Dichloroethylene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
trans-1,2-Dichloroethylene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2-Dichloropropane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,3-Dichloropropane	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
2,2-Dichloropropane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1-Dichloropropene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
cis-1,3-Dichloropropene	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
trans-1,3-Dichloropropene	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Diethyl Ether	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Diisopropyl Ether (DIPE)	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,4-Dioxane	ND	0.064	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Ethylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
2-Hexanone (MBK)	ND	0.013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Isopropylbenzene (Cumene)	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0026	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Methylene Chloride	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Naphthalene	ND	0.0026	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
n-Propylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Styrene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1,1,2-Tetrachloroethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Tetrachloroethylene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Tetrahydrofuran	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Toluene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2,3-Trichlorobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2,4-Trichlorobenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1,1-Trichloroethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,1,2-Trichloroethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Trichloroethylene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2,3-Trichloropropane	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,2,4-Trimethylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
1,3,5-Trimethylbenzene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Vinyl Chloride	ND	0.0064	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
m+p Xylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
o-Xylene	ND	0.0013	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 11:37	MFF
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
1,2-Dichloroethane-d4		99.5	70-130					4/8/20 11:37	
Toluene-d8		102	70-130					4/8/20 11:37	
4-Bromofluorobenzene		99.3	70-130					4/8/20 11:37	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Acenaphthylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Acetophenone	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Aniline	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Benzo(a)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Benzo(a)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Benzo(b)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Benzo(g,h,i)perylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Benzo(k)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Bis(2-chloroethoxy)methane	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Bis(2-chloroethyl)ether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Bis(2-chloroisopropyl)ether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
4-Bromophenylphenylether	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Butylbenzylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
4-Chloroaniline	ND	0.76	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2-Chloronaphthalene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2-Chlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Chrysene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Dibenz(a,h)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Dibenzofuran	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Di-n-butylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
1,2-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
1,3-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
1,4-Dichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
3,3-Dichlorobenzidine	ND	0.19	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,4-Dichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Diethylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,4-Dimethylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Dimethylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,4-Dinitrophenol	ND	0.76	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,4-Dinitrotoluene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,6-Dinitrotoluene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Di-n-octylphthalate	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Fluorene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Hexachlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Hexachlorobutadiene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Hexachloroethane	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Indeno(1,2,3-cd)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Isophorone	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2-Methylnaphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
3/4-Methylphenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Naphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Nitrobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2-Nitrophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
4-Nitrophenol	ND	0.76	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Pentachlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Phenanthrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Phenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Pyridine	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
1,2,4-Trichlorobenzene	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,4,5-Trichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
2,4,6-Trichlorophenol	ND	0.39	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:05	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		67.6	30-130					4/9/20 5:05	
Phenol-d6		73.5	30-130					4/9/20 5:05	
Nitrobenzene-d5		63.6	30-130					4/9/20 5:05	
2-Fluorobiphenyl		81.0	30-130					4/9/20 5:05	
2,4,6-Tribromophenol		65.7	30-130					4/9/20 5:05	
p-Terphenyl-d14		88.3	30-130					4/9/20 5:05	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1221 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1232 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1242 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1248 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1254 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1260 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1262 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Aroclor-1268 [1]	ND	0.086	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:17	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		114	30-150					4/11/20 4:17	
Decachlorobiphenyl [2]		111	30-150					4/11/20 4:17	
Tetrachloro-m-xylene [1]		105	30-150					4/11/20 4:17	
Tetrachloro-m-xylene [2]		107	30-150					4/11/20 4:17	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	19	9.5	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 22:34	RMW
<b>Surrogates</b>		<b>% Recovery</b>	<b>Recovery Limits</b>		<b>Flag/Qual</b>				
2-Fluorobiphenyl		46.6	40-140					4/8/20 22:34	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	4.7	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW
Barium	31	1.8	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW
Cadmium	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW
Chromium	15	0.73	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW
Lead	18	0.55	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW
Mercury	0.056	0.027	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:45	CJV
Selenium	ND	3.7	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW
Silver	ND	0.37	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:35	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0289-09

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	87.3		% Wt	1		SM 2540G	4/11/20	4/13/20 9:14	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @17.2°C	6.2		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	4.0	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/8/20	4/9/20 10:15	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Benzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Bromobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Bromochloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Bromodichloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Bromoform	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Bromomethane	ND	0.0072	mg/Kg dry	1	V-34	SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
2-Butanone (MEK)	ND	0.029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
n-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
sec-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
tert-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Carbon Disulfide	ND	0.0043	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Carbon Tetrachloride	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Chlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Chlorodibromomethane	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Chloroethane	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Chloroform	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Chloromethane	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
2-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
4-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0014	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2-Dibromoethane (EDB)	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Dibromomethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,3-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,4-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0072	mg/Kg dry	1	V-05	SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1-Dichloroethylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
cis-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
trans-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,3-Dichloropropane	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
2,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1-Dichloropropene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
cis-1,3-Dichloropropene	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
trans-1,3-Dichloropropene	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Diethyl Ether	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Diisopropyl Ether (DIPE)	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,4-Dioxane	ND	0.072	mg/Kg dry	1	V-16	SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Ethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
2-Hexanone (MBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Isopropylbenzene (Cumene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Methylene Chloride	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Naphthalene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
n-Propylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Styrene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1,1,2-Tetrachloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1,1,2,2-Tetrachloroethane	ND	0.00072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Tetrachloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Tetrahydrofuran	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Toluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2,3-Trichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2,4-Trichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1,1-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,1,2-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Trichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2,3-Trichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,2,4-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
1,3,5-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Vinyl Chloride	ND	0.0072	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
m+p Xylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
o-Xylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C-D	4/8/20	4/8/20 12:02	MFF
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
1,2-Dichloroethane-d4		98.7	70-130					4/8/20 12:02	
Toluene-d8		101	70-130					4/8/20 12:02	
4-Bromofluorobenzene		101	70-130					4/8/20 12:02	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acenaphthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Acenaphthylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Acetophenone	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Aniline	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Benzo(a)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Benzo(a)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Benzo(b)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Benzo(g,h,i)perylene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Benzo(k)fluoranthene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Bis(2-chloroethoxy)methane	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Bis(2-chloroethyl)ether	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Bis(2-chloroisopropyl)ether	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Bis(2-Ethylhexyl)phthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
4-Bromophenylphenylether	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Butylbenzylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
4-Chloroaniline	ND	0.74	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2-Chloronaphthalene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2-Chlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Chrysene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Dibenz(a,h)anthracene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Dibenzofuran	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Di-n-butylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
1,2-Dichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
1,3-Dichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
1,4-Dichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
3,3-Dichlorobenzidine	ND	0.19	mg/Kg dry	1	V-34	SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,4-Dichlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Diethylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,4-Dimethylphenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Dimethylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,4-Dinitrophenol	ND	0.74	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,4-Dinitrotoluene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,6-Dinitrotoluene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Di-n-octylphthalate	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
1,2-Diphenylhydrazine/Azobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Fluoranthene	0.20	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Fluorene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Hexachlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Hexachlorobutadiene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Hexachloroethane	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Indeno(1,2,3-cd)pyrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Isophorone	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2-Methylnaphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Semivolatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
2-Methylphenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
3/4-Methylphenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Naphthalene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Nitrobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2-Nitrophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
4-Nitrophenol	ND	0.74	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Pentachlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Phenanthrene	ND	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Phenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Pyrene	0.23	0.19	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Pyridine	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
1,2,4-Trichlorobenzene	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,4,5-Trichlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
2,4,6-Trichlorophenol	ND	0.38	mg/Kg dry	1		SW-846 8270D-E	4/8/20	4/9/20 5:29	KLB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
2-Fluorophenol		60.6	30-130					4/9/20 5:29	
Phenol-d6		65.7	30-130					4/9/20 5:29	
Nitrobenzene-d5		58.1	30-130					4/9/20 5:29	
2-Fluorobiphenyl		72.4	30-130					4/9/20 5:29	
2,4,6-Tribromophenol		56.3	30-130					4/9/20 5:29	
p-Terphenyl-d14		79.9	30-130					4/9/20 5:29	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Sample Flags: O-32

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aroclor-1016 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1221 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1232 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1242 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1248 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1254 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1260 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1262 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Aroclor-1268 [1]	ND	0.087	mg/Kg dry	4		SW-846 8082A	4/8/20	4/11/20 4:35	JMB
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		109	30-150					4/11/20 4:35	
Decachlorobiphenyl [2]		107	30-150					4/11/20 4:35	
Tetrachloro-m-xylene [1]		103	30-150					4/11/20 4:35	
Tetrachloro-m-xylene [2]		104	30-150					4/11/20 4:35	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
TPH (C9-C36)	21	9.4	mg/Kg dry	1		SW-846 8100 Modified	4/8/20	4/8/20 22:14	RMW
Surrogates	% Recovery		Recovery Limits	Flag/Qual					
2-Fluorobiphenyl	41.6		40-140					4/8/20 22:14	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	6.8	3.6	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW
Barium	39	1.8	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW
Cadmium	ND	0.36	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW
Chromium	13	0.73	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW
Lead	40	0.55	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW
Mercury	0.41	0.028	mg/Kg dry	1		SW-846 7471B	4/9/20	4/10/20 12:47	CJV
Selenium	ND	3.6	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW
Silver	ND	0.36	mg/Kg dry	1		SW-846 6010D	4/8/20	4/8/20 21:40	QNW

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0289

Date Received: 4/7/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0289-10

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	88.4		% Wt	1		SM 2540G	4/11/20	4/13/20 9:14	AVF
Ignitability	Absent		present/absent	1		SW-846 1030	4/9/20	4/9/20 17:00	DJM
pH @18.7°C	6.7		pH Units	1	H-03	SW-846 9045C	4/7/20	4/7/20 21:20	KMV
Reactive Cyanide	ND	3.9	mg/Kg	1		SW-846 9014	4/8/20	4/9/20 14:00	EC
Reactive Sulfide	ND	20	mg/Kg	1		SW-846 9030A	4/11/20	4/12/20 10:40	EC

NOT FOR BIDDING

**Sample Extraction Data**

**Prep Method: % Solids    Analytical Method: SM 2540G**

Lab Number [Field ID]	Batch	Date
20D0289-01 [Comp-West-1 (0-2)]	B256097	04/11/20
20D0289-02 [Comp-West-2 (0-2)]	B256097	04/11/20
20D0289-03 [Comp-Field-1 (0-1)]	B256097	04/11/20
20D0289-04 [Comp-Field-2 (0-1)]	B256097	04/11/20
20D0289-05 [Comp-Field-3 (0-4)]	B256097	04/11/20
20D0289-06 [Comp-East-1 (0-2)]	B256097	04/11/20
20D0289-07 [Comp-East-2 (0-1)]	B256097	04/11/20
20D0289-08 [Comp-VT (0-2.5)]	B256097	04/11/20
20D0289-09 [Comp-LP (0-8)]	B256097	04/11/20
20D0289-10 [Comp-SW (0-7.5)]	B256097	04/11/20

**SW-846 1030**

Lab Number [Field ID]	Batch	Initial [g]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255990	50.0	04/09/20
20D0289-02 [Comp-West-2 (0-2)]	B255990	50.0	04/09/20
20D0289-03 [Comp-Field-1 (0-1)]	B255990	50.0	04/09/20
20D0289-04 [Comp-Field-2 (0-1)]	B255990	50.0	04/09/20
20D0289-05 [Comp-Field-3 (0-4)]	B255990	50.0	04/09/20
20D0289-06 [Comp-East-1 (0-2)]	B255990	50.0	04/09/20
20D0289-07 [Comp-East-2 (0-1)]	B255990	50.0	04/09/20
20D0289-08 [Comp-VT (0-2.5)]	B255990	50.0	04/09/20
20D0289-09 [Comp-LP (0-8)]	B255990	50.0	04/09/20
20D0289-10 [Comp-SW (0-7.5)]	B255990	50.0	04/09/20

**Prep Method: SW-846 3050B    Analytical Method: SW-846 6010D**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255893	1.55	50.0	04/08/20
20D0289-02 [Comp-West-2 (0-2)]	B255893	1.58	50.0	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255893	1.53	50.0	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255893	1.56	50.0	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255893	1.53	50.0	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255893	1.58	50.0	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255893	1.52	50.0	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255893	1.54	50.0	04/08/20
20D0289-09 [Comp-LP (0-8)]	B255893	1.56	50.0	04/08/20
20D0289-10 [Comp-SW (0-7.5)]	B255893	1.55	50.0	04/08/20

**Prep Method: SW-846 7471    Analytical Method: SW-846 7471B**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255973	0.583	50.0	04/09/20
20D0289-02 [Comp-West-2 (0-2)]	B255973	0.600	50.0	04/09/20
20D0289-03 [Comp-Field-1 (0-1)]	B255973	0.589	50.0	04/09/20
20D0289-04 [Comp-Field-2 (0-1)]	B255973	0.598	50.0	04/09/20
20D0289-05 [Comp-Field-3 (0-4)]	B255973	0.599	50.0	04/09/20
20D0289-06 [Comp-East-1 (0-2)]	B255973	0.616	50.0	04/09/20
20D0289-07 [Comp-East-2 (0-1)]	B255973	0.583	50.0	04/09/20
20D0289-08 [Comp-VT (0-2.5)]	B255973	0.593	50.0	04/09/20
20D0289-09 [Comp-LP (0-8)]	B255973	0.626	50.0	04/09/20

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**Sample Extraction Data**

**Prep Method: SW-846 7471 Analytical Method: SW-846 7471B**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-10 [Comp-SW (0-7.5)]	B255973	0.616	50.0	04/09/20

**Prep Method: SW-846 3546 Analytical Method: SW-846 8081B**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255866	10.3	10.0	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255866	10.1	10.0	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255866	10.1	10.0	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255866	10.3	10.0	04/08/20

**Prep Method: SW-846 3540C Analytical Method: SW-846 8082A**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255907	10.5	10.0	04/08/20
20D0289-02 [Comp-West-2 (0-2)]	B255907	10.7	10.0	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255907	10.2	10.0	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255907	10.0	10.0	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255907	10.6	10.0	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255907	10.9	10.0	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255907	10.3	10.0	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255907	10.2	10.0	04/08/20
20D0289-09 [Comp-LP (0-8)]	B255907	10.7	10.0	04/08/20
20D0289-10 [Comp-SW (0-7.5)]	B255907	10.4	10.0	04/08/20

**Prep Method: SW-846 3546 Analytical Method: SW-846 8100 Modified**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-02 [Comp-West-2 (0-2)]	B255869	30.1	1.00	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255869	30.2	1.00	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255869	30.1	1.00	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255869	30.1	1.00	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255869	30.2	1.00	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255869	30.1	1.00	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255869	30.1	1.00	04/08/20
20D0289-09 [Comp-LP (0-8)]	B255869	30.0	1.00	04/08/20
20D0289-10 [Comp-SW (0-7.5)]	B255869	30.1	1.00	04/08/20

**Prep Method: SW-846 3546 Analytical Method: SW-846 8100 Modified**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01RE1 [Comp-West-1 (0-2)]	B255970	30.0	1.00	04/09/20

**Prep Method: SW-846 8151 Analytical Method: SW-846 8151A**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B256076	20.0	5.00	04/13/20
20D0289-03 [Comp-Field-1 (0-1)]	B256076	20.3	5.00	04/13/20
20D0289-04 [Comp-Field-2 (0-1)]	B256076	20.1	5.00	04/13/20
20D0289-07 [Comp-East-2 (0-1)]	B256076	20.1	5.00	04/13/20

**Sample Extraction Data**

Prep Method: SW-846 5035 Analytical Method: SW-846 8260C-D

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255863	8.44	10.0	04/08/20
20D0289-02 [Comp-West-2 (0-2)]	B255863	8.08	10.0	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255863	7.47	10.0	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255863	7.87	10.0	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255863	9.17	10.0	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255863	8.36	10.0	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255863	8.09	10.0	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255863	8.10	10.0	04/08/20
20D0289-09 [Comp-LP (0-8)]	B255863	8.94	10.0	04/08/20
20D0289-10 [Comp-SW (0-7.5)]	B255863	7.90	10.0	04/08/20

Prep Method: SW-846 3546 Analytical Method: SW-846 8270D-E

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255868	30.2	1.00	04/08/20
20D0289-02 [Comp-West-2 (0-2)]	B255868	30.1	1.00	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255868	30.2	1.00	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255868	30.1	1.00	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255868	30.1	1.00	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255868	30.2	1.00	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255868	30.1	1.00	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255868	30.1	1.00	04/08/20
20D0289-09 [Comp-LP (0-8)]	B255868	30.0	1.00	04/08/20
20D0289-10 [Comp-SW (0-7.5)]	B255868	30.1	1.00	04/08/20

SW-846 9014

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255871	25.2	250	04/08/20
20D0289-02 [Comp-West-2 (0-2)]	B255871	25.1	250	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255871	25.3	250	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255871	25.5	250	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255871	25.5	250	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255871	25.1	250	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255871	25.5	250	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255871	25.7	250	04/08/20
20D0289-09 [Comp-LP (0-8)]	B255871	25.1	250	04/08/20
20D0289-10 [Comp-SW (0-7.5)]	B255871	25.4	250	04/08/20

SW-846 9030A

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255874	25.2	250	04/08/20
20D0289-02 [Comp-West-2 (0-2)]	B255874	25.1	250	04/08/20
20D0289-03 [Comp-Field-1 (0-1)]	B255874	25.3	250	04/08/20
20D0289-04 [Comp-Field-2 (0-1)]	B255874	25.5	250	04/08/20
20D0289-05 [Comp-Field-3 (0-4)]	B255874	25.5	250	04/08/20
20D0289-06 [Comp-East-1 (0-2)]	B255874	25.1	250	04/08/20
20D0289-07 [Comp-East-2 (0-1)]	B255874	25.5	250	04/08/20
20D0289-08 [Comp-VT (0-2.5)]	B255874	25.7	250	04/08/20

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**Sample Extraction Data**

**SW-846 9030A**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-09 [Comp-LP (0-8)]	B255874	25.1	250	04/08/20

**SW-846 9030A**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0289-10 [Comp-SW (0-7.5)]	B256103	25.1	250	04/11/20

**SW-846 9045C**

Lab Number [Field ID]	Batch	Initial [g]	Date
20D0289-01 [Comp-West-1 (0-2)]	B255839	20.0	04/07/20
20D0289-02 [Comp-West-2 (0-2)]	B255839	20.0	04/07/20
20D0289-03 [Comp-Field-1 (0-1)]	B255839	20.0	04/07/20
20D0289-04 [Comp-Field-2 (0-1)]	B255839	20.0	04/07/20
20D0289-05 [Comp-Field-3 (0-4)]	B255839	20.0	04/07/20
20D0289-06 [Comp-East-1 (0-2)]	B255839	20.0	04/07/20
20D0289-07 [Comp-East-2 (0-1)]	B255839	20.0	04/07/20
20D0289-08 [Comp-VT (0-2.5)]	B255839	20.0	04/07/20
20D0289-09 [Comp-LP (0-8)]	B255839	20.0	04/07/20
20D0289-10 [Comp-SW (0-7.5)]	B255839	20.0	04/07/20

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255863 - SW-846 5035

Blank (B255863-BLK1)

Prepared & Analyzed: 04/08/20

Acetone	ND	0.10	mg/Kg wet							
tert-Amyl Methyl Ether (TAME)	ND	0.0010	mg/Kg wet							
Benzene	ND	0.0020	mg/Kg wet							
Bromobenzene	ND	0.0020	mg/Kg wet							
Bromochloromethane	ND	0.0020	mg/Kg wet							
Bromodichloromethane	ND	0.0020	mg/Kg wet							
Bromoform	ND	0.0020	mg/Kg wet							
Bromomethane	ND	0.010	mg/Kg wet							V-34
2-Butanone (MEK)	ND	0.040	mg/Kg wet							
n-Butylbenzene	ND	0.0020	mg/Kg wet							
sec-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butyl Ethyl Ether (TBEE)	ND	0.0010	mg/Kg wet							
Carbon Disulfide	ND	0.0060	mg/Kg wet							
Carbon Tetrachloride	ND	0.0020	mg/Kg wet							
Chlorobenzene	ND	0.0020	mg/Kg wet							
Chlorodibromomethane	ND	0.0010	mg/Kg wet							
Chloroethane	ND	0.010	mg/Kg wet							
Chloroform	ND	0.0040	mg/Kg wet							
Chloromethane	ND	0.010	mg/Kg wet							
2-Chlorotoluene	ND	0.0020	mg/Kg wet							
4-Chlorotoluene	ND	0.0020	mg/Kg wet							
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0020	mg/Kg wet							V-05
1,2-Dibromoethane (EDB)	ND	0.0010	mg/Kg wet							
Dibromomethane	ND	0.0020	mg/Kg wet							
1,2-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,3-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,4-Dichlorobenzene	ND	0.0020	mg/Kg wet							
Dichlorodifluoromethane (Freon 12)	ND	0.010	mg/Kg wet							V-05
1,1-Dichloroethane	ND	0.0020	mg/Kg wet							
1,2-Dichloroethane	ND	0.0020	mg/Kg wet							
1,1-Dichloroethylene	ND	0.0040	mg/Kg wet							
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
1,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,3-Dichloropropane	ND	0.0010	mg/Kg wet							
2,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,1-Dichloropropene	ND	0.0020	mg/Kg wet							
cis-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
trans-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
Diethyl Ether	ND	0.010	mg/Kg wet							
Diisopropyl Ether (DIPE)	ND	0.0010	mg/Kg wet							
1,4-Dioxane	ND	0.10	mg/Kg wet							V-16
Ethylbenzene	ND	0.0020	mg/Kg wet							
Hexachlorobutadiene	ND	0.0020	mg/Kg wet							
2-Hexanone (MBK)	ND	0.020	mg/Kg wet							
Isopropylbenzene (Cumene)	ND	0.0020	mg/Kg wet							
p-Isopropyltoluene (p-Cymene)	ND	0.0020	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.0040	mg/Kg wet							
Methylene Chloride	ND	0.010	mg/Kg wet							
4-Methyl-2-pentanone (MIBK)	ND	0.020	mg/Kg wet							
Naphthalene	ND	0.0040	mg/Kg wet							

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255863 - SW-846 5035

Blank (B255863-BLK1)

Prepared & Analyzed: 04/08/20

n-Propylbenzene	ND	0.0020	mg/Kg wet							
Styrene	ND	0.0020	mg/Kg wet							
1,1,1,2-Tetrachloroethane	ND	0.0020	mg/Kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0010	mg/Kg wet							
Tetrachloroethylene	ND	0.0020	mg/Kg wet							
Tetrahydrofuran	ND	0.010	mg/Kg wet							
Toluene	ND	0.0020	mg/Kg wet							
1,2,3-Trichlorobenzene	ND	0.0020	mg/Kg wet							
1,2,4-Trichlorobenzene	ND	0.0020	mg/Kg wet							
1,1,1-Trichloroethane	ND	0.0020	mg/Kg wet							
1,1,2-Trichloroethane	ND	0.0020	mg/Kg wet							
Trichloroethylene	ND	0.0020	mg/Kg wet							
Trichlorofluoromethane (Freon 11)	ND	0.010	mg/Kg wet							
1,2,3-Trichloropropane	ND	0.0020	mg/Kg wet							
1,2,4-Trimethylbenzene	ND	0.0020	mg/Kg wet							
1,3,5-Trimethylbenzene	ND	0.0020	mg/Kg wet							
Vinyl Chloride	ND	0.010	mg/Kg wet							
m+p Xylene	ND	0.0040	mg/Kg wet							
o-Xylene	ND	0.0020	mg/Kg wet							
Surrogate: 1,2-Dichloroethane-d4	0.0496		mg/Kg wet	0.0500		99.2	70-130			
Surrogate: Toluene-d8	0.0498		mg/Kg wet	0.0500		99.5	70-130			
Surrogate: 4-Bromofluorobenzene	0.0495		mg/Kg wet	0.0500		99.1	70-130			

LCS (B255863-BS1)

Prepared & Analyzed: 04/08/20

Acetone	0.200	0.10	mg/Kg wet	0.200		100	40-160			†
tert-Amyl Methyl Ether (TAME)	0.0199	0.0010	mg/Kg wet	0.0200		99.5	70-130			
Benzene	0.0196	0.0020	mg/Kg wet	0.0200		98.1	70-130			
Bromobenzene	0.0187	0.0020	mg/Kg wet	0.0200		93.5	70-130			
Bromochloromethane	0.0222	0.0020	mg/Kg wet	0.0200		111	70-130			
Bromodichloromethane	0.0193	0.0020	mg/Kg wet	0.0200		96.5	70-130			
Bromoform	0.0182	0.0020	mg/Kg wet	0.0200		91.1	70-130			
Bromomethane	0.0180	0.010	mg/Kg wet	0.0200		89.8	40-160	V-34		†
2-Butanone (MEK)	0.210	0.040	mg/Kg wet	0.200		105	40-160			†
n-Butylbenzene	0.0182	0.0020	mg/Kg wet	0.0200		90.8	70-130			
sec-Butylbenzene	0.0190	0.0020	mg/Kg wet	0.0200		94.8	70-130			
tert-Butylbenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.6	70-130			
tert-Butyl Ethyl Ether (TBEE)	0.0205	0.0010	mg/Kg wet	0.0200		102	70-130			
Carbon Disulfide	0.194	0.0060	mg/Kg wet	0.200		97.0	70-130			
Carbon Tetrachloride	0.0171	0.0020	mg/Kg wet	0.0200		85.5	70-130			
Chlorobenzene	0.0188	0.0020	mg/Kg wet	0.0200		93.8	70-130			
Chlorodibromomethane	0.0194	0.0010	mg/Kg wet	0.0200		97.0	70-130			
Chloroethane	0.0185	0.010	mg/Kg wet	0.0200		92.3	70-130			
Chloroform	0.0195	0.0040	mg/Kg wet	0.0200		97.6	70-130			
Chloromethane	0.0167	0.010	mg/Kg wet	0.0200		83.7	40-160			†
2-Chlorotoluene	0.0188	0.0020	mg/Kg wet	0.0200		93.8	70-130			
4-Chlorotoluene	0.0187	0.0020	mg/Kg wet	0.0200		93.5	70-130			
1,2-Dibromo-3-chloropropane (DBCP)	0.0158	0.0020	mg/Kg wet	0.0200		78.9	70-130		V-05	
1,2-Dibromoethane (EDB)	0.0182	0.0010	mg/Kg wet	0.0200		91.2	70-130			
Dibromomethane	0.0183	0.0020	mg/Kg wet	0.0200		91.6	70-130			
1,2-Dichlorobenzene	0.0186	0.0020	mg/Kg wet	0.0200		92.8	70-130			
1,3-Dichlorobenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.7	70-130			
1,4-Dichlorobenzene	0.0180	0.0020	mg/Kg wet	0.0200		90.2	70-130			

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255863 - SW-846 5035</b>										
<b>LCS (B255863-BS1)</b>										
Prepared & Analyzed: 04/08/20										
Dichlorodifluoromethane (Freon 12)	0.0131	0.010	mg/Kg wet	0.0200		65.5	40-160			L-14, V-05 †
1,1-Dichloroethane	0.0201	0.0020	mg/Kg wet	0.0200		100	70-130			
1,2-Dichloroethane	0.0198	0.0020	mg/Kg wet	0.0200		99.2	70-130			
1,1-Dichloroethylene	0.0190	0.0040	mg/Kg wet	0.0200		94.9	70-130			
cis-1,2-Dichloroethylene	0.0201	0.0020	mg/Kg wet	0.0200		101	70-130			
trans-1,2-Dichloroethylene	0.0199	0.0020	mg/Kg wet	0.0200		99.7	70-130			
1,2-Dichloropropane	0.0202	0.0020	mg/Kg wet	0.0200		101	70-130			
1,3-Dichloropropane	0.0198	0.0010	mg/Kg wet	0.0200		98.8	70-130			
2,2-Dichloropropane	0.0169	0.0020	mg/Kg wet	0.0200		84.6	70-130			
1,1-Dichloropropene	0.0198	0.0020	mg/Kg wet	0.0200		99.2	70-130			
cis-1,3-Dichloropropene	0.0187	0.0010	mg/Kg wet	0.0200		93.4	70-130			
trans-1,3-Dichloropropene	0.0173	0.0010	mg/Kg wet	0.0200		86.6	70-130			
Diethyl Ether	0.0198	0.010	mg/Kg wet	0.0200		98.8	70-130			
Diisopropyl Ether (DIPE)	0.0225	0.0010	mg/Kg wet	0.0200		113	70-130			
1,4-Dioxane	0.220	0.10	mg/Kg wet	0.200		110	40-160			V-16 †
Ethylbenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.6	70-130			
Hexachlorobutadiene	0.0188	0.0020	mg/Kg wet	0.0200		93.8	70-130			
2-Hexanone (MBK)	0.205	0.020	mg/Kg wet	0.200		103	40-160			†
Isopropylbenzene (Cumene)	0.0187	0.0020	mg/Kg wet	0.0200		93.5	70-130			
p-Isopropyltoluene (p-Cymene)	0.0189	0.0020	mg/Kg wet	0.0200		94.4	70-130			
Methyl tert-Butyl Ether (MTBE)	0.0202	0.0040	mg/Kg wet	0.0200		101	70-130			
Methylene Chloride	0.0231	0.010	mg/Kg wet	0.0200		115	70-130			
4-Methyl-2-pentanone (MIBK)	0.215	0.020	mg/Kg wet	0.200		108	40-160			†
Naphthalene	0.0180	0.0040	mg/Kg wet	0.0200		90.1	70-130			
n-Propylbenzene	0.0189	0.0020	mg/Kg wet	0.0200		94.5	70-130			
Styrene	0.0190	0.0020	mg/Kg wet	0.0200		95.2	70-130			
1,1,1,2-Tetrachloroethane	0.0175	0.0020	mg/Kg wet	0.0200		87.7	70-130			
1,1,1,2,2-Tetrachloroethane	0.0187	0.0010	mg/Kg wet	0.0200		93.7	70-130			
Tetrachloroethylene	0.0201	0.0020	mg/Kg wet	0.0200		101	70-130			
Tetrahydrofuran	0.0198	0.010	mg/Kg wet	0.0200		99.0	70-130			
Toluene	0.0192	0.0020	mg/Kg wet	0.0200		96.2	70-130			
1,2,3-Trichlorobenzene	0.0188	0.0020	mg/Kg wet	0.0200		94.1	70-130			
1,2,4-Trichlorobenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.5	70-130			
1,1,1-Trichloroethane	0.0193	0.0020	mg/Kg wet	0.0200		96.3	70-130			
1,1,2-Trichloroethane	0.0202	0.0020	mg/Kg wet	0.0200		101	70-130			
Trichloroethylene	0.0191	0.0020	mg/Kg wet	0.0200		95.7	70-130			
Trichlorofluoromethane (Freon 11)	0.0173	0.010	mg/Kg wet	0.0200		86.3	70-130			
1,2,3-Trichloropropane	0.0185	0.0020	mg/Kg wet	0.0200		92.4	70-130			
1,2,4-Trimethylbenzene	0.0182	0.0020	mg/Kg wet	0.0200		90.8	70-130			
1,3,5-Trimethylbenzene	0.0194	0.0020	mg/Kg wet	0.0200		97.2	70-130			
Vinyl Chloride	0.0189	0.010	mg/Kg wet	0.0200		94.6	70-130			
m+p Xylene	0.0370	0.0040	mg/Kg wet	0.0400		92.5	70-130			
o-Xylene	0.0185	0.0020	mg/Kg wet	0.0200		92.7	70-130			
Surrogate: 1,2-Dichloroethane-d4	0.0498		mg/Kg wet	0.0500		99.6	70-130			
Surrogate: Toluene-d8	0.0508		mg/Kg wet	0.0500		102	70-130			
Surrogate: 4-Bromofluorobenzene	0.0507		mg/Kg wet	0.0500		101	70-130			

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255863 - SW-846 5035</b>										
<b>LCS Dup (B255863-BSD1)</b>										
Prepared & Analyzed: 04/08/20										
Acetone	0.198	0.10	mg/Kg wet	0.200		99.0	40-160	1.10	20	†
tert-Amyl Methyl Ether (TAME)	0.0193	0.0010	mg/Kg wet	0.0200		96.7	70-130	2.92	20	
Benzene	0.0196	0.0020	mg/Kg wet	0.0200		97.8	70-130	0.316	20	
Bromobenzene	0.0185	0.0020	mg/Kg wet	0.0200		92.5	70-130	1.01	20	
Bromochloromethane	0.0215	0.0020	mg/Kg wet	0.0200		107	70-130	3.28	20	
Bromodichloromethane	0.0188	0.0020	mg/Kg wet	0.0200		94.1	70-130	2.57	20	
Bromoform	0.0181	0.0020	mg/Kg wet	0.0200		90.6	70-130	0.540	20	
Bromomethane	0.0179	0.010	mg/Kg wet	0.0200		89.4	40-160	0.424	20	V-34 †
2-Butanone (MEK)	0.206	0.040	mg/Kg wet	0.200		103	40-160	1.62	20	†
n-Butylbenzene	0.0178	0.0020	mg/Kg wet	0.0200		88.9	70-130	2.07	20	
sec-Butylbenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.3	70-130	3.76	20	
tert-Butylbenzene	0.0184	0.0020	mg/Kg wet	0.0200		92.2	70-130	0.577	20	
tert-Butyl Ethyl Ether (TBEE)	0.0205	0.0010	mg/Kg wet	0.0200		102	70-130	0.0293	20	
Carbon Disulfide	0.191	0.0060	mg/Kg wet	0.200		95.5	70-130	1.60	20	
Carbon Tetrachloride	0.0170	0.0020	mg/Kg wet	0.0200		85.0	70-130	0.634	20	
Chlorobenzene	0.0182	0.0020	mg/Kg wet	0.0200		91.2	70-130	2.83	20	
Chlorodibromomethane	0.0197	0.0010	mg/Kg wet	0.0200		98.3	70-130	1.32	20	
Chloroethane	0.0185	0.010	mg/Kg wet	0.0200		92.6	70-130	0.314	20	
Chloroform	0.0193	0.0040	mg/Kg wet	0.0200		96.7	70-130	0.916	20	
Chloromethane	0.0168	0.010	mg/Kg wet	0.0200		84.0	40-160	0.334	20	†
2-Chlorotoluene	0.0186	0.0020	mg/Kg wet	0.0200		92.9	70-130	1.02	20	
4-Chlorotoluene	0.0184	0.0020	mg/Kg wet	0.0200		91.8	70-130	1.80	20	
1,2-Dibromo-3-chloropropane (DBCP)	0.0153	0.0020	mg/Kg wet	0.0200		76.4	70-130	3.17	20	V-05
1,2-Dibromoethane (EDB)	0.0184	0.0010	mg/Kg wet	0.0200		91.9	70-130	0.677	20	
Dibromomethane	0.0182	0.0020	mg/Kg wet	0.0200		91.0	70-130	0.701	20	
1,2-Dichlorobenzene	0.0179	0.0020	mg/Kg wet	0.0200		89.4	70-130	3.68	20	
1,3-Dichlorobenzene	0.0181	0.0020	mg/Kg wet	0.0200		90.7	70-130	1.14	20	
1,4-Dichlorobenzene	0.0177	0.0020	mg/Kg wet	0.0200		88.4	70-130	2.08	20	
Dichlorodifluoromethane (Freon 12)	0.0131	0.010	mg/Kg wet	0.0200		65.6	40-160	0.168	20	L-14, V-05 †
1,1-Dichloroethane	0.0206	0.0020	mg/Kg wet	0.0200		103	70-130	2.70	20	
1,2-Dichloroethane	0.0200	0.0020	mg/Kg wet	0.0200		99.8	70-130	0.583	20	
1,1-Dichloroethylene	0.0185	0.0040	mg/Kg wet	0.0200		92.6	70-130	2.37	20	
cis-1,2-Dichloroethylene	0.0200	0.0020	mg/Kg wet	0.0200		100	70-130	0.289	20	
trans-1,2-Dichloroethylene	0.0199	0.0020	mg/Kg wet	0.0200		99.5	70-130	0.151	20	
1,2-Dichloropropane	0.0196	0.0020	mg/Kg wet	0.0200		98.1	70-130	2.82	20	
1,3-Dichloropropane	0.0197	0.0010	mg/Kg wet	0.0200		98.3	70-130	0.507	20	
2,2-Dichloropropane	0.0168	0.0020	mg/Kg wet	0.0200		84.2	70-130	0.415	20	
1,1-Dichloropropene	0.0197	0.0020	mg/Kg wet	0.0200		98.5	70-130	0.718	20	
cis-1,3-Dichloropropene	0.0179	0.0010	mg/Kg wet	0.0200		89.7	70-130	3.97	20	
trans-1,3-Dichloropropene	0.0175	0.0010	mg/Kg wet	0.0200		87.5	70-130	1.07	20	
Diethyl Ether	0.0194	0.010	mg/Kg wet	0.0200		96.8	70-130	2.04	20	
Diisopropyl Ether (DIPE)	0.0221	0.0010	mg/Kg wet	0.0200		111	70-130	1.71	20	
1,4-Dioxane	0.220	0.10	mg/Kg wet	0.200		110	40-160	0.285	20	V-16 †
Ethylbenzene	0.0179	0.0020	mg/Kg wet	0.0200		89.4	70-130	2.44	20	
Hexachlorobutadiene	0.0182	0.0020	mg/Kg wet	0.0200		90.8	70-130	3.21	20	
2-Hexanone (MBK)	0.205	0.020	mg/Kg wet	0.200		102	40-160	0.106	20	†
Isopropylbenzene (Cumene)	0.0182	0.0020	mg/Kg wet	0.0200		91.1	70-130	2.60	20	
p-Isopropyltoluene (p-Cymene)	0.0182	0.0020	mg/Kg wet	0.0200		90.8	70-130	3.94	20	
Methyl tert-Butyl Ether (MTBE)	0.0196	0.0040	mg/Kg wet	0.0200		98.2	70-130	2.63	20	
Methylene Chloride	0.0226	0.010	mg/Kg wet	0.0200		113	70-130	2.09	20	
4-Methyl-2-pentanone (MIBK)	0.216	0.020	mg/Kg wet	0.200		108	40-160	0.413	20	†
Naphthalene	0.0177	0.0040	mg/Kg wet	0.0200		88.6	70-130	1.75	20	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255863 - SW-846 5035</b>										
<b>LCS Dup (B255863-BSD1)</b>										
Prepared & Analyzed: 04/08/20										
n-Propylbenzene	0.0182	0.0020	mg/Kg wet	0.0200		91.1	70-130	3.70	20	
Styrene	0.0185	0.0020	mg/Kg wet	0.0200		92.6	70-130	2.76	20	
1,1,1,2-Tetrachloroethane	0.0170	0.0020	mg/Kg wet	0.0200		84.8	70-130	3.31	20	
1,1,2,2-Tetrachloroethane	0.0184	0.0010	mg/Kg wet	0.0200		92.1	70-130	1.67	20	
Tetrachloroethylene	0.0198	0.0020	mg/Kg wet	0.0200		99.1	70-130	1.45	20	
Tetrahydrofuran	0.0180	0.010	mg/Kg wet	0.0200		89.8	70-130	9.77	20	
Toluene	0.0191	0.0020	mg/Kg wet	0.0200		95.4	70-130	0.793	20	
1,2,3-Trichlorobenzene	0.0178	0.0020	mg/Kg wet	0.0200		89.2	70-130	5.34	20	
1,2,4-Trichlorobenzene	0.0180	0.0020	mg/Kg wet	0.0200		89.8	70-130	1.81	20	
1,1,1-Trichloroethane	0.0189	0.0020	mg/Kg wet	0.0200		94.5	70-130	1.95	20	
1,1,2-Trichloroethane	0.0203	0.0020	mg/Kg wet	0.0200		102	70-130	0.652	20	
Trichloroethylene	0.0192	0.0020	mg/Kg wet	0.0200		96.2	70-130	0.500	20	
Trichlorofluoromethane (Freon 11)	0.0173	0.010	mg/Kg wet	0.0200		86.4	70-130	0.150	20	
1,2,3-Trichloropropane	0.0180	0.0020	mg/Kg wet	0.0200		90.2	70-130	2.44	20	
1,2,4-Trimethylbenzene	0.0178	0.0020	mg/Kg wet	0.0200		89.2	70-130	1.78	20	
1,3,5-Trimethylbenzene	0.0190	0.0020	mg/Kg wet	0.0200		95.1	70-130	2.21	20	
Vinyl Chloride	0.0184	0.010	mg/Kg wet	0.0200		91.9	70-130	2.92	20	
m+p Xylene	0.0368	0.0040	mg/Kg wet	0.0400		91.9	70-130	0.618	20	
o-Xylene	0.0181	0.0020	mg/Kg wet	0.0200		90.4	70-130	2.52	20	
Surrogate: 1,2-Dichloroethane-d4	0.0495		mg/Kg wet	0.0500		99.0	70-130			
Surrogate: Toluene-d8	0.0516		mg/Kg wet	0.0500		103	70-130			
Surrogate: 4-Bromofluorobenzene	0.0497		mg/Kg wet	0.0500		99.3	70-130			

NOT FOR BIDDING

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255868 - SW-846 3546

Blank (B255868-BLK1)

Prepared & Analyzed: 04/08/20

Acenaphthene	ND	0.17	mg/Kg wet							
Acenaphthylene	ND	0.17	mg/Kg wet							
Acetophenone	ND	0.34	mg/Kg wet							
Aniline	ND	0.34	mg/Kg wet							
Anthracene	ND	0.17	mg/Kg wet							
Benzo(a)anthracene	ND	0.17	mg/Kg wet							
Benzo(a)pyrene	ND	0.17	mg/Kg wet							
Benzo(b)fluoranthene	ND	0.17	mg/Kg wet							
Benzo(g,h,i)perylene	ND	0.17	mg/Kg wet							
Benzo(k)fluoranthene	ND	0.17	mg/Kg wet							
Bis(2-chloroethoxy)methane	ND	0.34	mg/Kg wet							
Bis(2-chloroethyl)ether	ND	0.34	mg/Kg wet							
Bis(2-chloroisopropyl)ether	ND	0.34	mg/Kg wet							
Bis(2-Ethylhexyl)phthalate	ND	0.34	mg/Kg wet							
4-Bromophenylphenylether	ND	0.34	mg/Kg wet							
Butylbenzylphthalate	ND	0.34	mg/Kg wet							
4-Chloroaniline	ND	0.66	mg/Kg wet							V-34
2-Chloronaphthalene	ND	0.34	mg/Kg wet							
2-Chlorophenol	ND	0.34	mg/Kg wet							
Chrysene	ND	0.17	mg/Kg wet							
Dibenz(a,h)anthracene	ND	0.17	mg/Kg wet							
Dibenzofuran	ND	0.34	mg/Kg wet							
Di-n-butylphthalate	ND	0.34	mg/Kg wet							
1,2-Dichlorobenzene	ND	0.34	mg/Kg wet							
1,3-Dichlorobenzene	ND	0.34	mg/Kg wet							
1,4-Dichlorobenzene	ND	0.34	mg/Kg wet							
3,3-Dichlorobenzidine	ND	0.17	mg/Kg wet							V-34
2,4-Dichlorophenol	ND	0.34	mg/Kg wet							
Diethylphthalate	ND	0.34	mg/Kg wet							
2,4-Dimethylphenol	ND	0.34	mg/Kg wet							
Dimethylphthalate	ND	0.34	mg/Kg wet							
2,4-Dinitrophenol	ND	0.66	mg/Kg wet							
2,4-Dinitrotoluene	ND	0.34	mg/Kg wet							
2,6-Dinitrotoluene	ND	0.34	mg/Kg wet							
Di-n-octylphthalate	ND	0.34	mg/Kg wet							
1,2-Diphenylhydrazine/Azobenzene	ND	0.34	mg/Kg wet							
Fluoranthene	ND	0.17	mg/Kg wet							
Fluorene	ND	0.17	mg/Kg wet							
Hexachlorobenzene	ND	0.34	mg/Kg wet							
Hexachlorobutadiene	ND	0.34	mg/Kg wet							
Hexachloroethane	ND	0.34	mg/Kg wet							
Indeno(1,2,3-cd)pyrene	ND	0.17	mg/Kg wet							
Isophorone	ND	0.34	mg/Kg wet							
2-Methylnaphthalene	ND	0.17	mg/Kg wet							
2-Methylphenol	ND	0.34	mg/Kg wet							
3/4-Methylphenol	ND	0.34	mg/Kg wet							
Naphthalene	ND	0.17	mg/Kg wet							
Nitrobenzene	ND	0.34	mg/Kg wet							
2-Nitrophenol	ND	0.34	mg/Kg wet							
4-Nitrophenol	ND	0.66	mg/Kg wet							
Pentachlorophenol	ND	0.34	mg/Kg wet							
Phenanthrene	ND	0.17	mg/Kg wet							

NOT FOR BIDDING

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255868 - SW-846 3546</b>										
<b>Blank (B255868-BLK1)</b>										
Prepared & Analyzed: 04/08/20										
Phenol	ND	0.34	mg/Kg wet							
Pyrene	ND	0.17	mg/Kg wet							
Pyridine	ND	0.34	mg/Kg wet							
1,2,4-Trichlorobenzene	ND	0.34	mg/Kg wet							
2,4,5-Trichlorophenol	ND	0.34	mg/Kg wet							
2,4,6-Trichlorophenol	ND	0.34	mg/Kg wet							
Surrogate: 2-Fluorophenol	5.18		mg/Kg wet	6.67		77.7	30-130			
Surrogate: Phenol-d6	5.50		mg/Kg wet	6.67		82.5	30-130			
Surrogate: Nitrobenzene-d5	2.34		mg/Kg wet	3.33		70.3	30-130			
Surrogate: 2-Fluorobiphenyl	2.97		mg/Kg wet	3.33		89.1	30-130			
Surrogate: 2,4,6-Tribromophenol	5.42		mg/Kg wet	6.67		81.3	30-130			
Surrogate: p-Terphenyl-d14	2.91		mg/Kg wet	3.33		87.3	30-130			
<b>LCS (B255868-BS1)</b>										
Prepared & Analyzed: 04/08/20										
Acenaphthene	1.23	0.17	mg/Kg wet	1.67		73.9	40-140			
Acenaphthylene	1.20	0.17	mg/Kg wet	1.67		72.0	40-140			
Acetophenone	1.24	0.34	mg/Kg wet	1.67		74.6	40-140			
Aniline	1.13	0.34	mg/Kg wet	1.67		68.0	40-140			
Anthracene	1.31	0.17	mg/Kg wet	1.67		78.8	40-140			
Benzo(a)anthracene	1.25	0.17	mg/Kg wet	1.67		74.8	40-140			
Benzo(a)pyrene	1.25	0.17	mg/Kg wet	1.67		75.1	40-140			
Benzo(b)fluoranthene	1.29	0.17	mg/Kg wet	1.67		77.4	40-140			
Benzo(g,h,i)perylene	1.44	0.17	mg/Kg wet	1.67		86.3	40-140			
Benzo(k)fluoranthene	1.28	0.17	mg/Kg wet	1.67		76.8	40-140			
Bis(2-chloroethoxy)methane	1.25	0.34	mg/Kg wet	1.67		74.8	40-140			
Bis(2-chloroethyl)ether	1.19	0.34	mg/Kg wet	1.67		71.5	40-140			
Bis(2-chloroisopropyl)ether	1.31	0.34	mg/Kg wet	1.67		78.5	40-140			
Bis(2-Ethylhexyl)phthalate	1.22	0.34	mg/Kg wet	1.67		72.9	40-140			
4-Bromophenylphenylether	1.25	0.34	mg/Kg wet	1.67		75.1	40-140			
Butylbenzylphthalate	1.21	0.34	mg/Kg wet	1.67		72.6	40-140			
4-Chloroaniline	0.763	0.66	mg/Kg wet	1.67		45.8	15-140			V-34 †
2-Chloronaphthalene	1.09	0.34	mg/Kg wet	1.67		65.4	40-140			
2-Chlorophenol	1.28	0.34	mg/Kg wet	1.67		76.6	30-130			
Chrysene	1.30	0.17	mg/Kg wet	1.67		77.8	40-140			
Dibenz(a,h)anthracene	1.42	0.17	mg/Kg wet	1.67		85.4	40-140			
Dibenzofuran	1.29	0.34	mg/Kg wet	1.67		77.2	40-140			
Di-n-butylphthalate	1.22	0.34	mg/Kg wet	1.67		73.0	40-140			
1,2-Dichlorobenzene	1.14	0.34	mg/Kg wet	1.67		68.2	40-140			
1,3-Dichlorobenzene	1.08	0.34	mg/Kg wet	1.67		65.0	40-140			
1,4-Dichlorobenzene	1.11	0.34	mg/Kg wet	1.67		66.6	40-140			
3,3-Dichlorobenzidine	0.673	0.17	mg/Kg wet	1.67		40.4	40-140			V-34
2,4-Dichlorophenol	1.28	0.34	mg/Kg wet	1.67		77.0	30-130			
Diethylphthalate	1.21	0.34	mg/Kg wet	1.67		72.5	40-140			
2,4-Dimethylphenol	1.26	0.34	mg/Kg wet	1.67		75.4	30-130			
Dimethylphthalate	1.24	0.34	mg/Kg wet	1.67		74.2	40-140			
2,4-Dinitrophenol	0.838	0.66	mg/Kg wet	1.67		50.3	15-140			†
2,4-Dinitrotoluene	1.28	0.34	mg/Kg wet	1.67		76.6	40-140			
2,6-Dinitrotoluene	1.27	0.34	mg/Kg wet	1.67		76.4	40-140			
Di-n-octylphthalate	1.14	0.34	mg/Kg wet	1.67		68.2	40-140			
1,2-Diphenylhydrazine/Azobenzene	1.33	0.34	mg/Kg wet	1.67		80.0	40-140			
Fluoranthene	1.25	0.17	mg/Kg wet	1.67		74.9	40-140			
Fluorene	1.30	0.17	mg/Kg wet	1.67		77.7	40-140			

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255868 - SW-846 3546

LCS (B255868-BS1)

Prepared & Analyzed: 04/08/20

Hexachlorobenzene	1.33	0.34	mg/Kg wet	1.67		79.7	40-140			
Hexachlorobutadiene	1.19	0.34	mg/Kg wet	1.67		71.4	40-140			
Hexachloroethane	1.12	0.34	mg/Kg wet	1.67		67.0	40-140			
Indeno(1,2,3-cd)pyrene	1.50	0.17	mg/Kg wet	1.67		90.2	40-140			
Isophorone	1.28	0.34	mg/Kg wet	1.67		77.0	40-140			
2-Methylnaphthalene	1.43	0.17	mg/Kg wet	1.67		85.9	40-140			
2-Methylphenol	1.27	0.34	mg/Kg wet	1.67		76.2	30-130			
3/4-Methylphenol	1.32	0.34	mg/Kg wet	1.67		79.2	30-130			
Naphthalene	1.26	0.17	mg/Kg wet	1.67		75.7	40-140			
Nitrobenzene	1.24	0.34	mg/Kg wet	1.67		74.2	40-140			
2-Nitrophenol	1.30	0.34	mg/Kg wet	1.67		78.0	30-130			
4-Nitrophenol	1.26	0.66	mg/Kg wet	1.67		75.7	15-140			†
Pentachlorophenol	1.03	0.34	mg/Kg wet	1.67		62.0	30-130			
Phenanthrene	1.32	0.17	mg/Kg wet	1.67		79.2	40-140			
Phenol	1.28	0.34	mg/Kg wet	1.67		76.6	15-140			†
Pyrene	1.35	0.17	mg/Kg wet	1.67		80.8	40-140			
Pyridine	0.739	0.34	mg/Kg wet	1.67		44.4	30-140			†
1,2,4-Trichlorobenzene	1.20	0.34	mg/Kg wet	1.67		72.0	40-140			
2,4,5-Trichlorophenol	1.24	0.34	mg/Kg wet	1.67		74.7	30-130			
2,4,6-Trichlorophenol	1.25	0.34	mg/Kg wet	1.67		75.2	30-130			
Surrogate: 2-Fluorophenol	5.40		mg/Kg wet	6.67		81.0	30-130			
Surrogate: Phenol-d6	5.68		mg/Kg wet	6.67		85.2	30-130			
Surrogate: Nitrobenzene-d5	2.48		mg/Kg wet	3.33		74.4	30-130			
Surrogate: 2-Fluorobiphenyl	3.15		mg/Kg wet	3.33		94.5	30-130			
Surrogate: 2,4,6-Tribromophenol	5.56		mg/Kg wet	6.67		83.4	30-130			
Surrogate: p-Terphenyl-d14	2.84		mg/Kg wet	3.33		85.1	30-130			

LCS Dup (B255868-BS1)

Prepared & Analyzed: 04/08/20

Acenaphthene	1.06	0.17	mg/Kg wet	1.67		63.8	40-140	14.7	30	
Acenaphthylene	1.04	0.17	mg/Kg wet	1.67		62.2	40-140	14.7	30	
Acetophenone	1.12	0.34	mg/Kg wet	1.67		67.0	40-140	10.8	30	
Aniline	1.17	0.34	mg/Kg wet	1.67		70.2	40-140	3.21	30	
Anthracene	1.16	0.17	mg/Kg wet	1.67		69.6	40-140	12.3	30	
Benzo(a)anthracene	1.09	0.17	mg/Kg wet	1.67		65.7	40-140	12.9	30	
Benzo(a)pyrene	1.11	0.17	mg/Kg wet	1.67		66.4	40-140	12.4	30	
Benzo(b)fluoranthene	1.13	0.17	mg/Kg wet	1.67		67.8	40-140	13.1	30	
Benzo(g,h,i)perylene	1.29	0.17	mg/Kg wet	1.67		77.3	40-140	11.0	30	
Benzo(k)fluoranthene	1.11	0.17	mg/Kg wet	1.67		66.9	40-140	13.8	30	
Bis(2-chloroethoxy)methane	1.08	0.34	mg/Kg wet	1.67		64.7	40-140	14.5	30	
Bis(2-chloroethyl)ether	1.12	0.34	mg/Kg wet	1.67		67.2	40-140	6.26	30	
Bis(2-chloroisopropyl)ether	1.23	0.34	mg/Kg wet	1.67		73.8	40-140	6.09	30	
Bis(2-Ethylhexyl)phthalate	1.09	0.34	mg/Kg wet	1.67		65.6	40-140	10.7	30	
4-Bromophenylphenylether	1.08	0.34	mg/Kg wet	1.67		65.0	40-140	14.4	30	
Butylbenzylphthalate	1.10	0.34	mg/Kg wet	1.67		65.7	40-140	9.92	30	
4-Chloroaniline	0.855	0.66	mg/Kg wet	1.67		51.3	15-140	11.5	30	V-34 †
2-Chloronaphthalene	0.947	0.34	mg/Kg wet	1.67		56.8	40-140	14.1	30	
2-Chlorophenol	1.10	0.34	mg/Kg wet	1.67		66.0	30-130	14.9	30	
Chrysene	1.14	0.17	mg/Kg wet	1.67		68.4	40-140	12.9	30	
Dibenz(a,h)anthracene	1.21	0.17	mg/Kg wet	1.67		72.3	40-140	16.5	30	
Dibenzofuran	1.11	0.34	mg/Kg wet	1.67		66.5	40-140	14.8	30	
Di-n-butylphthalate	1.09	0.34	mg/Kg wet	1.67		65.2	40-140	11.3	30	
1,2-Dichlorobenzene	1.06	0.34	mg/Kg wet	1.67		63.8	40-140	6.73	30	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255868 - SW-846 3546

LCS Dup (B255868-BSD1)

Prepared & Analyzed: 04/08/20

1,3-Dichlorobenzene	1.03	0.34	mg/Kg wet	1.67		61.9	40-140	4.92	30	
1,4-Dichlorobenzene	1.05	0.34	mg/Kg wet	1.67		63.0	40-140	5.46	30	
3,3-Dichlorobenzidine	0.757	0.17	mg/Kg wet	1.67		45.4	40-140	11.7	30	V-34
2,4-Dichlorophenol	1.07	0.34	mg/Kg wet	1.67		64.2	30-130	18.2	30	
Diethylphthalate	1.06	0.34	mg/Kg wet	1.67		63.5	40-140	13.2	30	
2,4-Dimethylphenol	1.06	0.34	mg/Kg wet	1.67		63.8	30-130	16.6	30	
Dimethylphthalate	1.08	0.34	mg/Kg wet	1.67		65.1	40-140	13.1	30	
2,4-Dinitrophenol	0.784	0.66	mg/Kg wet	1.67		47.0	15-140	6.70	30	†
2,4-Dinitrotoluene	1.11	0.34	mg/Kg wet	1.67		66.9	40-140	13.6	30	
2,6-Dinitrotoluene	1.13	0.34	mg/Kg wet	1.67		67.5	40-140	12.3	30	
Di-n-octylphthalate	1.02	0.34	mg/Kg wet	1.67		61.3	40-140	10.6	30	
1,2-Diphenylhydrazine/Azobenzene	1.21	0.34	mg/Kg wet	1.67		72.4	40-140	9.95	30	
Fluoranthene	1.11	0.17	mg/Kg wet	1.67		66.7	40-140	11.6	30	
Fluorene	1.12	0.17	mg/Kg wet	1.67		67.2	40-140	14.6	30	
Hexachlorobenzene	1.14	0.34	mg/Kg wet	1.67		68.7	40-140	14.9	30	
Hexachlorobutadiene	1.07	0.34	mg/Kg wet	1.67		64.1	40-140	10.7	30	
Hexachloroethane	1.07	0.34	mg/Kg wet	1.67		64.5	40-140	3.92	30	
Indeno(1,2,3-cd)pyrene	1.34	0.17	mg/Kg wet	1.67		80.2	40-140	11.7	30	
Isophorone	1.14	0.34	mg/Kg wet	1.67		68.2	40-140	12.1	30	
2-Methylnaphthalene	1.22	0.17	mg/Kg wet	1.67		72.9	40-140	16.3	30	
2-Methylphenol	1.10	0.34	mg/Kg wet	1.67		66.1	30-130	14.2	30	
3/4-Methylphenol	1.12	0.34	mg/Kg wet	1.67		67.3	30-130	16.2	30	
Naphthalene	1.13	0.17	mg/Kg wet	1.67		67.5	40-140	11.4	30	
Nitrobenzene	1.13	0.34	mg/Kg wet	1.67		67.6	40-140	9.34	30	
2-Nitrophenol	1.13	0.34	mg/Kg wet	1.67		67.7	30-130	14.2	30	
4-Nitrophenol	1.12	0.66	mg/Kg wet	1.67		66.9	15-140	12.3	30	†
Pentachlorophenol	0.870	0.34	mg/Kg wet	1.67		52.2	30-130	17.2	30	
Phenanthrene	1.16	0.17	mg/Kg wet	1.67		69.6	40-140	13.0	30	
Phenol	1.10	0.34	mg/Kg wet	1.67		66.0	15-140	14.8	30	†
Pyrene	1.18	0.17	mg/Kg wet	1.67		71.0	40-140	13.0	30	
Pyridine	0.703	0.34	mg/Kg wet	1.67		42.2	30-140	5.04	30	†
1,2,4-Trichlorobenzene	1.07	0.34	mg/Kg wet	1.67		64.3	40-140	11.3	30	
2,4,5-Trichlorophenol	1.06	0.34	mg/Kg wet	1.67		63.6	30-130	16.1	30	
2,4,6-Trichlorophenol	1.06	0.34	mg/Kg wet	1.67		63.8	30-130	16.3	30	
Surrogate: 2-Fluorophenol	4.76		mg/Kg wet	6.67		71.4	30-130			
Surrogate: Phenol-d6	4.87		mg/Kg wet	6.67		73.1	30-130			
Surrogate: Nitrobenzene-d5	2.22		mg/Kg wet	3.33		66.6	30-130			
Surrogate: 2-Fluorobiphenyl	2.65		mg/Kg wet	3.33		79.4	30-130			
Surrogate: 2,4,6-Tribromophenol	4.61		mg/Kg wet	6.67		69.2	30-130			
Surrogate: p-Terphenyl-d14	2.38		mg/Kg wet	3.33		71.4	30-130			

Matrix Spike (B255868-MS1)

Source: 20D0289-01

Prepared & Analyzed: 04/08/20

Acenaphthene	1.04	0.20	mg/Kg dry	1.97	ND	52.5	40-140			
Acenaphthylene	0.999	0.20	mg/Kg dry	1.97	ND	50.7	40-140			
Acetophenone	1.12	0.40	mg/Kg dry	1.97	ND	56.8	40-140			
Aniline	0.296	0.40	mg/Kg dry	1.97	ND	15.0 *	40-140			MS-09
Anthracene	1.03	0.20	mg/Kg dry	1.97	ND	52.4	40-140			
Benzo(a)anthracene	1.08	0.20	mg/Kg dry	1.97	0.166	46.2	40-140			
Benzo(a)pyrene	1.09	0.20	mg/Kg dry	1.97	0.173	46.5	40-140			
Benzo(b)fluoranthene	1.21	0.20	mg/Kg dry	1.97	0.218	50.6	40-140			
Benzo(g,h,i)perylene	1.28	0.20	mg/Kg dry	1.97	0.150	57.3	40-140			
Benzo(k)fluoranthene	1.11	0.20	mg/Kg dry	1.97	ND	56.1	40-140			

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255868 - SW-846 3546</b>										
<b>Matrix Spike (B255868-MS1)</b>	<b>Source: 20D0289-01</b>			<b>Prepared &amp; Analyzed: 04/08/20</b>						
Bis(2-chloroethoxy)methane	1.09	0.40	mg/Kg dry	1.97	ND	55.3	40-140			
Bis(2-chloroethyl)ether	1.13	0.40	mg/Kg dry	1.97	ND	57.3	40-140			
Bis(2-chloroisopropyl)ether	1.21	0.40	mg/Kg dry	1.97	ND	61.2	40-140			
Bis(2-Ethylhexyl)phthalate	1.21	0.40	mg/Kg dry	1.97	0.292	46.6	40-140			
4-Bromophenylphenylether	0.983	0.40	mg/Kg dry	1.97	ND	49.9	40-140			
Butylbenzylphthalate	0.955	0.40	mg/Kg dry	1.97	ND	48.4	40-140			
<b>4-Chloroaniline</b>	0.488	0.78	mg/Kg dry	1.97	ND	<b>24.8</b>	40-140	*		MS-09, V-34
2-Chloronaphthalene	0.957	0.40	mg/Kg dry	1.97	ND	48.5	40-140			
2-Chlorophenol	1.11	0.40	mg/Kg dry	1.97	ND	56.1	30-130			
Chrysene	1.12	0.20	mg/Kg dry	1.97	0.176	47.8	40-140			
Dibenz(a,h)anthracene	1.07	0.20	mg/Kg dry	1.97	ND	54.2	40-140			
Dibenzofuran	1.04	0.40	mg/Kg dry	1.97	ND	52.8	40-140			
Di-n-butylphthalate	0.951	0.40	mg/Kg dry	1.97	ND	48.3	40-140			
1,2-Dichlorobenzene	1.04	0.40	mg/Kg dry	1.97	ND	52.8	40-140			
1,3-Dichlorobenzene	1.00	0.40	mg/Kg dry	1.97	ND	51.0	40-140			
1,4-Dichlorobenzene	1.03	0.40	mg/Kg dry	1.97	ND	52.2	40-140			
<b>3,3-Dichlorobenzidine</b>	0.0879	0.20	mg/Kg dry	1.97	ND	<b>4.46</b>	40-140	*		MS-09, V-34
2,4-Dichlorophenol	1.02	0.40	mg/Kg dry	1.97	ND	51.8	30-130			
Diethylphthalate	0.943	0.40	mg/Kg dry	1.97	ND	47.8	40-140			
2,4-Dimethylphenol	0.988	0.40	mg/Kg dry	1.97	ND	50.1	30-130			
Dimethylphthalate	0.992	0.40	mg/Kg dry	1.97	ND	50.3	40-140			
2,4-Dinitrophenol	0.909	0.78	mg/Kg dry	1.97	ND	46.1	30-130			
2,4-Dinitrotoluene	0.966	0.40	mg/Kg dry	1.97	ND	49.0	40-140			
2,6-Dinitrotoluene	1.01	0.40	mg/Kg dry	1.97	ND	51.3	40-140			
Di-n-octylphthalate	1.10	0.40	mg/Kg dry	1.97	ND	56.0	40-140			
1,2-Diphenylhydrazine/Azobenzene	1.10	0.40	mg/Kg dry	1.97	ND	55.7	40-140			
Fluoranthene	1.23	0.20	mg/Kg dry	1.97	0.313	46.7	40-140			
Fluorene	1.02	0.20	mg/Kg dry	1.97	ND	52.0	40-140			
Hexachlorobenzene	1.00	0.40	mg/Kg dry	1.97	ND	51.0	40-140			
Hexachlorobutadiene	1.05	0.40	mg/Kg dry	1.97	ND	53.1	40-140			
Hexachloroethane	1.02	0.40	mg/Kg dry	1.97	ND	51.8	40-140			
Indeno(1,2,3-cd)pyrene	1.31	0.20	mg/Kg dry	1.97	0.160	58.5	40-140			
Isophorone	1.12	0.40	mg/Kg dry	1.97	ND	56.7	40-140			
2-Methylnaphthalene	1.21	0.20	mg/Kg dry	1.97	ND	61.6	40-140			
2-Methylphenol	1.08	0.40	mg/Kg dry	1.97	ND	54.9	30-130			
3/4-Methylphenol	1.11	0.40	mg/Kg dry	1.97	ND	56.3	30-130			
Naphthalene	1.13	0.20	mg/Kg dry	1.97	ND	57.1	40-140			
Nitrobenzene	1.12	0.40	mg/Kg dry	1.97	ND	56.7	40-140			
2-Nitrophenol	1.13	0.40	mg/Kg dry	1.97	ND	57.3	30-130			
4-Nitrophenol	0.950	0.78	mg/Kg dry	1.97	ND	48.2	30-130			
Pentachlorophenol	0.816	0.40	mg/Kg dry	1.97	ND	41.4	30-130			
Phenanthrene	1.13	0.20	mg/Kg dry	1.97	0.135	50.6	40-140			
Phenol	1.12	0.40	mg/Kg dry	1.97	ND	56.8	30-130			
Pyrene	1.24	0.20	mg/Kg dry	1.97	0.359	44.7	40-140			
<b>Pyridine</b>	0.563	0.40	mg/Kg dry	1.97	ND	<b>28.6</b>	40-140	*		MS-09
1,2,4-Trichlorobenzene	1.05	0.40	mg/Kg dry	1.97	ND	53.3	40-140			
2,4,5-Trichlorophenol	0.921	0.40	mg/Kg dry	1.97	ND	46.7	30-130			
2,4,6-Trichlorophenol	0.978	0.40	mg/Kg dry	1.97	ND	49.6	30-130			
Surrogate: 2-Fluorophenol	4.71		mg/Kg dry	7.88		59.7	30-130			
Surrogate: Phenol-d6	4.91		mg/Kg dry	7.88		62.3	30-130			
Surrogate: Nitrobenzene-d5	2.17		mg/Kg dry	3.94		55.1	30-130			
Surrogate: 2-Fluorobiphenyl	2.64		mg/Kg dry	3.94		66.9	30-130			

NOT FOR BIDDING

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255868 - SW-846 3546</b>										
<b>Matrix Spike (B255868-MS1)</b>		<b>Source: 20D0289-01</b>			Prepared & Analyzed: 04/08/20					
Surrogate: 2,4,6-Tribromophenol	3.80		mg/Kg dry	7.88		48.2	30-130			
Surrogate: p-Terphenyl-d14	2.00		mg/Kg dry	3.94		50.7	30-130			
<b>Matrix Spike Dup (B255868-MSD1)</b>		<b>Source: 20D0289-01</b>			Prepared: 04/08/20 Analyzed: 04/09/20					
Acenaphthene	0.915	0.20	mg/Kg dry	1.97	ND	46.4	40-140	12.4	30	
Acenaphthylene	0.871	0.20	mg/Kg dry	1.97	ND	44.2	40-140	13.6	30	
Acetophenone	0.998	0.40	mg/Kg dry	1.97	ND	50.7	40-140	11.4	30	
<b>Aniline</b>	0.348	0.40	mg/Kg dry	1.97	ND	17.7	* 40-140	16.2	30	MS-09
Anthracene	0.936	0.20	mg/Kg dry	1.97	ND	47.5	40-140	9.81	30	
Benzo(a)anthracene	0.990	0.20	mg/Kg dry	1.97	0.166	41.9	40-140	8.31	30	
Benzo(a)pyrene	1.00	0.20	mg/Kg dry	1.97	0.173	42.1	40-140	8.21	30	
Benzo(b)fluoranthene	1.07	0.20	mg/Kg dry	1.97	0.218	43.4	40-140	12.3	30	
Benzo(g,h,i)perylene	1.30	0.20	mg/Kg dry	1.97	0.150	58.2	40-140	1.35	30	
Benzo(k)fluoranthene	0.977	0.20	mg/Kg dry	1.97	ND	49.6	40-140	12.3	30	
Bis(2-chloroethoxy)methane	0.985	0.40	mg/Kg dry	1.97	ND	50.0	40-140	10.1	30	
Bis(2-chloroethyl)ether	1.04	0.40	mg/Kg dry	1.97	ND	52.6	40-140	8.52	30	
Bis(2-chloroisopropyl)ether	1.11	0.40	mg/Kg dry	1.97	ND	56.5	40-140	8.05	30	
Bis(2-Ethylhexyl)phthalate	1.10	0.40	mg/Kg dry	1.97	0.292	41.0	40-140	9.62	30	
4-Bromophenylphenylether	0.874	0.40	mg/Kg dry	1.97	ND	44.4	40-140	11.7	30	
Butylbenzylphthalate	0.900	0.40	mg/Kg dry	1.97	ND	45.7	40-140	5.91	30	
<b>4-Chloroaniline</b>	0.482	0.78	mg/Kg dry	1.97	ND	24.5	* 40-140	1.22	30	MS-09, V-34
2-Chloronaphthalene	0.848	0.40	mg/Kg dry	1.97	ND	43.0	40-140	12.0	30	
2-Chlorophenol	0.972	0.40	mg/Kg dry	1.97	ND	49.3	30-130	12.8	30	
Chrysene	1.04	0.20	mg/Kg dry	1.97	0.176	43.7	40-140	7.46	30	
Dibenz(a,h)anthracene	1.08	0.20	mg/Kg dry	1.97	ND	54.7	40-140	1.03	30	
Dibenzofuran	0.917	0.40	mg/Kg dry	1.97	ND	46.5	40-140	12.6	30	
Di-n-butylphthalate	0.880	0.40	mg/Kg dry	1.97	ND	44.7	40-140	7.79	30	
1,2-Dichlorobenzene	0.940	0.40	mg/Kg dry	1.97	ND	47.7	40-140	10.2	30	
1,3-Dichlorobenzene	0.911	0.40	mg/Kg dry	1.97	ND	46.2	40-140	9.71	30	
1,4-Dichlorobenzene	0.935	0.40	mg/Kg dry	1.97	ND	47.4	40-140	9.52	30	
<b>3,3-Dichlorobenzidine</b>	0.0997	0.20	mg/Kg dry	1.97	ND	5.06	* 40-140		30	MS-09, V-34
2,4-Dichlorophenol	0.905	0.40	mg/Kg dry	1.97	ND	45.9	30-130	12.0	30	
Diethylphthalate	0.843	0.40	mg/Kg dry	1.97	ND	42.8	40-140	11.1	30	
2,4-Dimethylphenol	0.895	0.40	mg/Kg dry	1.97	ND	45.4	30-130	9.79	30	
Dimethylphthalate	0.884	0.40	mg/Kg dry	1.97	ND	44.8	40-140	11.6	30	
2,4-Dinitrophenol	0.838	0.78	mg/Kg dry	1.97	ND	42.5	30-130	8.21	30	
2,4-Dinitrotoluene	0.851	0.40	mg/Kg dry	1.97	ND	43.2	40-140	12.6	30	
2,6-Dinitrotoluene	0.888	0.40	mg/Kg dry	1.97	ND	45.1	40-140	12.9	30	
Di-n-octylphthalate	0.977	0.40	mg/Kg dry	1.97	ND	49.6	40-140	12.2	30	
1,2-Diphenylhydrazine/Azobenzene	1.01	0.40	mg/Kg dry	1.97	ND	51.0	40-140	8.81	30	
Fluoranthene	1.18	0.20	mg/Kg dry	1.97	0.313	44.2	40-140	4.08	30	
Fluorene	0.908	0.20	mg/Kg dry	1.97	ND	46.1	40-140	12.0	30	
Hexachlorobenzene	0.893	0.40	mg/Kg dry	1.97	ND	45.3	40-140	11.8	30	
Hexachlorobutadiene	0.963	0.40	mg/Kg dry	1.97	ND	48.9	40-140	8.28	30	
Hexachloroethane	0.947	0.40	mg/Kg dry	1.97	ND	48.1	40-140	7.49	30	
Indeno(1,2,3-cd)pyrene	1.31	0.20	mg/Kg dry	1.97	0.160	58.6	40-140	0.150	30	
Isophorone	1.02	0.40	mg/Kg dry	1.97	ND	51.6	40-140	9.57	30	
2-Methylnaphthalene	1.08	0.20	mg/Kg dry	1.97	ND	54.6	40-140	12.0	30	
2-Methylphenol	0.948	0.40	mg/Kg dry	1.97	ND	48.1	30-130	13.3	30	
3/4-Methylphenol	0.948	0.40	mg/Kg dry	1.97	ND	48.1	30-130	15.7	30	
Naphthalene	1.02	0.20	mg/Kg dry	1.97	ND	51.7	40-140	10.0	30	
Nitrobenzene	1.03	0.40	mg/Kg dry	1.97	ND	52.0	40-140	8.68	30	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Semivolatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255868 - SW-846 3546</b>										
<b>Matrix Spike Dup (B255868-MSD1)</b>	<b>Source: 20D0289-01</b>			Prepared: 04/08/20 Analyzed: 04/09/20						
2-Nitrophenol	1.01	0.40	mg/Kg dry	1.97	ND	51.2	30-130	11.2	30	
4-Nitrophenol	0.866	0.78	mg/Kg dry	1.97	ND	43.9	30-130	9.29	30	
Pentachlorophenol	0.756	0.40	mg/Kg dry	1.97	ND	38.3	30-130	7.72	30	
Phenanthrene	1.04	0.20	mg/Kg dry	1.97	0.135	45.8	40-140	8.72	30	
Phenol	0.985	0.40	mg/Kg dry	1.97	ND	50.0	30-130	12.8	30	
Pyrene	1.21	0.20	mg/Kg dry	1.97	0.359	43.0	40-140	2.71	30	
<b>Pyridine</b>	0.561	0.40	mg/Kg dry	1.97	ND	<b>28.5 *</b>	40-140	<b>0.281</b>	30	MS-09
1,2,4-Trichlorobenzene	0.952	0.40	mg/Kg dry	1.97	ND	48.3	40-140	9.92	30	
2,4,5-Trichlorophenol	0.831	0.40	mg/Kg dry	1.97	ND	42.2	30-130	10.3	30	
2,4,6-Trichlorophenol	0.862	0.40	mg/Kg dry	1.97	ND	43.7	30-130	12.6	30	
Surrogate: 2-Fluorophenol	4.12		mg/Kg dry	7.88		52.3	30-130			
Surrogate: Phenol-d6	4.25		mg/Kg dry	7.88		53.9	30-130			
Surrogate: Nitrobenzene-d5	1.97		mg/Kg dry	3.94		50.0	30-130			
Surrogate: 2-Fluorobiphenyl	2.31		mg/Kg dry	3.94		58.6	30-130			
Surrogate: 2,4,6-Tribromophenol	3.32		mg/Kg dry	7.88		42.1	30-130			
Surrogate: p-Terphenyl-d14	1.83		mg/Kg dry	3.94		46.5	30-130			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Organochloride Pesticides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255866 - SW-846 3546

Blank (B255866-BLK1)

Prepared: 04/08/20 Analyzed: 04/10/20

Aldrin	ND	0.0050	mg/Kg wet							
Aldrin [2C]	ND	0.0050	mg/Kg wet							
alpha-BHC	ND	0.0050	mg/Kg wet							
alpha-BHC [2C]	ND	0.0050	mg/Kg wet							
beta-BHC	ND	0.0050	mg/Kg wet							
beta-BHC [2C]	ND	0.0050	mg/Kg wet							
delta-BHC	ND	0.0050	mg/Kg wet							
delta-BHC [2C]	ND	0.0050	mg/Kg wet							
gamma-BHC (Lindane)	ND	0.0020	mg/Kg wet							
gamma-BHC (Lindane) [2C]	ND	0.0020	mg/Kg wet							
Chlordane	ND	0.020	mg/Kg wet							
Chlordane [2C]	ND	0.020	mg/Kg wet							
4,4'-DDD	ND	0.0040	mg/Kg wet							
4,4'-DDD [2C]	ND	0.0040	mg/Kg wet							
4,4'-DDE	ND	0.0040	mg/Kg wet							
4,4'-DDE [2C]	ND	0.0040	mg/Kg wet							
4,4'-DDT	ND	0.0040	mg/Kg wet							
4,4'-DDT [2C]	ND	0.0040	mg/Kg wet							
Dieldrin	ND	0.0040	mg/Kg wet							
Dieldrin [2C]	ND	0.0040	mg/Kg wet							
Endosulfan I	ND	0.0050	mg/Kg wet							
Endosulfan I [2C]	ND	0.0050	mg/Kg wet							
Endosulfan II	ND	0.0080	mg/Kg wet							
Endosulfan II [2C]	ND	0.0080	mg/Kg wet							
Endosulfan Sulfate	ND	0.0080	mg/Kg wet							
Endosulfan Sulfate [2C]	ND	0.0080	mg/Kg wet							
Endrin	ND	0.0080	mg/Kg wet							
Endrin [2C]	ND	0.0080	mg/Kg wet							
Endrin Aldehyde	ND	0.0080	mg/Kg wet							
Endrin Aldehyde [2C]	ND	0.0080	mg/Kg wet							
Endrin Ketone	ND	0.0080	mg/Kg wet							
Endrin Ketone [2C]	ND	0.0080	mg/Kg wet							
Heptachlor	ND	0.0050	mg/Kg wet							
Heptachlor [2C]	ND	0.0050	mg/Kg wet							
Heptachlor Epoxide	ND	0.0050	mg/Kg wet							
Heptachlor Epoxide [2C]	ND	0.0050	mg/Kg wet							
Hexachlorobenzene	ND	0.0060	mg/Kg wet							
Hexachlorobenzene [2C]	ND	0.0060	mg/Kg wet							
Methoxychlor	ND	0.050	mg/Kg wet							
Methoxychlor [2C]	ND	0.050	mg/Kg wet							
Toxaphene	ND	0.10	mg/Kg wet							
Toxaphene [2C]	ND	0.10	mg/Kg wet							
Surrogate: Decachlorobiphenyl	0.176		mg/Kg wet	0.200		88.2	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.181		mg/Kg wet	0.200		90.5	30-150			
Surrogate: Tetrachloro-m-xylene	0.172		mg/Kg wet	0.200		85.8	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.151		mg/Kg wet	0.200		75.6	30-150			

NOT FOR BIDDING

QUALITY CONTROL

Organochloride Pesticides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255866 - SW-846 3546

LCS (B255866-BS1)

Prepared: 04/08/20 Analyzed: 04/10/20

Aldrin	0.086	0.0050	mg/Kg wet	0.100		86.0	40-140			
Aldrin [2C]	0.090	0.0050	mg/Kg wet	0.100		89.6	40-140			
alpha-BHC	0.075	0.0050	mg/Kg wet	0.100		75.2	40-140			
alpha-BHC [2C]	0.095	0.0050	mg/Kg wet	0.100		94.7	40-140			
beta-BHC	0.082	0.0050	mg/Kg wet	0.100		82.5	40-140			
beta-BHC [2C]	0.083	0.0050	mg/Kg wet	0.100		82.8	40-140			
delta-BHC	0.074	0.0050	mg/Kg wet	0.100		73.7	40-140			
delta-BHC [2C]	0.079	0.0050	mg/Kg wet	0.100		79.5	40-140			
gamma-BHC (Lindane)	0.079	0.0020	mg/Kg wet	0.100		78.7	40-140			
gamma-BHC (Lindane) [2C]	0.093	0.0020	mg/Kg wet	0.100		93.2	40-140			
4,4'-DDD	0.091	0.0040	mg/Kg wet	0.100		90.9	40-140			
4,4'-DDD [2C]	0.091	0.0040	mg/Kg wet	0.100		91.1	40-140			
4,4'-DDE	0.093	0.0040	mg/Kg wet	0.100		92.7	40-140			
4,4'-DDE [2C]	0.095	0.0040	mg/Kg wet	0.100		94.6	40-140			
4,4'-DDT	0.096	0.0040	mg/Kg wet	0.100		96.0	40-140			
4,4'-DDT [2C]	0.070	0.0040	mg/Kg wet	0.100		70.4	40-140			
Dieldrin	0.089	0.0040	mg/Kg wet	0.100		88.7	40-140			
Dieldrin [2C]	0.087	0.0040	mg/Kg wet	0.100		86.9	40-140			
Endosulfan I	0.088	0.0050	mg/Kg wet	0.100		88.5	40-140			
Endosulfan I [2C]	0.089	0.0050	mg/Kg wet	0.100		89.0	40-140			
Endosulfan II	0.091	0.0080	mg/Kg wet	0.100		90.8	40-140			
Endosulfan II [2C]	0.090	0.0080	mg/Kg wet	0.100		90.4	40-140			
Endosulfan Sulfate	0.084	0.0080	mg/Kg wet	0.100		83.7	40-140			
Endosulfan Sulfate [2C]	0.087	0.0080	mg/Kg wet	0.100		86.9	40-140			
Endrin	0.091	0.0080	mg/Kg wet	0.100		91.2	40-140			
Endrin [2C]	0.089	0.0080	mg/Kg wet	0.100		89.1	40-140			
Endrin Ketone	0.092	0.0080	mg/Kg wet	0.100		92.4	40-140			
Endrin Ketone [2C]	0.087	0.0080	mg/Kg wet	0.100		87.0	40-140			
Heptachlor	0.061	0.0050	mg/Kg wet	0.100		60.8	40-140			
Heptachlor [2C]	0.086	0.0050	mg/Kg wet	0.100		85.7	40-140			
Heptachlor Epoxide	0.086	0.0050	mg/Kg wet	0.100		85.8	40-140			
Heptachlor Epoxide [2C]	0.084	0.0050	mg/Kg wet	0.100		84.1	40-140			
Hexachlorobenzene	0.086	0.0060	mg/Kg wet	0.100		86.3	40-140			
Hexachlorobenzene [2C]	0.090	0.0060	mg/Kg wet	0.100		90.1	40-140			
Methoxychlor	0.092	0.050	mg/Kg wet	0.100		92.1	40-140			
Methoxychlor [2C]	0.089	0.050	mg/Kg wet	0.100		88.7	40-140			
Surrogate: Decachlorobiphenyl	0.171		mg/Kg wet	0.200		85.4	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.178		mg/Kg wet	0.200		89.2	30-150			
Surrogate: Tetrachloro-m-xylene	0.161		mg/Kg wet	0.200		80.3	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.158		mg/Kg wet	0.200		78.9	30-150			

LCS Dup (B255866-BS1)

Prepared: 04/08/20 Analyzed: 04/10/20

Aldrin	0.088	0.0050	mg/Kg wet	0.100		87.7	40-140	2.06	30	
Aldrin [2C]	0.090	0.0050	mg/Kg wet	0.100		89.8	40-140	0.295	30	
alpha-BHC	0.079	0.0050	mg/Kg wet	0.100		79.1	40-140	5.12	30	
alpha-BHC [2C]	0.094	0.0050	mg/Kg wet	0.100		93.8	40-140	0.910	30	
beta-BHC	0.086	0.0050	mg/Kg wet	0.100		86.1	40-140	4.29	30	
beta-BHC [2C]	0.086	0.0050	mg/Kg wet	0.100		86.0	40-140	3.80	30	
delta-BHC	0.077	0.0050	mg/Kg wet	0.100		77.4	40-140	4.84	30	
delta-BHC [2C]	0.081	0.0050	mg/Kg wet	0.100		81.0	40-140	1.91	30	
gamma-BHC (Lindane)	0.082	0.0020	mg/Kg wet	0.100		82.1	40-140	4.19	30	
gamma-BHC (Lindane) [2C]	0.093	0.0020	mg/Kg wet	0.100		93.0	40-140	0.145	30	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Organochloride Pesticides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255866 - SW-846 3546</b>										
<b>LCS Dup (B255866-BSD1)</b>										
					Prepared: 04/08/20 Analyzed: 04/10/20					
4,4'-DDD	0.092	0.0040	mg/Kg wet	0.100		92.2	40-140	1.40	30	
4,4'-DDD [2C]	0.092	0.0040	mg/Kg wet	0.100		92.2	40-140	1.24	30	
4,4'-DDE	0.093	0.0040	mg/Kg wet	0.100		93.5	40-140	0.829	30	
4,4'-DDE [2C]	0.096	0.0040	mg/Kg wet	0.100		95.8	40-140	1.26	30	
4,4'-DDT	0.097	0.0040	mg/Kg wet	0.100		96.7	40-140	0.720	30	
4,4'-DDT [2C]	0.071	0.0040	mg/Kg wet	0.100		71.4	40-140	1.49	30	
Dieldrin	0.090	0.0040	mg/Kg wet	0.100		90.0	40-140	1.35	30	
Dieldrin [2C]	0.088	0.0040	mg/Kg wet	0.100		88.1	40-140	1.31	30	
Endosulfan I	0.090	0.0050	mg/Kg wet	0.100		90.3	40-140	2.08	30	
Endosulfan I [2C]	0.090	0.0050	mg/Kg wet	0.100		90.3	40-140	1.43	30	
Endosulfan II	0.092	0.0080	mg/Kg wet	0.100		92.0	40-140	1.36	30	
Endosulfan II [2C]	0.092	0.0080	mg/Kg wet	0.100		91.6	40-140	1.31	30	
Endosulfan Sulfate	0.085	0.0080	mg/Kg wet	0.100		84.8	40-140	1.31	30	
Endosulfan Sulfate [2C]	0.088	0.0080	mg/Kg wet	0.100		88.4	40-140	1.72	30	
Endrin	0.092	0.0080	mg/Kg wet	0.100		92.4	40-140	1.33	30	
Endrin [2C]	0.090	0.0080	mg/Kg wet	0.100		90.5	40-140	1.56	30	
Endrin Ketone	0.095	0.0080	mg/Kg wet	0.100		95.5	40-140	3.25	30	
Endrin Ketone [2C]	0.089	0.0080	mg/Kg wet	0.100		88.8	40-140	2.11	30	
Heptachlor	0.063	0.0050	mg/Kg wet	0.100		62.5	40-140	2.76	30	
Heptachlor [2C]	0.086	0.0050	mg/Kg wet	0.100		86.0	40-140	0.318	30	
Heptachlor Epoxide	0.087	0.0050	mg/Kg wet	0.100		87.0	40-140	1.31	30	
Heptachlor Epoxide [2C]	0.085	0.0050	mg/Kg wet	0.100		85.5	40-140	1.63	30	
Hexachlorobenzene	0.088	0.0060	mg/Kg wet	0.100		88.3	40-140	2.31	30	
Hexachlorobenzene [2C]	0.089	0.0060	mg/Kg wet	0.100		88.6	40-140	1.73	30	
Methoxychlor	0.093	0.050	mg/Kg wet	0.100		93.3	40-140	1.27	30	
Methoxychlor [2C]	0.090	0.050	mg/Kg wet	0.100		90.3	40-140	1.75	30	
Surrogate: Decachlorobiphenyl	0.171		mg/Kg wet	0.200		85.7	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.179		mg/Kg wet	0.200		89.7	30-150			
Surrogate: Tetrachloro-m-xylene	0.163		mg/Kg wet	0.200		81.6	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.155		mg/Kg wet	0.200		77.3	30-150			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**QUALITY CONTROL**

**Herbicides by GC/ECD - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B256076 - SW-846 8151</b>										
<b>Blank (B256076-BLK1)</b>										
Prepared: 04/13/20 Analyzed: 04/15/20										
2,4-D	ND	24	µg/kg wet							
2,4-D [2C]	ND	24	µg/kg wet							
2,4-DB	ND	24	µg/kg wet							
2,4-DB [2C]	ND	24	µg/kg wet							
2,4,5-TP (Silvex)	ND	2.4	µg/kg wet							
2,4,5-TP (Silvex) [2C]	ND	2.4	µg/kg wet							
2,4,5-T	ND	2.4	µg/kg wet							
2,4,5-T [2C]	ND	2.4	µg/kg wet							
Dalapon	ND	60	µg/kg wet							
Dalapon [2C]	ND	60	µg/kg wet							
Dicamba	ND	2.4	µg/kg wet							
Dicamba [2C]	ND	2.4	µg/kg wet							
Dichloroprop	ND	24	µg/kg wet							
Dichloroprop [2C]	ND	24	µg/kg wet							
Dinoseb	ND	12	µg/kg wet							V-20
Dinoseb [2C]	ND	12	µg/kg wet							V-20
MCPA	ND	2400	µg/kg wet							
MCPA [2C]	ND	2400	µg/kg wet							
MCPA	ND	2400	µg/kg wet							
MCPA [2C]	ND	2400	µg/kg wet							
Surrogate: 2,4-Dichlorophenylacetic acid	69.7		µg/kg wet	95.2		73.1	30-150			
Surrogate: 2,4-Dichlorophenylacetic acid [2C]	73.1		µg/kg wet	95.2		76.7	30-150			
<b>LCS (B256076-BS1)</b>										
Prepared: 04/13/20 Analyzed: 04/15/20										
2,4-D	113	25	µg/kg wet	125		90.1	40-140			
2,4-D [2C]	117	25	µg/kg wet	125		93.2	40-140			
2,4-DB	73.1	25	µg/kg wet	125		58.5	40-140			
2,4-DB [2C]	66.6	25	µg/kg wet	125		53.3	40-140			
2,4,5-TP (Silvex)	11.3	2.5	µg/kg wet	12.5		90.6	40-140			
2,4,5-TP (Silvex) [2C]	11.6	2.5	µg/kg wet	12.5		92.6	40-140			
2,4,5-T	10.5	2.5	µg/kg wet	12.5		84.0	40-140			
2,4,5-T [2C]	13.2	2.5	µg/kg wet	12.5		106	40-140			
Dalapon	211	62	µg/kg wet	312		67.6	40-140			
Dalapon [2C]	194	62	µg/kg wet	312		62.2	40-140			
Dicamba	10.8	2.5	µg/kg wet	12.5		86.2	40-140			
Dicamba [2C]	11.5	2.5	µg/kg wet	12.5		91.7	40-140			
Dichloroprop	117	25	µg/kg wet	125		93.6	40-140			
Dichloroprop [2C]	120	25	µg/kg wet	125		96.2	40-140			
Dinoseb	3.32	12	µg/kg wet	62.5		5.31	0-42.4			V-06
Dinoseb [2C]	3.81	12	µg/kg wet	62.5		6.09	0-41.1			V-06
MCPA	11600	2500	µg/kg wet	12500		93.1	40-140			
MCPA [2C]	10200	2500	µg/kg wet	12500		81.4	40-140			
MCPA	11300	2500	µg/kg wet	12500		90.6	40-140			
MCPA [2C]	11400	2500	µg/kg wet	12500		90.8	40-140			
Surrogate: 2,4-Dichlorophenylacetic acid	78.4		µg/kg wet	100		78.4	30-150			
Surrogate: 2,4-Dichlorophenylacetic acid [2C]	80.3		µg/kg wet	100		80.3	30-150			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Herbicides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B256076 - SW-846 8151</b>										
<b>LCS Dup (B256076-BSD1)</b>										
					Prepared: 04/13/20 Analyzed: 04/15/20					
2,4-D	112	25	µg/kg wet	125		89.2	40-140	1.00	30	
2,4-D [2C]	115	25	µg/kg wet	125		91.8	40-140	1.48	30	
2,4-DB	67.3	25	µg/kg wet	125		53.8	40-140	8.30	30	
2,4-DB [2C]	59.3	25	µg/kg wet	125		47.4	40-140	11.7	30	
2,4,5-TP (Silvex)	10.4	2.5	µg/kg wet	12.5		83.0	40-140	8.77	30	
2,4,5-TP (Silvex) [2C]	11.5	2.5	µg/kg wet	12.5		92.0	40-140	0.672	30	
2,4,5-T	10.4	2.5	µg/kg wet	12.5		83.0	40-140	1.16	30	
2,4,5-T [2C]	12.7	2.5	µg/kg wet	12.5		102	40-140	3.75	30	
Dalapon	218	62	µg/kg wet	312		69.6	40-140	2.99	30	
Dalapon [2C]	212	62	µg/kg wet	312		67.9	40-140	8.77	30	
Dicamba	11.1	2.5	µg/kg wet	12.5		88.6	40-140	2.76	30	
Dicamba [2C]	11.7	2.5	µg/kg wet	12.5		93.3	40-140	1.79	30	
Dichloroprop	117	25	µg/kg wet	125		93.7	40-140	0.109	30	
Dichloroprop [2C]	121	25	µg/kg wet	125		96.7	40-140	0.454	30	
Dinoseb	3.97	12	µg/kg wet	62.5		6.35	0-42.4	17.8	30	V-06
Dinoseb [2C]	4.33	12	µg/kg wet	62.5		6.93	0-41.1	12.9	30	V-06
MCPA	11500	2500	µg/kg wet	12500		92.2	40-140	1.03	30	
MCPA [2C]	10100	2500	µg/kg wet	12500		80.8	40-140	0.694	30	
MCPP	11400	2500	µg/kg wet	12500		90.8	40-140	0.284	30	
MCPP [2C]	11400	2500	µg/kg wet	12500		90.8	40-140	0.0113	30	
Surrogate: 2,4-Dichlorophenylacetic acid	75.1		µg/kg wet	100		75.1	30-150			
Surrogate: 2,4-Dichlorophenylacetic acid [2C]	78.7		µg/kg wet	100		78.7	30-150			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Polychlorinated Biphenyls with 3540 Soxhlet Extraction - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255907 - SW-846 3540C

Blank (B255907-BLK1)

Prepared: 04/08/20 Analyzed: 04/10/20

Aroclor-1016	ND	0.020	mg/Kg wet							
Aroclor-1016 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1221	ND	0.020	mg/Kg wet							
Aroclor-1221 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1232	ND	0.020	mg/Kg wet							
Aroclor-1232 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1242	ND	0.020	mg/Kg wet							
Aroclor-1242 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1248	ND	0.020	mg/Kg wet							
Aroclor-1248 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1254	ND	0.020	mg/Kg wet							
Aroclor-1254 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1260	ND	0.020	mg/Kg wet							
Aroclor-1260 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1262	ND	0.020	mg/Kg wet							
Aroclor-1262 [2C]	ND	0.020	mg/Kg wet							
Aroclor-1268	ND	0.020	mg/Kg wet							
Aroclor-1268 [2C]	ND	0.020	mg/Kg wet							
Surrogate: Decachlorobiphenyl	0.216		mg/Kg wet	0.200		108	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.215		mg/Kg wet	0.200		107	30-150			
Surrogate: Tetrachloro-m-xylene	0.193		mg/Kg wet	0.200		96.6	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.192		mg/Kg wet	0.200		96.0	30-150			

LCS (B255907-BS1)

Prepared: 04/08/20 Analyzed: 04/10/20

Aroclor-1016	0.20	0.020	mg/Kg wet	0.200		101	40-140			
Aroclor-1016 [2C]	0.19	0.020	mg/Kg wet	0.200		94.5	40-140			
Aroclor-1260	0.19	0.020	mg/Kg wet	0.200		93.4	40-140			
Aroclor-1260 [2C]	0.18	0.020	mg/Kg wet	0.200		90.7	40-140			
Surrogate: Decachlorobiphenyl	0.230		mg/Kg wet	0.200		115	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.229		mg/Kg wet	0.200		114	30-150			
Surrogate: Tetrachloro-m-xylene	0.217		mg/Kg wet	0.200		109	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.220		mg/Kg wet	0.200		110	30-150			

LCS Dup (B255907-BSD1)

Prepared: 04/08/20 Analyzed: 04/10/20

Aroclor-1016	0.21	0.020	mg/Kg wet	0.200		104	40-140	2.96	30	
Aroclor-1016 [2C]	0.20	0.020	mg/Kg wet	0.200		98.4	40-140	4.03	30	
Aroclor-1260	0.20	0.020	mg/Kg wet	0.200		98.3	40-140	5.08	30	
Aroclor-1260 [2C]	0.19	0.020	mg/Kg wet	0.200		94.9	40-140	4.58	30	
Surrogate: Decachlorobiphenyl	0.235		mg/Kg wet	0.200		118	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.235		mg/Kg wet	0.200		118	30-150			
Surrogate: Tetrachloro-m-xylene	0.223		mg/Kg wet	0.200		111	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.225		mg/Kg wet	0.200		113	30-150			

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**QUALITY CONTROL**

**Petroleum Hydrocarbons Analyses - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255869 - SW-846 3546</b>										
<b>Blank (B255869-BLK1)</b>										
Prepared & Analyzed: 04/08/20										
TPH (C9-C36)	ND	8.3	mg/Kg wet							
Surrogate: 2-Fluorobiphenyl	2.47		mg/Kg wet	3.33		74.0	40-140			
<b>LCS (B255869-BS1)</b>										
Prepared & Analyzed: 04/08/20										
TPH (C9-C36)	24.4	8.3	mg/Kg wet	33.3		73.3	40-140			
Surrogate: 2-Fluorobiphenyl	2.40		mg/Kg wet	3.33		71.9	40-140			
<b>LCS Dup (B255869-BSD1)</b>										
Prepared & Analyzed: 04/08/20										
TPH (C9-C36)	22.3	8.3	mg/Kg wet	33.3		66.9	40-140	9.20	30	
Surrogate: 2-Fluorobiphenyl	2.22		mg/Kg wet	3.33		66.7	40-140			
<b>Matrix Spike (B255869-MS1)</b>										
Source: 20D0289-02 Prepared: 04/08/20 Analyzed: 04/09/20										
TPH (C9-C36)	97.0	9.7	mg/Kg dry	38.9	90.1	17.7 *	40-140			MS-07A
Surrogate: 2-Fluorobiphenyl	1.78		mg/Kg dry	3.89		45.8	40-140			
<b>Matrix Spike Dup (B255869-MSD1)</b>										
Source: 20D0289-02 Prepared: 04/08/20 Analyzed: 04/09/20										
TPH (C9-C36)	104	9.7	mg/Kg dry	38.9	90.1	37.0 *	40-140	7.48	30	MS-07A
Surrogate: 2-Fluorobiphenyl	1.87		mg/Kg dry	3.89		47.9	40-140			
<b>Batch B255970 - SW-846 3546</b>										
<b>Blank (B255970-BLK1)</b>										
Prepared: 04/09/20 Analyzed: 04/11/20										
TPH (C9-C36)	ND	8.3	mg/Kg wet							
Surrogate: 2-Fluorobiphenyl	2.81		mg/Kg wet	3.33		84.2	40-140			
<b>LCS (B255970-BS1)</b>										
Prepared: 04/09/20 Analyzed: 04/11/20										
TPH (C9-C36)	28.8	8.3	mg/Kg wet	33.3		86.4	40-140			
Surrogate: 2-Fluorobiphenyl	2.70		mg/Kg wet	3.33		81.1	40-140			
<b>LCS Dup (B255970-BSD1)</b>										
Prepared: 04/09/20 Analyzed: 04/11/20										
TPH (C9-C36)	28.4	8.3	mg/Kg wet	33.3		85.2	40-140	1.40	30	
Surrogate: 2-Fluorobiphenyl	2.39		mg/Kg wet	3.33		71.6	40-140			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**QUALITY CONTROL**

**Metals Analyses (Total) - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255893 - SW-846 3050B</b>										
<b>Blank (B255893-BLK1)</b> Prepared & Analyzed: 04/08/20										
Arsenic	ND	3.3	mg/Kg wet							
Barium	ND	1.7	mg/Kg wet							
Cadmium	ND	0.33	mg/Kg wet							
Chromium	ND	0.67	mg/Kg wet							
Lead	ND	0.50	mg/Kg wet							
Selenium	ND	3.3	mg/Kg wet							
Silver	ND	0.33	mg/Kg wet							
<b>LCS (B255893-BS1)</b> Prepared & Analyzed: 04/08/20										
Arsenic	131	9.9	mg/Kg wet	143		91.5	83.2-117.5			
Barium	411	5.0	mg/Kg wet	415		99.1	82.7-117.6			
Cadmium	52.6	0.99	mg/Kg wet	56.2		93.6	82.9-117.3			
Chromium	92.3	2.0	mg/Kg wet	101		91.4	82.4-116.8			
Lead	115	1.5	mg/Kg wet	125		91.8	82.4-116.8			
Selenium	69.7	9.9	mg/Kg wet	77.9		89.4	79.3-120.7			
Silver	32.7	0.99	mg/Kg wet	34.3		95.2	81-119.2			
<b>LCS Dup (B255893-BSD1)</b> Prepared & Analyzed: 04/08/20										
Arsenic	133	9.9	mg/Kg wet	143		93.1	83.2-117.5	1.69	30	
Barium	410	4.9	mg/Kg wet	415		98.9	82.7-117.6	0.143	20	
Cadmium	49.6	0.99	mg/Kg wet	56.2		88.2	82.9-117.3	5.90	20	
Chromium	95.3	2.0	mg/Kg wet	101		94.3	82.4-116.8	3.17	30	
Lead	117	1.5	mg/Kg wet	125		93.8	82.4-116.8	2.15	30	
Selenium	69.6	9.9	mg/Kg wet	77.9		89.4	79.3-120.7	0.0349	30	
Silver	33.6	0.99	mg/Kg wet	34.3		97.9	81-119.2	2.78	30	
<b>Reference (B255893-SRM1)</b> Prepared & Analyzed: 04/08/20										
Lead	0.469	0.49	mg/Kg wet	0.488		96.0	80-120			
<b>Batch B255973 - SW-846 7471</b>										
<b>Blank (B255973-BLK1)</b> Prepared: 04/09/20 Analyzed: 04/10/20										
Mercury	ND	0.025	mg/Kg wet							
<b>LCS (B255973-BS1)</b> Prepared: 04/09/20 Analyzed: 04/10/20										
Mercury	6.26	0.38	mg/Kg wet	7.61		82.3	72.7-127.3			
<b>LCS Dup (B255973-BSD1)</b> Prepared: 04/09/20 Analyzed: 04/10/20										
Mercury	6.84	0.38	mg/Kg wet	7.61		89.8	72.7-127.3	8.76	20	
<b>Duplicate (B255973-DUP1)</b> Source: 20D0289-07 Prepared: 04/09/20 Analyzed: 04/10/20										
Mercury	0.311	0.029	mg/Kg dry		0.323			3.57	20	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**QUALITY CONTROL**

**Metals Analyses (Total) - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B255973 - SW-846 7471

Matrix Spike (B255973-MS1)

Source: 20D0289-07

Prepared: 04/09/20 Analyzed: 04/10/20

Mercury	0.731	0.031	mg/Kg dry	0.411	0.323	99.3	80-120			
---------	-------	-------	-----------	-------	-------	------	--------	--	--	--

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**QUALITY CONTROL**

**Conventional Chemistry Parameters by EPA/PHA/SW-846 Methods (Total) - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B255839 - SW-846 9045C</b>										
<b>LCS (B255839-BS1)</b>				Prepared & Analyzed: 04/07/20						
pH	6.03		pH Units	6.00		100	90-110			
<b>LCS (B255839-BS2)</b>				Prepared & Analyzed: 04/07/20						
pH	6.01		pH Units	6.00		100	90-110			
<b>Duplicate (B255839-DUP2)</b>				Source: 20D0289-10		Prepared & Analyzed: 04/07/20				
pH	6.7		pH Units		6.7			0.778	6.96	H-03
<b>Batch B255871 - SW-846 9014</b>										
<b>Blank (B255871-BLK1)</b>				Prepared: 04/08/20 Analyzed: 04/09/20						
Reactive Cyanide	ND	0.40	mg/Kg							
<b>LCS (B255871-BS1)</b>				Prepared: 04/08/20 Analyzed: 04/09/20						
Reactive Cyanide	9.4	0.40	mg/Kg	10.0		94.4	82.8-113			
<b>Batch B255874 - SW-846 9030A</b>										
<b>Blank (B255874-BLK1)</b>				Prepared: 04/08/20 Analyzed: 04/09/20						
Reactive Sulfide	ND	2.0	mg/Kg							
<b>LCS (B255874-BS1)</b>				Prepared: 04/08/20 Analyzed: 04/09/20						
Reactive Sulfide	15	2.0	mg/Kg	14.8		103	57.6-114			
<b>Batch B256103 - SW-846 9030A</b>										
<b>Blank (B256103-BLK1)</b>				Prepared: 04/11/20 Analyzed: 04/12/20						
Reactive Sulfide	ND	2.0	mg/Kg							
<b>LCS (B256103-BS1)</b>				Prepared: 04/11/20 Analyzed: 04/12/20						
Reactive Sulfide	15	2.0	mg/Kg	14.8		103	57.6-114			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

BREAKDOWN REPORT

Lab Sample ID: S047521-PEM1 Analyzed: 04/10/2020

Column Number:	1
Analyte	% Breakdown
4,4'-DDT [1]	2.26
Endrin [1]	2.33

Column Number:	2
Analyte	% Breakdown
4,4'-DDT [2]	2.10
Endrin [2]	2.68

BREAKDOWN REPORT

Lab Sample ID: S047521-PEM2 Analyzed: 04/10/2020

Column Number:	1
Analyte	% Breakdown
4,4'-DDT [1]	1.46
Endrin [1]	2.83

Column Number:	2
Analyte	% Breakdown
4,4'-DDT [2]	1.26
Endrin [2]	3.04

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

**Comp-West-1 (0-2)**

*SW-846 8081B*

Lab Sample ID: 20D0289-01 Date(s) Analyzed: 04/10/2020 04/10/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.920	0.000	0.000	0.029	
	2	6.690	0.000	0.000	0.028	3.5
4,4'-DDT	1	7.582	0.000	0.000	0.034	
	2	7.351	0.000	0.000	0.028	19.4

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

**Comp-Field-1 (0-1)**

Lab Sample ID: 20D0289-03 Date(s) Analyzed: 04/10/2020 04/10/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.920	0.000	0.000	0.033	
	2	6.688	0.000	0.000	0.031	6.3
4,4'-DDT	1	7.581	0.000	0.000	0.036	
	2	7.349	0.000	0.000	0.029	21.5

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

**Comp-Field-2 (0-1)**

Lab Sample ID: 20D0289-04 Date(s) Analyzed: 04/10/2020 04/10/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.919	0.000	0.000	0.027	
	2	6.689	0.000	0.000	0.027	0.0
4,4'-DDT	1	7.582	0.000	0.000	0.039	
	2	7.349	0.000	0.000	0.031	22.9

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

**Comp-East-2 (0-1)**

Lab Sample ID: 20D0289-07 Date(s) Analyzed: 04/10/2020 04/10/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.920	0.000	0.000	0.043	
	2	6.689	0.000	0.000	0.040	7.2
4,4'-DDT	1	7.581	0.000	0.000	0.058	
	2	7.350	0.000	0.000	0.047	21.0

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

LCS

Lab Sample ID:                     B255866-BS1                                          Date(s) Analyzed:           04/10/2020                     04/10/2020          

Instrument ID (1):                     ECD6                                          Instrument ID (2):                     ECD6                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDD	1	7.369	0.000	0.000	0.091	
	2	7.115	0.000	0.000	0.091	0.0
4,4'-DDE	1	6.922	0.000	0.000	0.093	
	2	6.691	0.000	0.000	0.095	2.1
4,4'-DDT	1	7.584	0.000	0.000	0.096	
	2	7.351	0.000	0.000	0.070	31.3
Aldrin	1	6.255	0.000	0.000	0.086	
	2	5.946	0.000	0.000	0.090	4.6
alpha-BHC	1	5.528	0.000	0.000	0.075	
	2	5.272	0.000	0.000	0.095	23.5
beta-BHC	1	5.786	0.000	0.000	0.082	
	2	5.532	0.000	0.000	0.083	0.0
delta-BHC	1	5.906	0.000	0.000	0.074	
	2	5.709	0.000	0.000	0.079	6.5
Dieldrin	1	7.146	0.000	0.000	0.089	
	2	6.791	0.000	0.000	0.087	2.3
Endosulfan I	1	6.969	0.000	0.000	0.088	
	2	6.595	0.000	0.000	0.089	0.0
Endosulfan II	1	7.490	0.000	0.000	0.091	
	2	7.170	0.000	0.000	0.090	1.1
Endosulfan Sulfate	1	8.135	0.000	0.000	0.084	
	2	7.643	0.000	0.000	0.087	3.5
Endrin	1	7.321	0.000	0.000	0.091	
	2	7.010	0.000	0.000	0.089	2.2
Endrin Ketone	1	8.321	0.000	0.000	0.092	
	2	8.044	0.000	0.000	0.087	5.6
gamma-BHC (Lindane)	1	5.732	0.000	0.000	0.079	
	2	5.478	0.000	0.000	0.093	16.3
Heptachlor	1	6.048	0.000	0.000	0.061	
	2	5.743	0.000	0.000	0.086	34.0
Heptachlor Epoxide	1	6.681	0.000	0.000	0.086	

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

LCS
-----

Lab Sample ID: B255866-BS1 Date(s) Analyzed: 04/10/2020 04/10/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
	2	6.326	0.000	0.000	0.084	2.4
Hexachlorobenzene	1	5.420	0.000	0.000	0.086	
	2	5.189	0.000	0.000	0.090	4.6
Methoxychlor	1	7.959	0.000	0.000	0.092	
	2	7.901	0.000	0.000	0.089	3.3

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

LCS Dup

*SW-846 8081B*

Lab Sample ID: B255866-BSD1 Date(s) Analyzed: 04/10/2020 04/10/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDD	1	7.368	0.000	0.000	0.092	
	2	7.115	0.000	0.000	0.092	0.0
4,4'-DDE	1	6.922	0.000	0.000	0.093	
	2	6.690	0.000	0.000	0.096	2.1
4,4'-DDT	1	7.583	0.000	0.000	0.097	
	2	7.351	0.000	0.000	0.071	31.0
Aldrin	1	6.255	0.000	0.000	0.088	
	2	5.945	0.000	0.000	0.090	2.3
alpha-BHC	1	5.527	0.000	0.000	0.079	
	2	5.271	0.000	0.000	0.094	17.3
beta-BHC	1	5.786	0.000	0.000	0.086	
	2	5.532	0.000	0.000	0.086	0.0
delta-BHC	1	5.905	0.000	0.000	0.077	
	2	5.708	0.000	0.000	0.081	5.1
Dieldrin	1	7.146	0.000	0.000	0.090	
	2	6.791	0.000	0.000	0.088	2.3
Endosulfan I	1	6.969	0.000	0.000	0.090	
	2	6.595	0.000	0.000	0.090	0.0
Endosulfan II	1	7.489	0.000	0.000	0.092	
	2	7.170	0.000	0.000	0.092	0.0
Endosulfan Sulfate	1	8.135	0.000	0.000	0.085	
	2	7.643	0.000	0.000	0.088	3.5
Endrin	1	7.320	0.000	0.000	0.092	
	2	7.009	0.000	0.000	0.090	2.2
Endrin Ketone	1	8.321	0.000	0.000	0.095	
	2	8.043	0.000	0.000	0.089	7.6
gamma-BHC (Lindane)	1	5.731	0.000	0.000	0.082	
	2	5.477	0.000	0.000	0.093	12.6
Heptachlor	1	6.048	0.000	0.000	0.063	
	2	5.742	0.000	0.000	0.086	30.9
Heptachlor Epoxide	1	6.681	0.000	0.000	0.087	

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

LCS Dup

*SW-846 8081B*

Lab Sample ID:                     B255866-BSD1                                          Date(s) Analyzed:           04/10/2020                     04/10/2020          

Instrument ID (1):                     ECD6                                          Instrument ID (2):                     ECD6                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
	2	6.326	0.000	0.000	0.085	2.3
Hexachlorobenzene	1	5.420	0.000	0.000	0.088	
	2	5.189	0.000	0.000	0.089	1.1
Methoxychlor	1	7.960	0.000	0.000	0.093	
	2	7.901	0.000	0.000	0.090	3.3

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8082A*

LCS
-----

Lab Sample ID:                   B255907-BS1                                        Date(s) Analyzed:           04/10/2020                     04/10/2020          

Instrument ID (1):                   ECD5                                        Instrument ID (2):                   ECD5                  

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1016	1	0.000	-0.030	0.030	0.20	
	2	0.000	-0.030	0.030	0.19	5.1
Aroclor-1260	1	0.000	-0.030	0.030	0.19	
	2	0.000	-0.030	0.030	0.18	5.4

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8082A*

LCS Dup

Lab Sample ID:                   B255907-BSD1                                        Date(s) Analyzed:           04/10/2020                     04/10/2020          

Instrument ID (1):                   ECD5                                        Instrument ID (2):                   ECD5                  

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
Aroclor-1016	1	0.000	-0.030	0.030	0.21	
	2	0.000	-0.030	0.030	0.20	4.9
Aroclor-1260	1	0.000	-0.030	0.030	0.20	
	2	0.000	-0.030	0.030	0.19	5.1

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

LCS

*SW-846 8151A*

Lab Sample ID:                     B256076-BS1                                          Date(s) Analyzed:           04/15/2020                     04/15/2020          

Instrument ID (1):                     ECD 8                                          Instrument ID (2):                     ECD 8                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
2,4,5-T	1	16.339	0.000	0.000	10.5	
	2	15.959	0.000	0.000	13.2	18.2
2,4,5-TP (Silvex)	1	15.714	0.000	0.000	11.3	
	2	15.120	0.000	0.000	11.6	5.3
2,4-D	1	13.853	0.000	0.000	113	
	2	13.374	0.000	0.000	117	6.2
2,4-DB	1	17.041	0.000	0.000	73.1	
	2	16.843	0.000	0.000	66.6	9.2
Dalapon	1	4.645	0.000	0.000	211	
	2	4.157	0.000	0.000	194	7.9
Dicamba	1	11.712	0.000	0.000	10.8	
	2	11.181	0.000	0.000	11.5	4.4
Dichloroprop	1	13.341	0.000	0.000	117	
	2	12.703	0.000	0.000	120	0.0
Dinoseb	1	17.672	0.000	0.000	3.32	
	2	17.080	0.000	0.000	3.81	14.3
MCPA	1	12.544	0.000	0.000	11600	
	2	12.015	0.000	0.000	10200	16.2
MCPP	1	12.209	0.000	0.000	11300	
	2	11.523	0.000	0.000	11400	3.6

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8151A*

LCS Dup

Lab Sample ID:                     B256076-BSD1                                          Date(s) Analyzed:           04/15/2020                     04/15/2020          

Instrument ID (1):                     ECD 8                                          Instrument ID (2):                     ECD 8                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
2,4,5-T	1	16.339	0.000	0.000	10.4	
	2	15.958	0.000	0.000	12.7	23.8
2,4,5-TP (Silvex)	1	15.714	0.000	0.000	10.4	
	2	15.118	0.000	0.000	11.5	14.0
2,4-D	1	13.853	0.000	0.000	112	
	2	13.374	0.000	0.000	115	4.4
2,4-DB	1	17.042	0.000	0.000	67.3	
	2	16.842	0.000	0.000	59.3	12.2
Dalapon	1	4.645	0.000	0.000	218	
	2	4.156	0.000	0.000	212	3.7
Dicamba	1	11.712	0.000	0.000	11.1	
	2	11.180	0.000	0.000	11.7	6.2
Dichloroprop	1	13.341	0.000	0.000	117	
	2	12.702	0.000	0.000	121	0.8
Dinoseb	1	17.673	0.000	0.000	3.97	
	2	17.080	0.000	0.000	4.33	7.9
MCPA	1	12.544	0.000	0.000	11500	
	2	12.013	0.000	0.000	10100	17.2
MCPP	1	12.208	0.000	0.000	11400	
	2	11.523	0.000	0.000	11400	3.6

NOT FOR BIDDING

## FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
DL-03	Elevated reporting limit due to matrix interference.
H-03	Sample received after recommended holding time was exceeded.
L-14	Compound classified by MA CAM as difficult with acceptable recoveries of 40-160%. Recovery does not meet 70-130% criteria but does meet difficult compound criteria.
MS-07A	Matrix spike and spike duplicate recovery is outside of control limits. Analysis is in control based on laboratory fortified blank recovery. Possibility of matrix effects that lead to low bias or non-homogeneous sample aliquot cannot be eliminated.
MS-09	Matrix spike recovery and/or matrix spike duplicate recovery outside of control limits. Possibility of sample matrix effects that lead to a low bias for reported result or non-homogeneous sample aliquots cannot be eliminated.
O-32	A dilution was performed as part of the standard analytical procedure.
V-05	Continuing calibration verification (CCV) did not meet method specifications and was biased on the low side for this compound.
V-06	Continuing calibration verification (CCV) did not meet method specifications and was biased on the high side for this compound.
V-16	Response factor is less than method specified minimum acceptable value. Reduced precision and accuracy may be associated with reported result.
V-20	Continuing calibration verification (CCV) did not meet method specifications and was biased on the high side. Data validation is not affected since sample result was "not detected" for this compound.
V-34	Initial calibration verification (ICV) did not meet method specifications and was biased on the low side for this compound. Reported result is estimated.

NOT FOR BIDDING

**CERTIFICATIONS**

**Certified Analyses included in this Report**

Analyte	Certifications
<b>SW-846 1030 in Soil</b>	
Ignitability	NY,NH,CT,NC,ME,VA
<b>SW-846 6010D in Soil</b>	
Arsenic	CT,NH,NY,ME,VA,NC
Barium	CT,NH,NY,ME,VA,NC
Cadmium	CT,NH,NY,ME,VA,NC
Chromium	CT,NH,NY,ME,VA,NC
Lead	CT,NH,NY,AIHA,ME,VA,NC
Selenium	CT,NH,NY,ME,VA,NC
Silver	CT,NH,NY,ME,VA,NC
<b>SW-846 7471B in Soil</b>	
Mercury	CT,NH,NY,NC,ME,VA
<b>SW-846 8081B in Soil</b>	
Aldrin	CT,NC,NH,NY,ME,VA
Aldrin [2C]	CT,NC,NH,NY,ME,VA
alpha-BHC	CT,NC,NH,NY,ME,VA
alpha-BHC [2C]	CT,NC,NH,NY,ME,VA
beta-BHC	CT,NC,NH,NY,ME,VA
beta-BHC [2C]	CT,NC,NH,NY,ME,VA
delta-BHC	CT,NC,NH,NY,ME,VA
delta-BHC [2C]	CT,NC,NH,NY,ME,VA
gamma-BHC (Lindane)	CT,NC,NH,NY,ME,VA
gamma-BHC (Lindane) [2C]	CT,NC,NH,NY,ME,VA
Chlordane	CT,NC,NH,NY,ME,VA
Chlordane [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDD	CT,NC,NH,NY,ME,VA
4,4'-DDD [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDE	CT,NC,NH,NY,ME,VA
4,4'-DDE [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDT	CT,NC,NH,NY,ME,VA
4,4'-DDT [2C]	CT,NC,NH,NY,ME,VA
Dieldrin	CT,NC,NH,NY,ME,VA
Dieldrin [2C]	CT,NC,NH,NY,ME,VA
Endosulfan I	CT,NC,NH,NY,ME,VA
Endosulfan I [2C]	CT,NC,NH,NY,ME,VA
Endosulfan II	CT,NC,NH,NY,ME,VA
Endosulfan II [2C]	CT,NC,NH,NY,ME,VA
Endosulfan Sulfate	CT,NC,NH,NY,ME,VA
Endosulfan Sulfate [2C]	CT,NC,NH,NY,ME,VA
Endrin	CT,NC,NH,NY,ME,VA
Endrin [2C]	CT,NC,NH,NY,ME,VA
Endrin Ketone	NC
Endrin Ketone [2C]	NC
Heptachlor	CT,NC,NH,NY,ME,VA
Heptachlor [2C]	CT,NC,NH,NY,ME,VA
Heptachlor Epoxide	CT,NC,NH,NY,ME,VA
Heptachlor Epoxide [2C]	CT,NC,NH,NY,ME,VA

NOT FOR BIDDING

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
<b>SW-846 8081B in Soil</b>	
Hexachlorobenzene	NC
Hexachlorobenzene [2C]	NC
Methoxychlor	CT,NC,NH,NY,ME,VA
Methoxychlor [2C]	CT,NC,NH,NY,ME,VA
<b>SW-846 8081B in Water</b>	
Aldrin	CT,NC,NH,NY,ME,VA
Aldrin [2C]	CT,NC,NH,NY,ME,VA
alpha-BHC	CT,NC,NH,NY,ME,VA
alpha-BHC [2C]	CT,NC,NH,NY,ME,VA
beta-BHC	CT,NC,NH,NY,ME,VA
beta-BHC [2C]	CT,NC,NH,NY,ME,VA
delta-BHC	CT,NC,NH,NY,ME,VA
delta-BHC [2C]	CT,NC,NH,NY,ME,VA
gamma-BHC (Lindane)	CT,NC,NH,NY,ME,VA
gamma-BHC (Lindane) [2C]	CT,NC,NH,NY,ME,VA
Chlordane	CT,NC,NH,NY,ME,VA
Chlordane [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDD	CT,NC,NH,NY,ME,VA
4,4'-DDD [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDE	CT,NC,NH,NY,ME,VA
4,4'-DDE [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDT	CT,NC,NH,NY,ME,VA
4,4'-DDT [2C]	CT,NC,NH,NY,ME,VA
Dieldrin	CT,NC,NH,NY,ME,VA
Dieldrin [2C]	CT,NC,NH,NY,ME,VA
Endosulfan I	CT,NC,NH,NY,ME,VA
Endosulfan I [2C]	CT,NC,NH,NY,ME,VA
Endosulfan II	CT,NC,NH,NY,ME,VA
Endosulfan II [2C]	CT,NC,NH,NY,ME,VA
Endosulfan Sulfate	CT,NC,NH,NY,ME,VA
Endosulfan Sulfate [2C]	CT,NC,NH,NY,ME,VA
Endrin	CT,NC,NH,NY,ME,VA
Endrin [2C]	CT,NC,NH,NY,ME,VA
Endrin Ketone	NC
Endrin Ketone [2C]	NC
Heptachlor	CT,NC,NH,NY,ME,VA
Heptachlor [2C]	CT,NC,NH,NY,ME,VA
Heptachlor Epoxide	CT,NC,NH,NY,ME,VA
Heptachlor Epoxide [2C]	CT,NC,NH,NY,ME,VA
Hexachlorobenzene	NC
Hexachlorobenzene [2C]	NC
Methoxychlor	CT,NC,NH,NY,ME,VA
Methoxychlor [2C]	CT,NC,NH,NY,ME,VA
<b>SW-846 8082A in Soil</b>	
Aroclor-1016	CT,NH,NY,ME,NC,VA,PA
Aroclor-1016 [2C]	CT,NH,NY,ME,NC,VA,PA

NOT FOR BIDDING

**CERTIFICATIONS**

**Certified Analyses included in this Report**

Analyte	Certifications
<b>SW-846 8082A in Soil</b>	
Aroclor-1221	CT,NH,NY,ME,NC,VA,PA
Aroclor-1221 [2C]	CT,NH,NY,ME,NC,VA,PA
Aroclor-1232	CT,NH,NY,ME,NC,VA,PA
Aroclor-1232 [2C]	CT,NH,NY,ME,NC,VA,PA
Aroclor-1242	CT,NH,NY,ME,NC,VA,PA
Aroclor-1242 [2C]	CT,NH,NY,ME,NC,VA,PA
Aroclor-1248	CT,NH,NY,ME,NC,VA,PA
Aroclor-1248 [2C]	CT,NH,NY,ME,NC,VA,PA
Aroclor-1254	CT,NH,NY,ME,NC,VA,PA
Aroclor-1254 [2C]	CT,NH,NY,ME,NC,VA,PA
Aroclor-1260	CT,NH,NY,ME,NC,VA,PA
Aroclor-1260 [2C]	CT,NH,NY,ME,NC,VA,PA
Aroclor-1262	NY,NC,VA,PA
Aroclor-1262 [2C]	NY,NC,VA,PA
Aroclor-1268	NY,NC,VA,PA
Aroclor-1268 [2C]	NY,NC,VA,PA
<b>SW-846 8151A in Soil</b>	
2,4-D	NY,ME,NC,NH,VA,CT
2,4-D [2C]	NY,ME,NC,NH,VA,CT
2,4-DB	NY,ME,NC,NH,VA,CT
2,4-DB [2C]	NY,ME,NC,NH,VA,CT
2,4,5-TP (Silvex)	NY,ME,NC,NH,VA,CT
2,4,5-TP (Silvex) [2C]	NY,ME,NC,NH,VA,CT
2,4,5-T	NY,ME,NC,NH,VA,CT
2,4,5-T [2C]	NY,ME,NC,NH,VA,CT
Dalapon	NY,ME,NC,NH,VA,CT
Dalapon [2C]	NY,ME,NC,NH,VA,CT
Dicamba	NY,ME,NC,NH,VA,CT
Dicamba [2C]	NY,ME,NC,NH,VA,CT
Dichloroprop	NY,ME,NC,NH,VA,CT
Dichloroprop [2C]	NY,ME,NC,NH,VA,CT
Dinoseb	NY,ME,NC,NH,VA,CT
Dinoseb [2C]	NY,ME,NC,NH,VA,CT
MCPA	NY,ME,NC,NH,VA,CT
MCPA [2C]	NY,ME,NC,NH,VA,CT
MCPP	NY,ME,NC,NH,VA,CT
MCPP [2C]	NY,ME,NC,NH,VA,CT
<b>SW-846 8260C-D in Soil</b>	
Acetone	CT,NH,NY,ME
Benzene	CT,NH,NY,ME
Bromobenzene	NH,NY,ME
Bromochloromethane	NH,NY,ME
Bromodichloromethane	CT,NH,NY,ME
Bromoform	CT,NH,NY,ME
Bromomethane	CT,NH,NY,ME
2-Butanone (MEK)	CT,NH,NY,ME

NOT FOR BIDDING

**CERTIFICATIONS**

**Certified Analyses included in this Report**

Analyte	Certifications
<i>SW-846 8260C-D in Soil</i>	
n-Butylbenzene	CT,NH,NY,ME
sec-Butylbenzene	CT,NH,NY,ME
tert-Butylbenzene	CT,NH,NY,ME
Carbon Disulfide	CT,NH,NY,ME
Carbon Tetrachloride	CT,NH,NY,ME
Chlorobenzene	CT,NH,NY,ME
Chlorodibromomethane	CT,NH,NY,ME
Chloroethane	CT,NH,NY,ME
Chloroform	CT,NH,NY,ME
Chloromethane	CT,NH,NY,ME
2-Chlorotoluene	CT,NH,NY,ME
4-Chlorotoluene	CT,NH,NY,ME
1,2-Dibromo-3-chloropropane (DBCP)	NY
Dibromomethane	NH,NY,ME
1,2-Dichlorobenzene	CT,NH,NY,ME
1,3-Dichlorobenzene	CT,NH,NY,ME
1,4-Dichlorobenzene	CT,NH,NY,ME
Dichlorodifluoromethane (Freon 12)	NY,ME
1,1-Dichloroethane	CT,NH,NY,ME
1,2-Dichloroethane	CT,NH,NY,ME
1,1-Dichloroethylene	CT,NH,NY,ME
cis-1,2-Dichloroethylene	CT,NH,NY,ME
trans-1,2-Dichloroethylene	CT,NH,NY,ME
1,2-Dichloropropane	CT,NH,NY,ME
1,3-Dichloropropane	NH,NY,ME
2,2-Dichloropropane	NH,NY,ME
1,1-Dichloropropene	NH,NY,ME
cis-1,3-Dichloropropene	CT,NH,NY,ME
trans-1,3-Dichloropropene	CT,NH,NY,ME
1,4-Dioxane	NY
Ethylbenzene	CT,NH,NY,ME
Hexachlorobutadiene	NH,NY,ME
2-Hexanone (MBK)	CT,NH,NY,ME
Isopropylbenzene (Cumene)	CT,NH,NY,ME
p-Isopropyltoluene (p-Cymene)	NH,NY
Methyl tert-Butyl Ether (MTBE)	NH,NY
Methylene Chloride	CT,NH,NY,ME
4-Methyl-2-pentanone (MIBK)	CT,NH,NY
Naphthalene	NH,NY,ME
n-Propylbenzene	NH,NY
Styrene	CT,NH,NY,ME
1,1,1,2-Tetrachloroethane	CT,NH,NY,ME
1,1,2,2-Tetrachloroethane	CT,NH,NY,ME
Tetrachloroethylene	CT,NH,NY,ME
Toluene	CT,NH,NY,ME
1,2,3-Trichlorobenzene	NY
1,2,4-Trichlorobenzene	NH,NY,ME

NOT FOR BIDDING

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
<i>SW-846 8260C-D in Soil</i>	
1,1,1-Trichloroethane	CT,NH,NY,ME
1,1,2-Trichloroethane	CT,NH,NY,ME
Trichloroethylene	CT,NH,NY,ME
Trichlorofluoromethane (Freon 11)	CT,NH,NY,ME
1,2,3-Trichloropropane	NH,NY,ME
1,2,4-Trimethylbenzene	CT,NH,NY,ME
1,3,5-Trimethylbenzene	CT,NH,NY,ME
Vinyl Chloride	CT,NH,NY,ME
m+p Xylene	CT,NH,NY,ME
o-Xylene	CT,NH,NY,ME
<i>SW-846 8270D-E in Soil</i>	
Acenaphthene	CT,NY,NH
Acenaphthylene	CT,NY,NH
Acetophenone	NY,NH
Aniline	NY,NH
Anthracene	CT,NY,NH
Benzo(a)anthracene	CT,NY,NH
Benzo(a)pyrene	CT,NY,NH
Benzo(b)fluoranthene	CT,NY,NH
Benzo(g,h,i)perylene	CT,NY,NH
Benzo(k)fluoranthene	CT,NY,NH
Bis(2-chloroethoxy)methane	CT,NY,NH
Bis(2-chloroethyl)ether	CT,NY,NH
Bis(2-chloroisopropyl)ether	CT,NY,NH
Bis(2-Ethylhexyl)phthalate	CT,NY,NH
4-Bromophenylphenylether	CT,NY,NH
Butylbenzylphthalate	CT,NY,NH
4-Chloroaniline	CT,NY,NH
2-Chloronaphthalene	CT,NY,NH
2-Chlorophenol	CT,NY,NH
Chrysene	CT,NY,NH
Dibenz(a,h)anthracene	CT,NY,NH
Dibenzofuran	CT,NY,NH
Di-n-butylphthalate	CT,NY,NH
1,2-Dichlorobenzene	NY,NH
1,3-Dichlorobenzene	NY,NH
1,4-Dichlorobenzene	NY,NH
3,3-Dichlorobenzidine	CT,NY,NH
2,4-Dichlorophenol	CT,NY,NH
Diethylphthalate	CT,NY,NH
2,4-Dimethylphenol	CT,NY,NH
Dimethylphthalate	CT,NY,NH
2,4-Dinitrophenol	CT,NY,NH
2,4-Dinitrotoluene	CT,NY,NH
2,6-Dinitrotoluene	CT,NY,NH
Di-n-octylphthalate	CT,NY,NH

NOT FOR BIDDING

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
<b>SW-846 8270D-E in Soil</b>	
1,2-Diphenylhydrazine/Azobenzene	NY,NH
Fluoranthene	CT,NY,NH
Fluorene	NY,NH
Hexachlorobenzene	CT,NY,NH
Hexachlorobutadiene	CT,NY,NH
Hexachloroethane	CT,NY,NH
Indeno(1,2,3-cd)pyrene	CT,NY,NH
Isophorone	CT,NY,NH
2-Methylnaphthalene	CT,NY,NH
2-Methylphenol	CT,NY,NH
3/4-Methylphenol	CT,NY,NH
Naphthalene	CT,NY,NH
Nitrobenzene	CT,NY,NH
2-Nitrophenol	CT,NY,NH
4-Nitrophenol	CT,NY,NH
Pentachlorophenol	CT,NY,NH
Phenanthrene	CT,NY,NH
Phenol	CT,NY,NH
Pyrene	CT,NY,NH
1,2,4-Trichlorobenzene	CT,NY,NH
2,4,5-Trichlorophenol	CT,NY,NH
2,4,6-Trichlorophenol	CT,NY,NH
<b>SW-846 8270D-E in Water</b>	
Acenaphthene	CT,NY,NH
Acenaphthylene	CT,NY,NH
Acetophenone	NY
Aniline	CT,NY
Anthracene	CT,NY,NH
Benzo(a)anthracene	CT,NY,NH
Benzo(a)pyrene	CT,NY,NH
Benzo(b)fluoranthene	CT,NY,NH
Benzo(g,h,i)perylene	CT,NY,NH
Benzo(k)fluoranthene	CT,NY,NH
Bis(2-chloroethoxy)methane	CT,NY,NH
Bis(2-chloroethyl)ether	CT,NY,NH
Bis(2-chloroisopropyl)ether	CT,NY,NH
Bis(2-Ethylhexyl)phthalate	CT,NY,NH
4-Bromophenylphenylether	CT,NY,NH
Butylbenzylphthalate	CT,NY,NH
4-Chloroaniline	CT,NY,NH
2-Chloronaphthalene	CT,NY,NH
2-Chlorophenol	CT,NY,NH
Chrysene	CT,NY,NH
Dibenz(a,h)anthracene	CT,NY,NH
Dibenzofuran	CT,NY,NH
Di-n-butylphthalate	CT,NY,NH

NOT FOR BIDDING

**CERTIFICATIONS**

**Certified Analyses included in this Report**

Analyte	Certifications
<i>SW-846 8270D-E in Water</i>	
1,2-Dichlorobenzene	CT,NY,NH
1,3-Dichlorobenzene	CT,NY,NH
1,4-Dichlorobenzene	CT,NY,NH
3,3-Dichlorobenzidine	CT,NY,NH
2,4-Dichlorophenol	CT,NY,NH
Diethylphthalate	CT,NY,NH
2,4-Dimethylphenol	CT,NY,NH
Dimethylphthalate	CT,NY,NH
2,4-Dinitrophenol	CT,NY,NH
2,4-Dinitrotoluene	CT,NY,NH
2,6-Dinitrotoluene	CT,NY,NH
Di-n-octylphthalate	CT,NY,NH
1,2-Diphenylhydrazine/Azobenzene	NY
Fluoranthene	CT,NY,NH
Fluorene	NY,NH
Hexachlorobenzene	CT,NY,NH
Hexachlorobutadiene	CT,NY,NH
Hexachloroethane	CT,NY,NH
Indeno(1,2,3-cd)pyrene	CT,NY,NH
Isophorone	CT,NY,NH
2-Methylnaphthalene	CT,NY,NH
2-Methylphenol	CT,NY,NH
3/4-Methylphenol	CT,NY,NH
Naphthalene	CT,NY,NH
Nitrobenzene	CT,NY,NH
2-Nitrophenol	CT,NY,NH
4-Nitrophenol	CT,NY,NH
Pentachlorophenol	CT,NY,NH
Phenanthrene	CT,NY,NH
Phenol	CT,NY,NH
Pyrene	CT,NY,NH
1,2,4-Trichlorobenzene	CT,NY,NH
2,4,5-Trichlorophenol	CT,NY,NH
2,4,6-Trichlorophenol	CT,NY,NH

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

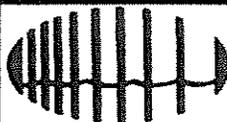
The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2020
CT	Connecticut Department of Public Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2020
FL	Florida Department of Health	E871027 NELAP	06/30/2020
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2020
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2020
NC-DW	North Carolina Department of Health	25703	07/31/2020
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2020

NOT FOR BIDDING



I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples \_\_\_\_\_



**con-test**  
ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

**Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False**

Client WAS  
 Received By 981 Date 4/7/20 Time 8:10

How were the samples received? In Cooler T No Cooler \_\_\_\_\_ On Ice T No Ice \_\_\_\_\_  
 Direct from Sampling \_\_\_\_\_ Ambient \_\_\_\_\_ Melted Ice \_\_\_\_\_

Were samples within Temperature? 2-6°C T By Gun # 5 Actual Temp - 5.5  
 By Blank # \_\_\_\_\_ Actual Temp - \_\_\_\_\_

Was Custody Seal Intact? n/a Were Samples Tampered with? n/a  
 Was COC Relinquished? T Does Chain Agree With Samples? T

Are there broken/leaking/loose caps on any samples? F

Is COC in ink/ Legible? T Were samples received within holding time? F  
 Did COC include all pertinent Information? Client T Analysis T Sampler Name T  
 Project T ID's T Collection Dates/Times T

Are Sample labels filled out and legible? T  
 Are there Lab to Filters? F Who was notified? \_\_\_\_\_  
 Are there Rushes? F Who was notified? \_\_\_\_\_  
 Are there Short Holds? T Who was notified? Mandy

Is there enough Volume? T  
 Is there Headspace where applicable? n/a MS/MSD? F  
 Proper Media/Containers Used? T Is splitting samples required? F  
 Were trip blanks received? F On COC? F  
 Do all samples have the proper pH? Acid n/a Base n/a

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-	10	250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-	20	Flashpoint		Col./Bacteria	2oz Amb/Clear
DI-		Other Glass		Other Plastic	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

**Unused Media**

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-		250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-		Col./Bacteria		Flashpoint	2oz Amb/Clear
DI-		Other Plastic		Other Glass	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

**Comments:**

Received past hold for pH.

## MADEP MCP Analytical Method Report Certification Form

Laboratory Name: Con-Test Analytical Laboratory	Project #: 20D0289
Project Location: Brookline, MA	RTN:

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

20D0289-01 thru 20D0289-10

Matrices: Soil

**CAM Protocol (check all that below)**

8260 VOC CAM II A (X)	7470/7471 Hg CAM IIIB (X)	MassDEP VPH CAM IV A ( )	8082 PCB CAM V A (X)	9014 Total Cyanide/PAC CAM VI A ( )	6860 Perchlorate CAM VIII B ( )
8270 SVOC CAM II B (X)	7010 Metals CAM III C ( )	MassDEP VPH CAM IV C ( )	8081 Pesticides CAM V B (X)	7196 Hex Cr CAM VI B ( )	MassDEP APH CAM IX A ( )
6010 Metals CAM III A (X)	6020 Metals CAM III D ( )	MassDEP EPH CAM IV B ( )	8151 Herbicides CAM V C (X)	8330 Explosives CAM VIII A ( )	TO-15 VOC CAM IX B ( )

**Affirmative response to Questions A through F is required for "Presumptive Certainty" status**

<b>A</b>	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
<b>B</b>	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
<b>C</b>	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
<b>D</b>	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
<b>E a</b>	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	<input type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
<b>E b</b>	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	<input type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
<b>F</b>	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all No responses to Questions A through E)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>

**A response to questions G, H and I below is required for "Presumptive Certainty" status**

<b>G</b>	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <sup>1</sup>
----------	---	--

**Data User Note: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**

<b>H</b>	Were all QC performance standards specified in the CAM protocol(s) achieved?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <sup>1</sup>
<b>I</b>	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <sup>1</sup>

<sup>1</sup>All Negative responses must be addressed in an attached Environmental Laboratory case narrative.

**I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.**

Signature: Lisa Worthington Position: Technical Representative  
 Printed Name: Lisa A. Worthington Date: 04/16/20

April 21, 2020

Daron Kurkjian  
Weston & Sampson Engineers MA  
55 Walkers Brook Drive  
Reading, MA 01867

Project Location: Brookline, MA  
Client Job Number:  
Project Number: [none]  
Laboratory Work Order Number: 20D0689

Enclosed are results of analyses for samples received by the laboratory on April 16, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Michelle M. Koch  
Project Manager

NOT FOR BIDDING

## Table of Contents

Sample Summary	3
Case Narrative	4
Sample Results	5
20D0689-01	5
20D0689-02	6
20D0689-03	7
20D0689-04	8
20D0689-05	9
20D0689-06	10
20D0689-07	11
20D0689-08	12
20D0689-09	13
20D0689-10	14
Sample Preparation Information	15
QC Data	16
Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)	16
B256526	16
Flag/Qualifier Summary	17
Certifications	18
Chain of Custody/Sample Receipt	19

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Weston & Sampson Engineers MA  
 55 Walkers Brook Drive  
 Reading, MA 01867  
 ATTN: Daron Kurkjian

REPORT DATE: 4/21/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 20D0689

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Brookline, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
Comp-West-1 (0-2)	20D0689-01	Soil		SM21-22 2510B Modified	
Comp-West-2 (0-2)	20D0689-02	Soil		SM21-22 2510B Modified	
Comp-Field-1 (0-1)	20D0689-03	Soil		SM21-22 2510B Modified	
Comp-Field-2 (0-1)	20D0689-04	Soil		SM21-22 2510B Modified	
Comp-Field-3 (0-4)	20D0689-05	Soil		SM21-22 2510B Modified	
Comp-East-1 (0-2)	20D0689-06	Soil		SM21-22 2510B Modified	
Comp-East-2 (0-1)	20D0689-07	Soil		SM21-22 2510B Modified	
Comp-VT (0-2.5)	20D0689-08	Soil		SM21-22 2510B Modified	
Comp-LP (0-8)	20D0689-09	Soil		SM21-22 2510B Modified	
Comp-SW (0-7.5)	20D0689-10	Soil		SM21-22 2510B Modified	

NOT FOR BIDDING

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

NOT FOR BIDDING

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.

I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington  
Technical Representative

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-West-1 (0-2)

Sampled: 4/6/2020 10:00

Sample ID: 20D0689-01

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	3.1	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0689-02

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	3.6	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-Field-1 (0-1)

Sampled: 4/6/2020 07:30

Sample ID: 20D0689-03

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	3.2	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-Field-2 (0-1)

Sampled: 4/6/2020 07:45

Sample ID: 20D0689-04

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	4.2	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0689-05

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	4.5	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0689-06

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	3.9	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-East-2 (0-1)

Sampled: 4/6/2020 15:30

Sample ID: 20D0689-07

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	2.2	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0689-08

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	3.3	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0689-09

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	5.1	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0689

Date Received: 4/16/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0689-10

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Specific conductance	3.3	2.0	µmhos/cm	1		SM21-22 2510B Modified	4/19/20	4/19/20 11:00	EC

NOT FOR BIDDING

**Sample Extraction Data****SM21-22 2510B Modified**

<b>Lab Number [Field ID]</b>	<b>Batch</b>	<b>Initial [g]</b>	<b>Date</b>
20D0689-01 [Comp-West-1 (0-2)]	B256526	1.00	04/19/20
20D0689-02 [Comp-West-2 (0-2)]	B256526	1.00	04/19/20
20D0689-03 [Comp-Field-1 (0-1)]	B256526	1.00	04/19/20
20D0689-04 [Comp-Field-2 (0-1)]	B256526	1.00	04/19/20
20D0689-05 [Comp-Field-3 (0-4)]	B256526	1.00	04/19/20
20D0689-06 [Comp-East-1 (0-2)]	B256526	1.00	04/19/20
20D0689-07 [Comp-East-2 (0-1)]	B256526	1.00	04/19/20
20D0689-08 [Comp-VT (0-2.5)]	B256526	1.00	04/19/20
20D0689-09 [Comp-LP (0-8)]	B256526	1.00	04/19/20
20D0689-10 [Comp-SW (0-7.5)]	B256526	1.00	04/19/20

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**QUALITY CONTROL**

**Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total) - Quality Control**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B256526 - SM21-22 2510B Modified</b>										
<b>Blank (B256526-BLK1)</b>										
				Prepared & Analyzed: 04/19/20						
Specific conductance	ND	2.0	µmhos/cm							
<b>LCS (B256526-BS1)</b>										
				Prepared & Analyzed: 04/19/20						
Specific conductance	140		µmhos/cm	137	101	90-111				
<b>Duplicate (B256526-DUP1)</b>										
				Source: 20D0689-01			Prepared & Analyzed: 04/19/20			
Specific conductance	3.2	2.0	µmhos/cm		3.1			2.52	27.4	

NOT FOR BIDDING

---

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**FLAG/QUALIFIER SUMMARY**

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

NOT FOR BIDDING

**CERTIFICATIONS**

**Certified Analyses included in this Report**

Analyte	Certifications
---------	----------------

**No certified Analyses included in this Report**

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2020
CT	Connecticut Department of Public Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2020
FL	Florida Department of Health	E871027 NELAP	06/30/2020
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2020
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2020
NC-DW	North Carolina Department of Health	25703	07/31/2020
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2020

NOT FOR BIDDING

Company Name: **Weston & Sampson**  
Address: **55 Wickes Street Deerfield MA**  
Phone: **978-257-0110**  
Project Name: **Cypress St. Playground**  
Project Location: **Brookline MA**  
Project Number:  
Project Manager: **Darin Kurkjian**  
Con-Test Quote Name/Number:  
Invoice Recipient: **DK**  
Sampled By: **NMA + JW**

Requested Turnaround Time:  
7-Day  10-Day   Field Filtered  
PFAS 10-Day (std)  Due Date: **5 day**  Lab to Filter

Rush-Approval Required:  
1-Day  3-Day   Field Filtered  
2-Day  4-Day   Lab to Filter

Orthophosphate Samples:  
 Field Filtered  
 Lab to Filter

Data Delivery:  
Format: PDF  EXCEL   
Other:  
CLP Like Data Pkg Required:   
Email To: **Kurkjian.d@wsemc.com**  
Fax To #:

ANALYSIS REQUESTED

Element	PCBs	SOxhlet	VOCs	SVOCs	RCRA Metals	TPH	Ammonia	Reactive Cyanide	Reactive Sulfide	Corrosivity (pH)	Pesticide	Herbicide
PCBs	X	X	X	X	X	X	X	X	X	X	X	X
SOxhlet	X	X	X	X	X	X	X	X	X	X	X	X
VOCs	X	X	X	X	X	X	X	X	X	X	X	X
SVOCs	X	X	X	X	X	X	X	X	X	X	X	X
RCRA Metals	X	X	X	X	X	X	X	X	X	X	X	X
TPH	X	X	X	X	X	X	X	X	X	X	X	X
Ammonia	X	X	X	X	X	X	X	X	X	X	X	X
Reactive Cyanide	X	X	X	X	X	X	X	X	X	X	X	X
Reactive Sulfide	X	X	X	X	X	X	X	X	X	X	X	X
Corrosivity (pH)	X	X	X	X	X	X	X	X	X	X	X	X
Pesticide	X	X	X	X	X	X	X	X	X	X	X	X
Herbicide	X	X	X	X	X	X	X	X	X	X	X	X

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	COMP/GRAB	Matrix Code	Conc Code	VIALS	GLASS	PLASTIC	BACTERIA	ENCORE
-01*	1 COMP-West-1(0-2')	4/16/2020	1000	COMP	S	V	3	Z			
-02*	2 COMP-West-2(0-2')		1010								
-03*	3 COMP-FIELD-1(0-1')		0720								
-04*	4 COMP-FIELD-2(0-1')		0745								
-05*	5 COMP-FIELD-3(0-4')		0800								
-06*	6 COMP-East-1(0-2')		1545								
-07*	7 COMP-East-2(0-1')		1530								
-08*	8 COMP-VT(0-2.5')		1100								
-09*	9 COMP-LP(0-8')		1500								
-10*	10 COMP-SW(0-7.5')		1315								

Relinquished by: (signature) **NMA** Date/Time: **4/17/2020, 0900**  
 Received by: (signature) **Paul Chestney** Date/Time: **4-2-20 1103**  
 Relinquished by: (signature) **Paul Chestney** Date/Time: **1540**  
 Received by: (signature) **Paul Record** Date/Time: **4-7-20 12:15**  
 Relinquished by: (signature) **Paul Record** Date/Time: **4-7-20 15:40**  
 Received by: (signature) **Edith Villan** Date/Time: **5.5 4/16/20 18:40**  
 Relinquished by: (signature) \_\_\_\_\_ Date/Time: \_\_\_\_\_

Client Comments:  
**Please only run pesticide/herbicide analysis for COMP-FIELD-1(0-1'), COMP-FIELD-2(0-1'), COMP-East-2(0-1'), and COMP-West-1(0-2'). Hold pest/herb analysis for all other samples until approval is given by W&S.**

Detection Limit Required:  MA  **84 PCS-1**  X  
 Special Requirements: **COMM-97 criteria**

MA MCP Required   
 MCP Certification Form Required   
 CT RCP Required   
 RCP Certification Form Required   
 MA State DW Required

PWSID: # \_\_\_\_\_

Project Entity:  
 Government  Municipality  MWRA  WRTA   
 Federal  21 J  School   
 City  Brownfield  MBTA

Please use the following codes to indicate possible sample concentration within the Conc Code column above:  
 H - High; M - Medium; L - Low; C - Clean; U - Unknown

Preservation Code  
 Courier Use Only  
 Total Number Of:  
 VIALS \_\_\_\_\_  
 GLASS \_\_\_\_\_  
 PLASTIC \_\_\_\_\_  
 BACTERIA \_\_\_\_\_  
 ENCORE \_\_\_\_\_

Glassware in the fridge? Y/N  
 Glassware in freezer? Y/N  
 Prepackaged Cooler? Y/N

\*Contest is not responsible for missing samples from prepacked coolers

1 Matrix Codes:  
 GW = Ground Water  
 WW = Waste Water  
 DW = Drinking Water  
 A = Air  
 S = Soil  
 SL = Sludge  
 SOL = Solid  
 O = Other (please define)

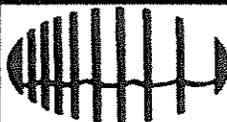
2 Preservation Codes:  
 I = Iced  
 H = HCL  
 M = Methanol  
 N = Nitric Acid  
 S = Sulfuric Acid  
 B = Sodium Bisulfate  
 X = Sodium Hydroxide  
 T = Sodium Thiosulfate  
 O = Other (please define)

PCB ONLY  
 Soxhlet  
 Non Soxhlet

\* Activate all samples for Specific Conductance per client email 4/16/2020 mmk

Disclaimer: Con-Test Labs is not responsible for any omitted information on the Chain of Custody. The Chain of Custody is a legal document that must be complete and accurate and is used to determine what analyses the laboratory will perform. Any missing information is not the laboratory's responsibility. Con-Test values your partnership on each project and will try to assist with missing information, but will not be held accountable.

I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples \_\_\_\_\_



**con-test**  
ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

**Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False**

Client WAS  
 Received By 981 Date 4/7/20 Time 8:10  
 How were the samples received? In Cooler T No Cooler \_\_\_\_\_ On Ice T No Ice \_\_\_\_\_  
 Direct from Sampling \_\_\_\_\_ Ambient \_\_\_\_\_ Melted Ice \_\_\_\_\_  
 Were samples within Temperature? 2-6°C T By Gun # 5 Actual Temp - 5.5  
 By Blank # \_\_\_\_\_ Actual Temp - \_\_\_\_\_  
 Was Custody Seal Intact? n/a Were Samples Tampered with? n/a  
 Was COC Relinquished? T Does Chain Agree With Samples? T  
 Are there broken/leaking/loose caps on any samples? F  
 Is COC in ink/ Legible? T Were samples received within holding time? F  
 Did COC include all pertinent Information? Client T Analysis T Sampler Name T  
 Project T ID's T Collection Dates/Times T  
 Are Sample labels filled out and legible? T  
 Are there Lab to Filters? F Who was notified? \_\_\_\_\_  
 Are there Rushes? F Who was notified? \_\_\_\_\_  
 Are there Short Holds? T Who was notified? Mandy  
 Is there enough Volume? T  
 Is there Headspace where applicable? n/a MS/MSD? F  
 Proper Media/Containers Used? T Is splitting samples required? F  
 Were trip blanks received? F On COC? F  
 Do all samples have the proper pH? Acid n/a Base n/a

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-	10	250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-	20	Flashpoint		Col./Bacteria	2oz Amb/Clear
DI-		Other Glass		Other Plastic	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

**Unused Media**

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-		250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-		Col./Bacteria		Flashpoint	2oz Amb/Clear
DI-		Other Plastic		Other Glass	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

**Comments:**

Received past hold for pH.

April 28, 2020

Daron Kurkjian  
Weston & Sampson Engineers MA  
55 Walkers Brook Drive  
Reading, MA 01867

Project Location: Brookline, MA  
Client Job Number:  
Project Number: [none]  
Laboratory Work Order Number: 20D0905

Enclosed are results of analyses for samples received by the laboratory on April 23, 2020. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Michelle Koch". The signature is written in a cursive style and is placed on a light gray rectangular background.

Michelle M. Koch  
Project Manager

NOT FOR BIDDING

## Table of Contents

Sample Summary	3
Case Narrative	4
Sample Results	5
20D0905-01	5
20D0905-02	7
20D0905-03	9
20D0905-04	11
20D0905-05	13
20D0905-06	15
Sample Preparation Information	17
QC Data	18
Organochloride Pesticides by GC/ECD	18
B256836	18
Pesticides Degradation Report	21
Dual Column RPD Report	22
Flag/Qualifier Summary	29
Certifications	30
Chain of Custody/Sample Receipt	32

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Weston & Sampson Engineers MA  
 55 Walkers Brook Drive  
 Reading, MA 01867  
 ATTN: Daron Kurkjian

REPORT DATE: 4/28/2020

PURCHASE ORDER NUMBER:

PROJECT NUMBER: [none]

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 20D0905

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Brookline, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
Comp-West-2 (0-2)	20D0905-01	Soil		SM 2540G SW-846 8081B	
Comp-Field-3 (0-4)	20D0905-02	Soil		SM 2540G SW-846 8081B	
Comp-East-1 (0-2)	20D0905-03	Soil		SM 2540G SW-846 8081B	
Comp-VT (0-2.5)	20D0905-04	Soil		SM 2540G SW-846 8081B	
Comp-LP (0-8)	20D0905-05	Soil		SM 2540G SW-846 8081B	
Comp-SW (0-7.5)	20D0905-06	Soil		SM 2540G SW-846 8081B	

NOT FOR BIDDING

## CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

SW-846 8081B

**Qualifications:****DL-03**

Elevated reporting limit due to matrix interference.

**Analyte & Samples(s) Qualified:**

20D0905-06[Comp-SW (0-7.5)]

**H-10**

Analysis was requested after the recommended holding time had passed.

**Analyte & Samples(s) Qualified:**

20D0905-01[Comp-West-2 (0-2)], 20D0905-02[Comp-Field-3 (0-4)], 20D0905-03[Comp-East-1 (0-2)], 20D0905-04[Comp-VT (0-2.5)], 20D0905-05[Comp-LP (0-8)], 20D0905-06[Comp-SW (0-7.5)]

**L-11**

Laboratory fortified blank/laboratory control sample was outside of control limits on the confirmation column, but within control limits on the primary column. All sample results are reported from the column within control criteria.

**Analyte & Samples(s) Qualified:****delta-BHC**  
B256836-BSD1**V-35**

Initial calibration verification (ICV) did not meet method specifications and was biased on the high side for this compound. Reported result is estimated.

**Analyte & Samples(s) Qualified:****delta-BHC [2C]**

20D0905-01[Comp-West-2 (0-2)], 20D0905-02[Comp-Field-3 (0-4)], 20D0905-03[Comp-East-1 (0-2)], 20D0905-04[Comp-VT (0-2.5)], 20D0905-05[Comp-LP (0-8)], 20D0905-06[Comp-SW (0-7.5)], B256836-BLK1, B256836-BS1, B256836-BSD1

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.

I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington  
Technical Representative

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0905-01

Sample Matrix: Soil

Sample Flags: H-10

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
alpha-BHC [1]	ND	0.0058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
beta-BHC [1]	ND	0.0058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
delta-BHC [2]	ND	0.0058	mg/Kg dry	1	V-35	SW-846 8081B	4/23/20	4/28/20 3:04	TG
gamma-BHC (Lindane) [1]	ND	0.0023	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Chlordane [1]	ND	0.023	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
4,4'-DDD [1]	ND	0.0046	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
4,4'-DDE [1]	0.019	0.0046	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
4,4'-DDT [1]	0.022	0.0046	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Dieldrin [1]	ND	0.0046	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Endosulfan I [1]	ND	0.0058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Endosulfan II [1]	ND	0.0093	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Endosulfan sulfate [1]	ND	0.0093	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Endrin [1]	ND	0.0093	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Endrin ketone [1]	ND	0.0093	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Heptachlor [1]	ND	0.0058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Heptachlor epoxide [1]	ND	0.0058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Hexachlorobenzene [1]	ND	0.0070	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG
Methoxychlor [1]	ND	0.058	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:04	TG

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	65.5	30-150	4/28/20 3:04
Decachlorobiphenyl [2]	59.1	30-150	4/28/20 3:04
Tetrachloro-m-xylene [1]	72.2	30-150	4/28/20 3:04
Tetrachloro-m-xylene [2]	69.2	30-150	4/28/20 3:04

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-West-2 (0-2)

Sampled: 4/6/2020 10:10

Sample ID: 20D0905-01

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	85.3		% Wt	1		SM 2540G	4/23/20	4/23/20 23:19	AVF

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0905-02

Sample Matrix: Soil

Sample Flags: H-10

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
alpha-BHC [1]	ND	0.0054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
beta-BHC [1]	ND	0.0054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
delta-BHC [2]	ND	0.0054	mg/Kg dry	1	V-35	SW-846 8081B	4/23/20	4/28/20 3:31	TG
gamma-BHC (Lindane) [1]	ND	0.0022	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Chlordane [1]	ND	0.022	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
4,4'-DDD [1]	ND	0.0043	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
4,4'-DDE [1]	ND	0.0043	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
4,4'-DDT [1]	ND	0.0043	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Dieldrin [1]	ND	0.0043	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Endosulfan I [1]	ND	0.0054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Endosulfan II [1]	ND	0.0087	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Endosulfan sulfate [1]	ND	0.0087	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Endrin [1]	ND	0.0087	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Endrin ketone [1]	ND	0.0087	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Heptachlor [1]	ND	0.0054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Heptachlor epoxide [1]	ND	0.0054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Hexachlorobenzene [1]	ND	0.0065	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG
Methoxychlor [1]	ND	0.054	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:31	TG

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	69.5	30-150	
Decachlorobiphenyl [2]	73.2	30-150	
Tetrachloro-m-xylene [1]	73.7	30-150	
Tetrachloro-m-xylene [2]	73.8	30-150	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-Field-3 (0-4)

Sampled: 4/6/2020 08:00

Sample ID: 20D0905-02

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	89.5		% Wt	1		SM 2540G	4/23/20	4/23/20 23:19	AVF

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0905-03

Sample Matrix: Soil

Sample Flags: H-10

Organochloride Pesticides by GC/ECD

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
alpha-BHC [1]	ND	0.0062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
beta-BHC [1]	ND	0.0062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
delta-BHC [2]	ND	0.0062	mg/Kg dry	1	V-35	SW-846 8081B	4/23/20	4/28/20 3:58	TG
gamma-BHC (Lindane) [1]	ND	0.0025	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Chlordane [1]	ND	0.025	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
4,4'-DDD [1]	ND	0.0049	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
4,4'-DDE [1]	0.035	0.0049	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
4,4'-DDT [1]	0.047	0.0049	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Dieldrin [1]	ND	0.0049	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Endosulfan I [1]	ND	0.0062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Endosulfan II [1]	ND	0.0099	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Endosulfan sulfate [1]	ND	0.0099	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Endrin [1]	ND	0.0099	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Endrin ketone [1]	ND	0.0099	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Heptachlor [1]	ND	0.0062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Heptachlor epoxide [1]	ND	0.0062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Hexachlorobenzene [1]	ND	0.0074	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG
Methoxychlor [1]	ND	0.062	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 3:58	TG

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	73.8	30-150	4/28/20 3:58
Decachlorobiphenyl [2]	66.4	30-150	4/28/20 3:58
Tetrachloro-m-xylene [1]	79.5	30-150	4/28/20 3:58
Tetrachloro-m-xylene [2]	75.6	30-150	4/28/20 3:58

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-East-1 (0-2)

Sampled: 4/6/2020 15:45

Sample ID: 20D0905-03

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	77.1		% Wt	1		SM 2540G	4/23/20	4/23/20 23:19	AVF

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0905-04

Sample Matrix: Soil

Sample Flags: H-10

**Organochloride Pesticides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
alpha-BHC [1]	ND	0.0056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
beta-BHC [1]	ND	0.0056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
delta-BHC [2]	ND	0.0056	mg/Kg dry	1	V-35	SW-846 8081B	4/23/20	4/28/20 4:26	TG
gamma-BHC (Lindane) [1]	ND	0.0022	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Chlordane [1]	ND	0.022	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
4,4'-DDD [1]	ND	0.0044	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
4,4'-DDE [2]	0.012	0.0044	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
4,4'-DDT [1]	0.015	0.0044	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Dieldrin [1]	ND	0.0044	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Endosulfan I [1]	ND	0.0056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Endosulfan II [1]	ND	0.0089	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Endosulfan sulfate [1]	ND	0.0089	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Endrin [1]	ND	0.0089	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Endrin ketone [1]	ND	0.0089	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Heptachlor [1]	ND	0.0056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Heptachlor epoxide [1]	ND	0.0056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Hexachlorobenzene [1]	ND	0.0067	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Methoxychlor [1]	ND	0.056	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:26	TG
Surrogates		% Recovery	Recovery Limits		Flag/Qual				
Decachlorobiphenyl [1]		68.0	30-150					4/28/20 4:26	
Decachlorobiphenyl [2]		65.9	30-150					4/28/20 4:26	
Tetrachloro-m-xylene [1]		70.7	30-150					4/28/20 4:26	
Tetrachloro-m-xylene [2]		69.9	30-150					4/28/20 4:26	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-VT (0-2.5)

Sampled: 4/6/2020 11:00

Sample ID: 20D0905-04

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	87.4		% Wt	1		SM 2540G	4/23/20	4/23/20 23:19	AVF

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0905-05

Sample Matrix: Soil

Sample Flags: H-10

**Organochloride Pesticides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.0053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
alpha-BHC [1]	ND	0.0053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
beta-BHC [1]	ND	0.0053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
delta-BHC [2]	ND	0.0053	mg/Kg dry	1	V-35	SW-846 8081B	4/23/20	4/28/20 4:53	TG
gamma-BHC (Lindane) [1]	ND	0.0021	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Chlordane [1]	ND	0.021	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
4,4'-DDD [1]	ND	0.0042	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
4,4'-DDE [2]	0.0045	0.0042	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
4,4'-DDT [1]	0.0046	0.0042	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Dieldrin [1]	ND	0.0042	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Endosulfan I [1]	ND	0.0053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Endosulfan II [1]	ND	0.0084	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Endosulfan sulfate [1]	ND	0.0084	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Endrin [1]	ND	0.0084	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Endrin ketone [1]	ND	0.0084	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Heptachlor [1]	ND	0.0053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Heptachlor epoxide [1]	ND	0.0053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Hexachlorobenzene [1]	ND	0.0063	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG
Methoxychlor [1]	ND	0.053	mg/Kg dry	1		SW-846 8081B	4/23/20	4/28/20 4:53	TG

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	67.5	30-150	
Decachlorobiphenyl [2]	67.4	30-150	
Tetrachloro-m-xylene [1]	68.6	30-150	
Tetrachloro-m-xylene [2]	69.2	30-150	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-LP (0-8)

Sampled: 4/6/2020 15:00

Sample ID: 20D0905-05

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	87.3		% Wt	1		SM 2540G	4/23/20	4/23/20 23:19	AVF

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0905-06

Sample Matrix: Soil

Sample Flags: DL-03, H-10

**Organochloride Pesticides by GC/ECD**

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Aldrin [1]	ND	0.027	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
alpha-BHC [1]	ND	0.027	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
beta-BHC [1]	ND	0.027	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
delta-BHC [2]	ND	0.027	mg/Kg dry	5	V-35	SW-846 8081B	4/23/20	4/28/20 5:20	TG
gamma-BHC (Lindane) [1]	ND	0.011	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Chlordane [1]	ND	0.11	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
4,4'-DDD [1]	ND	0.022	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
4,4'-DDE [1]	ND	0.022	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
4,4'-DDT [1]	ND	0.022	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Dieldrin [1]	ND	0.022	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Endosulfan I [1]	ND	0.027	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Endosulfan II [1]	ND	0.043	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Endosulfan sulfate [1]	ND	0.043	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Endrin [1]	ND	0.043	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Endrin ketone [1]	ND	0.043	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Heptachlor [1]	ND	0.027	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Heptachlor epoxide [1]	ND	0.027	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Hexachlorobenzene [1]	ND	0.032	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG
Methoxychlor [1]	ND	0.27	mg/Kg dry	5		SW-846 8081B	4/23/20	4/28/20 5:20	TG

Surrogates	% Recovery	Recovery Limits	Flag/Qual
Decachlorobiphenyl [1]	70.5	30-150	
Decachlorobiphenyl [2]	67.5	30-150	
Tetrachloro-m-xylene [1]	80.6	30-150	
Tetrachloro-m-xylene [2]	74.8	30-150	

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

Project Location: Brookline, MA

Sample Description:

Work Order: 20D0905

Date Received: 4/23/2020

Field Sample #: Comp-SW (0-7.5)

Sampled: 4/6/2020 13:15

Sample ID: 20D0905-06

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	88.4		% Wt	1		SM 2540G	4/23/20	4/23/20 23:19	AVF

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

**Sample Extraction Data**

**Prep Method: % Solids      Analytical Method: SM 2540G**

Lab Number [Field ID]	Batch	Date
20D0905-01 [Comp-West-2 (0-2)]	B256859	04/23/20
20D0905-02 [Comp-Field-3 (0-4)]	B256859	04/23/20
20D0905-03 [Comp-East-1 (0-2)]	B256859	04/23/20
20D0905-04 [Comp-VT (0-2.5)]	B256859	04/23/20
20D0905-05 [Comp-LP (0-8)]	B256859	04/23/20
20D0905-06 [Comp-SW (0-7.5)]	B256859	04/23/20

**Prep Method: SW-846 3546      Analytical Method: SW-846 8081B**

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
20D0905-01 [Comp-West-2 (0-2)]	B256836	10.1	10.0	04/23/20
20D0905-02 [Comp-Field-3 (0-4)]	B256836	10.3	10.0	04/23/20
20D0905-03 [Comp-East-1 (0-2)]	B256836	10.5	10.0	04/23/20
20D0905-04 [Comp-VT (0-2.5)]	B256836	10.3	10.0	04/23/20
20D0905-05 [Comp-LP (0-8)]	B256836	10.9	10.0	04/23/20
20D0905-06 [Comp-SW (0-7.5)]	B256836	10.5	10.0	04/23/20

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Organochloride Pesticides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B256836 - SW-846 3546

Blank (B256836-BLK1)

Prepared: 04/23/20 Analyzed: 04/27/20

Aldrin	ND	0.0050	mg/Kg wet							
Aldrin [2C]	ND	0.0050	mg/Kg wet							
alpha-BHC	ND	0.0050	mg/Kg wet							
alpha-BHC [2C]	ND	0.0050	mg/Kg wet							
beta-BHC	ND	0.0050	mg/Kg wet							
beta-BHC [2C]	ND	0.0050	mg/Kg wet							
delta-BHC	ND	0.0050	mg/Kg wet							
delta-BHC [2C]	ND	0.0050	mg/Kg wet							
gamma-BHC (Lindane)	ND	0.0020	mg/Kg wet							
gamma-BHC (Lindane) [2C]	ND	0.0020	mg/Kg wet							
Chlordane	ND	0.020	mg/Kg wet							
Chlordane [2C]	ND	0.020	mg/Kg wet							
4,4'-DDD	ND	0.0040	mg/Kg wet							
4,4'-DDD [2C]	ND	0.0040	mg/Kg wet							
4,4'-DDE	ND	0.0040	mg/Kg wet							
4,4'-DDE [2C]	ND	0.0040	mg/Kg wet							
4,4'-DDT	ND	0.0040	mg/Kg wet							
4,4'-DDT [2C]	ND	0.0040	mg/Kg wet							
Dieldrin	ND	0.0040	mg/Kg wet							
Dieldrin [2C]	ND	0.0040	mg/Kg wet							
Endosulfan I	ND	0.0050	mg/Kg wet							
Endosulfan I [2C]	ND	0.0050	mg/Kg wet							
Endosulfan II	ND	0.0080	mg/Kg wet							
Endosulfan II [2C]	ND	0.0080	mg/Kg wet							
Endosulfan Sulfate	ND	0.0080	mg/Kg wet							
Endosulfan Sulfate [2C]	ND	0.0080	mg/Kg wet							
Endrin	ND	0.0080	mg/Kg wet							
Endrin [2C]	ND	0.0080	mg/Kg wet							
Endrin Aldehyde	ND	0.0080	mg/Kg wet							
Endrin Aldehyde [2C]	ND	0.0080	mg/Kg wet							
Endrin Ketone	ND	0.0080	mg/Kg wet							
Endrin Ketone [2C]	ND	0.0080	mg/Kg wet							
Heptachlor	ND	0.0050	mg/Kg wet							
Heptachlor [2C]	ND	0.0050	mg/Kg wet							
Heptachlor Epoxide	ND	0.0050	mg/Kg wet							
Heptachlor Epoxide [2C]	ND	0.0050	mg/Kg wet							
Hexachlorobenzene	ND	0.0060	mg/Kg wet							
Hexachlorobenzene [2C]	ND	0.0060	mg/Kg wet							
Methoxychlor	ND	0.050	mg/Kg wet							
Methoxychlor [2C]	ND	0.050	mg/Kg wet							
Toxaphene	ND	0.10	mg/Kg wet							
Toxaphene [2C]	ND	0.10	mg/Kg wet							
Surrogate: Decachlorobiphenyl	0.174		mg/Kg wet	0.200		86.9	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.183		mg/Kg wet	0.200		91.5	30-150			
Surrogate: Tetrachloro-m-xylene	0.179		mg/Kg wet	0.200		89.4	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.174		mg/Kg wet	0.200		87.0	30-150			

NOT FOR BIDDING

V-35

QUALITY CONTROL

Organochloride Pesticides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B256836 - SW-846 3546

LCS (B256836-BS1)

Prepared: 04/23/20 Analyzed: 04/28/20

Aldrin	0.098	0.0050	mg/Kg wet	0.100		97.5	40-140			
Aldrin [2C]	0.10	0.0050	mg/Kg wet	0.100		102	40-140			
alpha-BHC	0.094	0.0050	mg/Kg wet	0.100		93.6	40-140			
alpha-BHC [2C]	0.10	0.0050	mg/Kg wet	0.100		102	40-140			
beta-BHC	0.094	0.0050	mg/Kg wet	0.100		94.3	40-140			
beta-BHC [2C]	0.098	0.0050	mg/Kg wet	0.100		97.6	40-140			
delta-BHC	0.043	0.0050	mg/Kg wet	0.100		43.2	40-140			
delta-BHC [2C]	0.050	0.0050	mg/Kg wet	0.100		49.6	40-140			V-35
gamma-BHC (Lindane)	0.092	0.0020	mg/Kg wet	0.100		91.5	40-140			
gamma-BHC (Lindane) [2C]	0.10	0.0020	mg/Kg wet	0.100		104	40-140			
4,4'-DDD	0.10	0.0040	mg/Kg wet	0.100		99.7	40-140			
4,4'-DDD [2C]	0.11	0.0040	mg/Kg wet	0.100		107	40-140			
4,4'-DDE	0.10	0.0040	mg/Kg wet	0.100		101	40-140			
4,4'-DDE [2C]	0.10	0.0040	mg/Kg wet	0.100		104	40-140			
4,4'-DDT	0.10	0.0040	mg/Kg wet	0.100		103	40-140			
4,4'-DDT [2C]	0.077	0.0040	mg/Kg wet	0.100		76.6	40-140			
Dieldrin	0.096	0.0040	mg/Kg wet	0.100		95.8	40-140			
Dieldrin [2C]	0.096	0.0040	mg/Kg wet	0.100		96.4	40-140			
Endosulfan I	0.093	0.0050	mg/Kg wet	0.100		93.1	40-140			
Endosulfan I [2C]	0.092	0.0050	mg/Kg wet	0.100		92.1	40-140			
Endosulfan II	0.097	0.0080	mg/Kg wet	0.100		97.1	40-140			
Endosulfan II [2C]	0.096	0.0080	mg/Kg wet	0.100		95.6	40-140			
Endosulfan Sulfate	0.085	0.0080	mg/Kg wet	0.100		85.2	40-140			
Endosulfan Sulfate [2C]	0.086	0.0080	mg/Kg wet	0.100		85.9	40-140			
Endrin	0.099	0.0080	mg/Kg wet	0.100		98.7	40-140			
Endrin [2C]	0.097	0.0080	mg/Kg wet	0.100		96.7	40-140			
Endrin Ketone	0.099	0.0080	mg/Kg wet	0.100		99.3	40-140			
Endrin Ketone [2C]	0.096	0.0080	mg/Kg wet	0.100		95.9	40-140			
Heptachlor	0.070	0.0050	mg/Kg wet	0.100		69.5	40-140			
Heptachlor [2C]	0.10	0.0050	mg/Kg wet	0.100		99.6	40-140			
Heptachlor Epoxide	0.094	0.0050	mg/Kg wet	0.100		94.1	40-140			
Heptachlor Epoxide [2C]	0.094	0.0050	mg/Kg wet	0.100		93.9	40-140			
Hexachlorobenzene	0.10	0.0060	mg/Kg wet	0.100		101	40-140			
Hexachlorobenzene [2C]	0.096	0.0060	mg/Kg wet	0.100		96.2	40-140			
Methoxychlor	0.10	0.050	mg/Kg wet	0.100		101	40-140			
Methoxychlor [2C]	0.10	0.050	mg/Kg wet	0.100		101	40-140			
Surrogate: Decachlorobiphenyl	0.190		mg/Kg wet	0.200		94.9	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.197		mg/Kg wet	0.200		98.5	30-150			
Surrogate: Tetrachloro-m-xylene	0.193		mg/Kg wet	0.200		96.4	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.193		mg/Kg wet	0.200		96.6	30-150			

LCS Dup (B256836-BS1)

Prepared: 04/23/20 Analyzed: 04/28/20

Aldrin	0.090	0.0050	mg/Kg wet	0.100		90.3	40-140	7.75	30	
Aldrin [2C]	0.092	0.0050	mg/Kg wet	0.100		92.2	40-140	9.98	30	
alpha-BHC	0.085	0.0050	mg/Kg wet	0.100		85.1	40-140	9.54	30	
alpha-BHC [2C]	0.096	0.0050	mg/Kg wet	0.100		96.0	40-140	5.68	30	
beta-BHC	0.087	0.0050	mg/Kg wet	0.100		87.2	40-140	7.84	30	
beta-BHC [2C]	0.088	0.0050	mg/Kg wet	0.100		87.9	40-140	10.5	30	
delta-BHC	0.038	0.0050	mg/Kg wet	0.100		38.5 *	40-140	11.6	30	L-11
delta-BHC [2C]	0.044	0.0050	mg/Kg wet	0.100		43.5	40-140	13.2	30	V-35
gamma-BHC (Lindane)	0.085	0.0020	mg/Kg wet	0.100		84.8	40-140	7.68	30	
gamma-BHC (Lindane) [2C]	0.096	0.0020	mg/Kg wet	0.100		95.6	40-140	8.12	30	

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

QUALITY CONTROL

Organochloride Pesticides by GC/ECD - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B256836 - SW-846 3546</b>										
<b>LCS Dup (B256836-BSD1)</b>										
					Prepared: 04/23/20 Analyzed: 04/28/20					
4,4'-DDD	0.092	0.0040	mg/Kg wet	0.100		92.4	40-140	7.64	30	
4,4'-DDD [2C]	0.097	0.0040	mg/Kg wet	0.100		97.0	40-140	9.44	30	
4,4'-DDE	0.094	0.0040	mg/Kg wet	0.100		94.0	40-140	7.29	30	
4,4'-DDE [2C]	0.094	0.0040	mg/Kg wet	0.100		94.1	40-140	9.62	30	
4,4'-DDT	0.095	0.0040	mg/Kg wet	0.100		94.6	40-140	8.06	30	
4,4'-DDT [2C]	0.073	0.0040	mg/Kg wet	0.100		72.7	40-140	5.14	30	
Dieldrin	0.089	0.0040	mg/Kg wet	0.100		88.7	40-140	7.77	30	
Dieldrin [2C]	0.088	0.0040	mg/Kg wet	0.100		88.3	40-140	8.84	30	
Endosulfan I	0.086	0.0050	mg/Kg wet	0.100		85.7	40-140	8.21	30	
Endosulfan I [2C]	0.084	0.0050	mg/Kg wet	0.100		83.5	40-140	9.78	30	
Endosulfan II	0.089	0.0080	mg/Kg wet	0.100		88.5	40-140	9.23	30	
Endosulfan II [2C]	0.087	0.0080	mg/Kg wet	0.100		86.9	40-140	9.54	30	
Endosulfan Sulfate	0.078	0.0080	mg/Kg wet	0.100		77.9	40-140	8.95	30	
Endosulfan Sulfate [2C]	0.077	0.0080	mg/Kg wet	0.100		77.4	40-140	10.4	30	
Endrin	0.091	0.0080	mg/Kg wet	0.100		91.2	40-140	7.91	30	
Endrin [2C]	0.089	0.0080	mg/Kg wet	0.100		88.7	40-140	8.61	30	
Endrin Ketone	0.090	0.0080	mg/Kg wet	0.100		90.3	40-140	9.47	30	
Endrin Ketone [2C]	0.087	0.0080	mg/Kg wet	0.100		86.5	40-140	10.3	30	
Heptachlor	0.065	0.0050	mg/Kg wet	0.100		64.5	40-140	7.42	30	
Heptachlor [2C]	0.091	0.0050	mg/Kg wet	0.100		90.5	40-140	9.56	30	
Heptachlor Epoxide	0.087	0.0050	mg/Kg wet	0.100		87.3	40-140	7.53	30	
Heptachlor Epoxide [2C]	0.086	0.0050	mg/Kg wet	0.100		86.1	40-140	8.64	30	
Hexachlorobenzene	0.094	0.0060	mg/Kg wet	0.100		94.1	40-140	7.17	30	
Hexachlorobenzene [2C]	0.087	0.0060	mg/Kg wet	0.100		87.0	40-140	10.1	30	
Methoxychlor	0.092	0.050	mg/Kg wet	0.100		92.4	40-140	9.07	30	
Methoxychlor [2C]	0.091	0.050	mg/Kg wet	0.100		90.6	40-140	10.4	30	
Surrogate: Decachlorobiphenyl	0.177		mg/Kg wet	0.200		88.4	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.186		mg/Kg wet	0.200		93.1	30-150			
Surrogate: Tetrachloro-m-xylene	0.181		mg/Kg wet	0.200		90.6	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.180		mg/Kg wet	0.200		89.9	30-150			

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

BREAKDOWN REPORT

Lab Sample ID: S047986-PEM1 Analyzed: 04/27/2020

Column Number:	1
Analyte	% Breakdown
4,4'-DDT [1]	4.55
Endrin [1]	2.56

Column Number:	2
Analyte	% Breakdown
4,4'-DDT [2]	4.34
Endrin [2]	2.79

BREAKDOWN REPORT

Lab Sample ID: S047986-PEM2 Analyzed: 04/28/2020

Column Number:	1
Analyte	% Breakdown
4,4'-DDT [1]	4.13
Endrin [1]	2.44

Column Number:	2
Analyte	% Breakdown
4,4'-DDT [2]	3.92
Endrin [2]	2.63

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

**Comp-West-2 (0-2)**

*SW-846 8081B*

Lab Sample ID: 20D0905-01 Date(s) Analyzed: 04/28/2020 04/28/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.846	0.000	0.000	0.019	
	2	6.617	0.000	0.000	0.019	0.0
4,4'-DDT	1	7.502	0.000	0.000	0.022	
	2	7.271	0.000	0.000	0.017	25.6

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

**Comp-East-1 (0-2)**

Lab Sample ID: 20D0905-03 Date(s) Analyzed: 04/28/2020 04/28/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.847	0.000	0.000	0.035	
	2	6.618	0.000	0.000	0.034	2.9
4,4'-DDT	1	7.503	0.000	0.000	0.047	
	2	7.271	0.000	0.000	0.037	23.8

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

**Comp-VT (0-2.5)**

Lab Sample ID: 20D0905-04 Date(s) Analyzed: 04/28/2020 04/28/2020

Instrument ID (1): ECD6 Instrument ID (2): ECD6

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDE	1	6.847	0.000	0.000	0.011	
	2	6.618	0.000	0.000	0.012	8.7
4,4'-DDT	1	7.503	0.000	0.000	0.015	
	2	7.271	0.000	0.000	0.012	22.2

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

LCS

*SW-846 8081B*

Lab Sample ID:                     B256836-BS1                                          Date(s) Analyzed:           04/28/2020                     04/28/2020          

Instrument ID (1):                     ECD6                                          Instrument ID (2):                     ECD6                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDD	1	7.289	0.000	0.000	0.10	
	2	7.039	0.000	0.000	0.11	9.5
4,4'-DDE	1	6.848	0.000	0.000	0.10	
	2	6.619	0.000	0.000	0.10	0.0
4,4'-DDT	1	7.503	0.000	0.000	0.10	
	2	7.272	0.000	0.000	0.077	26.0
Aldrin	1	6.187	0.000	0.000	0.098	
	2	5.882	0.000	0.000	0.10	2.0
alpha-BHC	1	5.473	0.000	0.000	0.094	
	2	5.223	0.000	0.000	0.10	6.2
beta-BHC	1	5.726	0.000	0.000	0.094	
	2	5.478	0.000	0.000	0.098	4.2
delta-BHC	1	5.844	0.000	0.000	0.043	
	2	5.650	0.000	0.000	0.050	15.1
Dieldrin	1	7.067	0.000	0.000	0.096	
	2	6.716	0.000	0.000	0.096	0.0
Endosulfan I	1	6.891	0.000	0.000	0.093	
	2	6.522	0.000	0.000	0.092	1.1
Endosulfan II	1	7.407	0.000	0.000	0.097	
	2	7.091	0.000	0.000	0.096	1.0
Endosulfan Sulfate	1	8.056	0.000	0.000	0.085	
	2	7.560	0.000	0.000	0.086	1.2
Endrin	1	7.239	0.000	0.000	0.099	
	2	6.932	0.000	0.000	0.097	2.0
Endrin Ketone	1	8.247	0.000	0.000	0.099	
	2	7.963	0.000	0.000	0.096	3.1
gamma-BHC (Lindane)	1	5.672	0.000	0.000	0.092	
	2	5.425	0.000	0.000	0.10	8.3
Heptachlor	1	5.983	0.000	0.000	0.070	
	2	5.684	0.000	0.000	0.10	35.3
Heptachlor Epoxide	1	6.607	0.000	0.000	0.094	

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**

LCS

*SW-846 8081B*

Lab Sample ID:                     B256836-BS1                                          Date(s) Analyzed:           04/28/2020                     04/28/2020          

Instrument ID (1):                     ECD6                                          Instrument ID (2):                     ECD6                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
	2	6.257	0.000	0.000	0.094	0.0
Hexachlorobenzene	1	5.367	0.000	0.000	0.10	
	2	5.143	0.000	0.000	0.096	4.1
Methoxychlor	1	7.884	0.000	0.000	0.10	
	2	7.821	0.000	0.000	0.10	0.0

NOT FOR BIDDING

**IDENTIFICATION SUMMARY  
FOR SINGLE COMPONENT ANALYTES**  
*SW-846 8081B*

**LCS Dup**

Lab Sample ID:                     B256836-BSD1                                          Date(s) Analyzed:           04/28/2020                     04/28/2020          

Instrument ID (1):                     ECD6                                          Instrument ID (2):                     ECD6                    

GC Column (1):                      ID:                      (mm)                      GC Column (2):                      ID:                      (mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%RPD
			FROM	TO		
4,4'-DDD	1	7.290	0.000	0.000	0.092	
	2	7.039	0.000	0.000	0.097	5.3
4,4'-DDE	1	6.848	0.000	0.000	0.094	
	2	6.619	0.000	0.000	0.094	0.0
4,4'-DDT	1	7.503	0.000	0.000	0.095	
	2	7.272	0.000	0.000	0.073	26.2
Aldrin	1	6.187	0.000	0.000	0.090	
	2	5.882	0.000	0.000	0.092	2.2
alpha-BHC	1	5.472	0.000	0.000	0.085	
	2	5.223	0.000	0.000	0.096	12.2
beta-BHC	1	5.726	0.000	0.000	0.087	
	2	5.479	0.000	0.000	0.088	1.1
delta-BHC	1	5.843	0.000	0.000	0.038	
	2	5.651	0.000	0.000	0.044	12.0
Dieldrin	1	7.067	0.000	0.000	0.089	
	2	6.716	0.000	0.000	0.088	1.1
Endosulfan I	1	6.891	0.000	0.000	0.086	
	2	6.523	0.000	0.000	0.084	2.4
Endosulfan II	1	7.407	0.000	0.000	0.089	
	2	7.091	0.000	0.000	0.087	2.3
Endosulfan Sulfate	1	8.056	0.000	0.000	0.078	
	2	7.560	0.000	0.000	0.077	1.3
Endrin	1	7.239	0.000	0.000	0.091	
	2	6.932	0.000	0.000	0.089	2.2
Endrin Ketone	1	8.246	0.000	0.000	0.090	
	2	7.963	0.000	0.000	0.087	3.4
gamma-BHC (Lindane)	1	5.672	0.000	0.000	0.085	
	2	5.425	0.000	0.000	0.096	12.2
Heptachlor	1	5.983	0.000	0.000	0.065	
	2	5.684	0.000	0.000	0.091	33.3
Heptachlor Epoxide	1	6.607	0.000	0.000	0.087	



## FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit is at the level of quantitation (LOQ)
DL	Detection Limit is the lower limit of detection determined by the MDL study
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
DL-03	Elevated reporting limit due to matrix interference.
H-10	Analysis was requested after the recommended holding time had passed.
L-11	Laboratory fortified blank/laboratory control sample was outside of control limits on the confirmation column, but within control limits on the primary column. All sample results are reported from the column within control criteria.
V-35	Initial calibration verification (ICV) did not meet method specifications and was biased on the high side for this compound. Reported result is estimated.

NOT FOR BIDDING

**CERTIFICATIONS**

**Certified Analyses included in this Report**

Analyte	Certifications
<i>SW-846 8081B in Soil</i>	
Aldrin	CT,NC,NH,NY,ME,VA
Aldrin [2C]	CT,NC,NH,NY,ME,VA
alpha-BHC	CT,NC,NH,NY,ME,VA
alpha-BHC [2C]	CT,NC,NH,NY,ME,VA
beta-BHC	CT,NC,NH,NY,ME,VA
beta-BHC [2C]	CT,NC,NH,NY,ME,VA
delta-BHC	CT,NC,NH,NY,ME,VA
delta-BHC [2C]	CT,NC,NH,NY,ME,VA
gamma-BHC (Lindane)	CT,NC,NH,NY,ME,VA
gamma-BHC (Lindane) [2C]	CT,NC,NH,NY,ME,VA
Chlordane	CT,NC,NH,NY,ME,VA
Chlordane [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDD	CT,NC,NH,NY,ME,VA
4,4'-DDD [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDE	CT,NC,NH,NY,ME,VA
4,4'-DDE [2C]	CT,NC,NH,NY,ME,VA
4,4'-DDT	CT,NC,NH,NY,ME,VA
4,4'-DDT [2C]	CT,NC,NH,NY,ME,VA
Dieldrin	CT,NC,NH,NY,ME,VA
Dieldrin [2C]	CT,NC,NH,NY,ME,VA
Endosulfan I	CT,NC,NH,NY,ME,VA
Endosulfan I [2C]	CT,NC,NH,NY,ME,VA
Endosulfan II	CT,NC,NH,NY,ME,VA
Endosulfan II [2C]	CT,NC,NH,NY,ME,VA
Endosulfan Sulfate	CT,NC,NH,NY,ME,VA
Endosulfan Sulfate [2C]	CT,NC,NH,NY,ME,VA
Endrin	CT,NC,NH,NY,ME,VA
Endrin [2C]	CT,NC,NH,NY,ME,VA
Endrin Ketone	NC
Endrin Ketone [2C]	NC
Heptachlor	CT,NC,NH,NY,ME,VA
Heptachlor [2C]	CT,NC,NH,NY,ME,VA
Heptachlor Epoxide	CT,NC,NH,NY,ME,VA
Heptachlor Epoxide [2C]	CT,NC,NH,NY,ME,VA
Hexachlorobenzene	NC
Hexachlorobenzene [2C]	NC
Methoxychlor	CT,NC,NH,NY,ME,VA
Methoxychlor [2C]	CT,NC,NH,NY,ME,VA

NOT FOR BIDDING

39 Spruce Street \* East Longmeadow, MA 01028 \* FAX 413/525-6405 \* TEL. 413/525-2332

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2017	100033	03/1/2022
MA	Massachusetts DEP	M-MA100	06/30/2020
CT	Connecticut Department of Public Health	PH-0567	09/30/2021
NY	New York State Department of Health	10899 NELAP	04/1/2021
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2021
RI	Rhode Island Department of Health	LAO00112	12/30/2020
NC	North Carolina Div. of Water Quality	652	12/31/2020
NJ	New Jersey DEP	MA007 NELAP	06/30/2020
FL	Florida Department of Health	E871027 NELAP	06/30/2020
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2020
ME	State of Maine	2011028	06/9/2021
VA	Commonwealth of Virginia	460217	12/14/2020
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2020
VT-DW	Vermont Department of Health Drinking Water	VT-255716	06/12/2020
NC-DW	North Carolina Department of Health	25703	07/31/2020
PA	Commonwealth of Pennsylvania DEP	68-05812	06/30/2020

NOT FOR BIDDING



I Have Not Confirmed Sample Container Numbers With Lab Staff Before Relinquishing Over Samples \_\_\_\_\_



**con-test**  
ANALYTICAL LABORATORY

Doc# 277 Rev 5 2017

**Login Sample Receipt Checklist - (Rejection Criteria Listing - Using Acceptance Policy) Any False Statement will be brought to the attention of the Client - State True or False**

Client WAS  
 Received By 981 Date 4/7/20 Time 18:10  
 How were the samples received? In Cooler T No Cooler \_\_\_\_\_ On Ice T No Ice \_\_\_\_\_  
 Direct from Sampling \_\_\_\_\_ Ambient \_\_\_\_\_ Melted Ice \_\_\_\_\_  
 Were samples within Temperature? 2-6°C T By Gun # 5 Actual Temp - 5.5  
 By Blank # \_\_\_\_\_ Actual Temp - \_\_\_\_\_  
 Was Custody Seal Intact? n/a Were Samples Tampered with? n/a  
 Was COC Relinquished? T Does Chain Agree With Samples? T  
 Are there broken/leaking/loose caps on any samples? F  
 Is COC in ink/ Legible? T Were samples received within holding time? F  
 Did COC include all pertinent Information? Client T Analysis T Sampler Name I  
 Project T ID's T Collection Dates/Times T  
 Are Sample labels filled out and legible? T  
 Are there Lab to Filters? F Who was notified? \_\_\_\_\_  
 Are there Rushes? F Who was notified? \_\_\_\_\_  
 Are there Short Holds? T Who was notified? Mandy  
 Is there enough Volume? T  
 Is there Headspace where applicable? n/a MS/MSD? F  
 Proper Media/Containers Used? T Is splitting samples required? F  
 Were trip blanks received? F On COC? F  
 Do all samples have the proper pH? Acid n/a Base n/a

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-	10	250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-	20	Flashpoint		Col./Bacteria	2oz Amb/Clear
DI-		Other Glass		Other Plastic	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

**Unused Media**

Vials	#	Containers:	#	#	#
Unp-		1 Liter Amb.		1 Liter Plastic	16 oz Amb.
HCL-		500 mL Amb.		500 mL Plastic	8oz Amb/Clear
Meoh-		250 mL Amb.		250 mL Plastic	4oz Amb/Clear
Bisulfate-		Col./Bacteria		Flashpoint	2oz Amb/Clear
DI-		Other Plastic		Other Glass	Encore
Thiosulfate-		SOC Kit		Plastic Bag	Frozen:
Sulfuric-		Perchlorate		Ziplock	

**Comments:**

Received past hold for pH.



Appendix D  
Soil Particle Size Testing

NOT FOR BIDDING



Turf & Soil Diagnostics

June 19, 2019

Angela Sawyer  
Weston & Sampson  
85 Devonshire Street, 3<sup>rd</sup> Floor  
Boston, MA 02109

RE: Cypress 2190095 - TSD File #19060046

Enclosed are the results of five soil samples received by our laboratory on 6-13-2019. These samples were tested as received. We have no specifications for the soils.

Particle size test results indicate that the TP 1 WSE, TP2 WSE, and TP 6 WSE samples are classified as gravelly sandy loam, per the USDA soil classification system. These samples have very high gravel contents bordering on very gravelly classifications. The TP 3 WSE and TP 5 WSE samples have lower gravel and sand content than the other samples, and they are classified as gravelly loam, per the USDA system.

There are moderate amounts of organic matter present in all of the samples. The TP 5 WSE sample has the highest organic content at 4.5% by dry weight, and the TP 2 WSE has the lowest organic content at 1.0%. The other three samples have organic contents between 2 and 3%.

Saturated hydraulic conductivity testing indicates that the samples have low infiltration rates at the tested bulk densities. It should be noted that soil infiltration rate is affected by compaction level. These samples were tested with a reduced compaction procedure. If the samples are in the field at higher compaction level than the tested bulk density, the infiltration rates may be lower than what was determined in the lab test.

If you have any questions or need further assistance, please contact us. Samples are generally kept on the premises for 45 days after report date. Thank you for using Turf & Soil Diagnostics, Inc.

Sincerely,

  
Digitally signed  
by Sam Ferro  
Date: 2019.06.19  
11:04:21 -05'00'

Sam Ferro  
President

Page 1 of 2



**Turf & Soil Diagnostics**

Weston & Sampson  
 Angela Sawyer  
 85 Devonshire Street, 3rd Floor  
 Boston, MA 02109



Date Received Jun-13-2019  
 Date Reported Jun-19-2019  
 Facility Cypress 2190095

**Particle Size Evaluation\***

Lab ID#	Sample Name	% Gravel (mm/US sieve)		% Sand 2.0 - 0.05 mm	% Silt 0.05-0.002mm	% Clay < 0.002mm	% Retained mm (US sieve)					
		6.3 (1/4")	4.0 (5)				2.0 (10)	V. Coarse 1.0 (18)	Coarse 0.50 (35)	Medium 0.25 (60)	Fine 0.15 (100)	Fine 0.10 (140)
19060046-1	TP 1 WSE	17.0	6.5	62.9	29.6	7.5	10.0	13.3	15.5	9.0	5.5	10.0
19060046-2	TP 2 WSE	22.7	3.9	66.6	27.8	5.6	10.7	13.6	15.5	9.8	6.0	11.3
19060046-3	TP 3 WSE	9.4	2.1	48.3	43.7	8.0	4.8	6.4	9.7	7.1	5.2	15.4
19060046-4	TP 5 WSE	8.9	3.2	46.1	41.6	12.3	4.1	7.5	11.0	7.3	4.5	12.1
19060046-5	TP 6 WSE	23.3	2.9	58.8	32.9	8.4	8.9	11.6	13.8	8.2	5.1	11.1

Lab ID#	Sample Name	Combined Fractions < 0.25 mm	D50 mm	USDA Textural Classification	Uniformity Coefficient Cu	Acid Reaction	Infiltration Rate** in/hr	Infiltration Rate** cm/hr	Bulk Density** g/cc	pH <sup>F</sup> 1:1	% Organic Matter Dry Wt.***
19060046-1	TP 1 WSE	61.2	0.26	Gravelly Sandy Loam	127	None	0.6	1.6	1.56	5.2	2.64
19060046-2	TP 2 WSE	60.2	0.21	Gravelly Sandy Loam	88	Slight	0.4	1.1	1.67	5.4	1.00
19060046-3	TP 3 WSE	79.2	0.06	Gravelly Loam	36	None	0.2	0.6	1.39	5.6	2.26
19060046-4	TP 5 WSE	77.4	0.05	Gravelly Loam	51	None	0.2	0.5	1.31	5.2	4.47
19060046-5	TP 6 WSE	65.6	0.13	Gravelly Sandy Loam	103	None	0.3	0.8	1.56	4.8	2.60

\*\*\*ASTM F1647 Method A

\*\* Saturated Hydraulic Conductivity (K-SAT) with compaction energy reduced to 5.75 ft lb/sq inch.

\*ASTM F1632 Method B & Determination of Size Factors SOP

† ASTM D4972 w/ CaCl<sub>2</sub> (pH in H<sub>2</sub>O available upon request)

Samples were tested as received and comments pertain only to the samples shown.

This report may not be reproduced in part, but only in full.

Sample condition upon receipt was normal.

Samples were received with a transmittal letter.

Reviewed by *Sami Ferrer*

Appendix E

ASTM F-2396 Rootzones for Athletic Fields

NOT FOR BIDDING



# Standard Guide for Construction of High Performance Sand-Based Rootzones for Athletic Fields<sup>1</sup>

This standard is issued under the fixed designation F2396; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This guide covers techniques that are appropriate for the construction of high performance sand-based rootzones for sports fields. This guide provides guidance for the selection of materials, including soil, sand, gravel, peat, and so forth, for use in designing and constructing sand-based sports turf rootzones.

1.2 Decisions in selecting construction and maintenance techniques are influenced by existing soil types, climatic factors, level of play, intensity and frequency of use, equipment available, budget and training, and the ability of management personnel.

1.3 This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This guide is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.4 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.5 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C1444 Test Method for Measuring the Angle of Repose of Free-Flowing Mold Powders (Withdrawn 2005)<sup>3</sup>
- D422 Test Method for Particle-Size Analysis of Soils
- D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
- D1883 Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils
- D1997 Test Method for Laboratory Determination of the Fiber Content of Peat Samples by Dry Mass
- D2944 Test Method of Sampling Processed Peat Materials
- D2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- D2976 Test Method for pH of Peat Materials
- D2980 Test Method for Volume Mass, Moisture-Holding Capacity, and Porosity of Saturated Peat Materials
- D3080 Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
- D4427 Classification of Peat Samples by Laboratory Testing
- D4972 Test Method for pH of Soils
- F1632 Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes
- F1647 Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes
- F1815 Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity, and Bulk Density of Athletic Field Rootzones

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.64 on Natural Playing Surfaces.

Current edition approved April 1, 2011. Published May 2011. Originally approved in 2004. Last previous edition approved in 2004 as F2396–04. DOI: 10.1520/F2396-11.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

**F2060** Guide for Maintaining Cool Season Turfgrasses on Athletic Fields

**F2107** Guide for Construction and Maintenance of Skinned Areas on Baseball and Softball Fields

**F2269** Guide for Maintaining Warm Season Turfgrasses on Athletic Fields

**F2651** Terminology Relating to Soil and Turfgrass Characteristics of Natural Playing Surfaces

### 3. Terminology

#### 3.1 Definitions:

3.1.1 Except as noted, soil-related definitions are in accordance with Terminology **F2651**.

NOTE 1—Particle size ranges for sand, silt, and clay used in this standard vary somewhat from ranges given in Test Method **D422**.

### 4. Significance and Use

4.1 A dense, uniform, smooth, and vigorously growing natural turfgrass sports field provides the ideal and preferred playing surface for most outdoor field sports. Such a surface is pleasing to the spectators and athletes. A thick, consistent, and smooth grass cover also increases playing quality and safety by providing stable footing for the athletes, cushioning their impact from falls, slides, or tackles, and cools the playing surface during hot weather. Sand is commonly used to construct high performance sports turf rootzone systems. Sand is chosen as the primary construction material for two basic properties, compaction resistance and improved drainage/aeration state. Sands are more resistant to compaction than finer soil materials when played upon within a wide range of soil moisture conditions. A loamy soil that may provide a more stable surface and enhanced growing media compared to sand under optimal or normal conditions will quickly compact and deteriorate in condition if used in periods of excessive soil moisture, such as during or following a rainy season. A properly constructed sand-based rootzone, on the other hand, will resist compaction even during wet periods. Once compacted, sands are easier to decompact with the use of mechanical aeration equipment. Even when compacted, sands will retain an enhanced drainage and aeration state compared to native soil rootzones under the same level of traffic. As such, sand-based rootzones are more conducive to providing an all-weather type of playing surface. Properties of both the soil and grass plants must be considered in planning, constructing, and maintaining a high quality sports turf installation. Turfgrass utilized must be adapted to the local growing conditions and be capable of forming a thick, dense, turf cover at the desired mowing height. Unvegetated sand in and of itself is not inherently stable; therefore, it is imperative that grasses with superior wear tolerance and superior recuperative potential are utilized to withstand heavy foot traffic and intense shear forces. Sand does, however, have incredible load bearing capacity and if a dense, uniform turf cover is maintained, the sand-based system can provide a very stable, firm, smooth, and uniform playing surface. A successful sand-based rootzone system is dependent upon the proper selection of materials to use in the project. The proper selection of sand, organic amendment, soil and gravel is of vital concern to the performance of the system and this guide addresses these issues.

4.1.1 During construction, consideration should be given to factors such as the physical and chemical properties of materials used in the area, freedom from stones and other debris, and surface and internal drainage.

4.1.2 Maintenance practices that influence the playability of the surface include mowing, irrigation, fertilization, and mechanical aeration and are factors addressed in other standards (see Guides **F2060** and **F2269**).

4.2 Those responsible for the design, construction, or maintenance, or a combination thereof, of natural turf athletic fields for high-performance, all-weather purposes will benefit from this guide.

4.3 A successful project development depends upon proper planning and upon the selection of and cooperation among design and construction team members. A high-performance, sand-based rootzone project design team should include a project designer, an agronomist or soil scientist, or both, and an owner's representative. Additions to the team during the construction phase should include an owner's project manager (often an expansion of role for the owner's representative), an owner's quality control agent (often the personnel that is employed in advance with the intent of becoming the finished project's sports field manager), an owner's testing agent (often an expansion of roles for the project's agronomist/soil scientist), and the contractor.

4.3.1 Planning for projects must be conducted well in advance of the intended construction date. This often requires numerous meetings to create a calendar of events, schedule, approvals, assessments, performance criteria, material sourcing, geotechnical reports, and construction budgets.

NOTE 2—Other specifications on soils for athletic field construction have been published and have been considered during the development of this guide.

### 5. Construction

5.1 The steps to be used in construction of a new athletic field include:

5.1.1 Survey and stake the site to establish subgrade and finish grade elevations.

5.1.2 Construct and prepare subgrade, and provide a correct and certified subgrade.

5.1.3 Install subsurface drainage system, frame out warning tracks, skinned areas, and so forth, as appropriate.

5.1.4 Install irrigation system (irrigation system may be installed prior to rootzone installation).

5.1.5 Prepare for rootzone installation.

5.1.5.1 Secure suitable sand, properly tested and approved.

5.1.5.2 Blend any amendments with sand to project specifications, approve using QC program.

5.1.5.3 Install approved gravel (if included in design).

5.1.6 Install rootzone blend.

5.1.7 Bring field to final grade and contour in accordance with specifications, compact to specifications.

5.1.7.1 A pre-plant fertilizer application may be applied at this point as specified.

5.1.8 Establish turf by appropriate methods (seed, sprigs, plugs or sod).

5.1.9 Fertilize the installation as appropriate based upon soil testing.

5.1.10 Turf is to be established based upon grow-in recommendations from a competent agronomist or soil testing laboratory, as appropriate for the turf species utilized and the climate of the site.

5.2 *Survey and Stake*—This procedure should be done to conform to the project designer’s specifications as appropriate for the sport. In the case of the construction of a replacement field, this step may be deleted or modified as appropriate. Care should be taken to protect staking during the construction process.

5.3 *Construct and Prepare Subgrade*—Contour the subgrade in accordance with specifications at a suggested tolerance of  $\pm 12.5$  mm ( $\frac{1}{2}$  in.) within 3 m (10 ft) of linear direction as specified in 5.5.6. The subgrade should be installed at a depth such to accommodate the final profile depth of rootzone and any gravel layer (if included). The subgrade should be compacted sufficiently (suggested 85 % minimum to 90 % maximum proctor density) to prevent future settling. Subgrade should be designed to conform to surface contour of finished playing surface.

5.4 *Subsurface Drainage System*—Many types of designs exist for subsurface drainage most commonly including a grid or herringbone pattern. The project specifications should include a subsurface drainage design to facilitate drainage for a 25 year storm event. Most commonly used drainage systems for sand-based athletic fields include utilizing perforated drainlines 10 cm (4 in.) in a 4.5 m (15 ft) to 6 m (20 ft) spacing between drainline laterals.

5.4.1 *Drainline Trenches*—Trenches constructed for drainlines should be excavated into a properly prepared, graded, and compacted subgrade. Drainage trenches should be of a depth such to conform to the drainage contours. All drainage trenches and drainline installations should maintain a minimum positive slope gradient of  $\geq 0.5$  % toward drainage outlets with trench bottoms compacted to subgrade specifications. Drainage excavations should be made such that a minimum of 5 cm (2 in.) of bedding material can be contained around the installed drainline (below, to each side, and above). For example, a 10 cm (4 in.) diameter drainline installation will require a minimum dimension of 20 cm (8 in.) wide by 20 cm (8 in.) depth (for example, 10 cm drainline + (5 cm/side  $\times$  2 sides) = 20 cm; 10 cm drainline + 5 cm top + 5 cm bottom = 20 cm). Once drainage trenches are excavated, all excavated material should be removed from the subgrade surface and disposed off site. The subgrade should have no elevations of subgrade soil material such to hinder the flow of water along the subgrade interface into the drainage trench. Once drainage trenches have been excavated, the trench bottoms should be sufficiently compacted to the subgrade compaction specifications prior to installation of drainage system. Subgrade shall be re-surveyed and certified prior to gravel or rootzone import.

5.4.2 *Surface Drainage*—To maintain adequate surface drainage, all field installations should include a minimum of 0.5 % slope gradient (simple slope or crown) to remove water off of the playing field in case of a storm event with severe

rainfall intensity and to facilitate the use of tarps. It is recommended that an adequate number of small size surface drainage inlets be installed in the perimeter of the installation (in out-of-play areas) and tied into the drainage collection system for removal of surface runoff with the subsurface drainage water.

NOTE 3—In planning and designing projects, consideration shall be given to the permeability of the rootzone when determining the slope of the finished surface and the need for adjacent surface drainage systems. Further consideration shall be given in cold climates where frost penetration may impact the permeability of the rootzone when determining the slope of the finish surface and the need for adjacent surface drainage systems. Generally, the need for improved surface drainage increases as the permeability of the rootzone decreases.

5.4.3 *Sub-Surface Drainage Material*—Three recommended options exist for the use of drainage material. Option 1 could utilize sand rootzone material to backfill around drainlines within the drainage trenches. Option 2 could utilize gravel material to backfill around drainlines in the drainage trenches. Option 3 could include the use of gravel to backfill around drainlines in drainage trenches and to form a drainage layer overlying the subgrade before placement of rootzone sand blend. All backfill treatments shall be compacted to specifications prior to further installation procedures. It is recommended that backfill for trench bottoms is installed and compacted prior to installing drain pipe into the trenches. It is recommended that the trench bottom remain unobstructed as installed and no soil pilings, wood blocks, concrete or metal blocks are used to adjust and maintain slope of drainlines. Any blocks used for this purpose must be removed from under the drainlines and any cavities backfilled before proceeding. It is recommended that drainage trenches (bottom and sides *only*) should be lined with a woven geosynthetic filter fabric to prevent contamination (lateral movement of subgrade materials into trench fill). Geosynthetic filter fabric should *not* be used to cover the drainage trench. It is recommended that all drainlines are installed straight (without ‘snaking’) within the trenches. It is recommended that sleeves (of oversize PVC piping) should be installed across the drainage trenches at appropriate points as indicated by the irrigation design to facilitate irrigation pipe installation at points where the irrigation line crosses over the drainage trenches.

5.4.3.1 *Option 1*—Rootzone sand (with or without other rootzone amendments) may be utilized to backfill around drainlines. If sand is utilized for this purpose, the drainage pipe used in these installations must be of a type that utilizes slitted perforations with slit openings meeting a specification of  $D_{85}$  sand/slot width  $>1.5$ , to reduce the potential for particle migration into the drainage system (7).

5.4.3.2 *Option 2*—Gravel may be used for backfill of drainage trenches. If gravel is used for backfill, it should conform to the specifications in Table 1. Soft gravel minerals (such as limestone, sandstone, or shale) are not acceptable for use and all questionable gravel material should be tested for weathering stability using the sulfate soundness test (see Test Method C88). A loss of material greater than a 12 % by weight is unacceptable. Likewise, any gravel material that is suspect in its mechanical stability should be tested utilizing the LA

**TABLE 1 Gravel Filter/Drainage Layer Specifications (7, 8)**

Performance Factor	Criteria	Acceptable Value
Filtering Factors	D <sub>15</sub> of gravel/D <sub>85</sub> of rootzone mix	<5
	D <sub>50</sub> of gravel/D <sub>50</sub> of rootzone mix	<25
Permeability Factor	D <sub>15</sub> of gravel/D <sub>15</sub> of rootzone mix	≧5
Uniformity Factors	D <sub>90</sub> of gravel/D <sub>15</sub> of gravel	≦2.5
	>12 mm fraction	0 %
	<2 mm fraction	≦10 %
	<1 mm fraction	≦5 %

Abrasion test (see Test Method C131). An LA Abrasion test value greater than 40 is unacceptable.

5.4.3.3 *Option 3*—Gravel may be used to backfill drainage trenches and to form a drainage layer beneath the sand rootzone. If gravel is used for this purpose, the same gravel should be used for backfill and the drainage layer, and should conform to the specifications given in Table 1. Soft gravel minerals are not acceptable for use and all questionable gravel material should be tested for weathering stability using the sulfate soundness test (see Test Method C88). A loss of material greater than 12 % by weight is unacceptable. Likewise, any gravel material that is suspect in its mechanical stability should be tested utilizing the LA Abrasion test (see Test Method C131). An LA Abrasion test value greater than 40 is unacceptable. A gravel drainage layer should be a minimum of 7.5 cm (3 in.), with 10 cm to 15 cm (4 to 6 in.) preferred. During installation, the gravel is typically dumped from the delivery trucks onto the perimeter, and then distributed over the construction site by a small, tracked, crawler tractor (or similar), being careful to avoid driving over and crushing the drain lines. Contour and compact the gravel in accordance with specifications at a suggested tolerance of ±12.5 mm (½ in.) within 3 m (10 ft) of linear direction and as specified in 5.5.6.

5.4.3.4 *Discussion*—If gravel is utilized as a drainage layer, it will improve the drainage of the system under conditions of saturated flow only. Saturated flow conditions typically only occur during intense or prolonged rainfall events. Under unsaturated conditions, the use of a gravel layer will impede drainage and will serve to retain additional moisture within the rootzone profile. This condition is commonly referred to as a ‘perched’ or ‘suspended’ water table. The water perched in the rootzone at the interface with the gravel will be retained in a condition nearing saturation. While such conditions may be beneficial in terms of water conservation, care must be exercised in the design of the rootzone system, such that excessive moisture is not retained that could lead to anaerobic rootzone conditions. Such conditions are common on poorly designed gravel, underdrained, sand-based rootzone systems. If a gravel underdrain system is used, the design parameters should be adjusted to assure a minimum of 15 cm (6 in.) of well aerated rootzone. If the capillary rise of salts or other contaminants from the subgrade are of concern on a particular project, the use of a gravel layer is recommended to prevent this occurrence.

5.4.3.5 *Determination of Well-Aerated Rootzone Conditions*—A well-aerated rootzone is normally that portion of the rootzone that retains ≥20 % air-filled porosity (AFP) after gravitational drainage ceases (as determined at 40 cm

tension). To determine the depth of sand required to obtain the desired well-aerated profile depth, a soil moisture retention curve of the rootzone material must be determined. Considering that the perched water above a gravel layer will be retained at a tension of approximately 10 cm tension, the moisture retention status of the rootzone material should be considered at tensions greater than 10 cm until the proportion of air-filled pores within the rootzone material reaches 20 % or greater. For example, let’s hypothesize that a soil moisture retention curve shows that a material reaches 20 % AFP at 21 cm tension. To provide a 15 cm well-aerated rootzone, our profile depth would be 21 cm (AFP threshold tension) – 10 cm (tension of perched water) + 15 cm of well-aerated rootzone, for a total rootzone depth of 26 cm. Moisture retention points should be determined utilizing methodologies in Test Method F1815.

5.5 *Sand-Based Rootzone*—Materials used to provide the sand for the rootzone shall meet the performance criteria established in this guide. Additions of peat or soil, or both, may be included in small proportions as part of the rootzone blend, if the inclusion of these materials will not bring the resulting blend out of specifications and if they are uniformly blended together to form a homogeneous blend.

5.5.1 *Sand Type*—Quartz sands are recommended; if sand contains more than 5 % calcium carbonate equivalent, the sand has the potential for particle cementation due to dissolution and reprecipitation of carbonates. Other sands are not recommended due to their propensity to weather (by either mechanical or chemical means, or both) over a relative short period of time (1 to 5 years) that may influence the performance of the construction. For example, granitic material often contains appreciable amounts of feldspar or mica which is much more readily subject to weathering. Caution should be given to sands that contain appreciable proportions of mica minerals. Mica grains have a flat or plate-like morphology and redistribution of these grains with a rootzone profile may create layers that impede drainage and aeration.

5.5.2 *Particle Size Distribution*—Particle size analyses (Test Methods D422 or F1632) are based on oven-dried mass of a weighed sample; shaker is the preferred method of dispersion to prevent fracturing of sand particles that may falsely influence the sand size distribution. There are many published specifications within the turf industry for sand size distribution for sand-based rootzone constructions. Many of these specifications are primarily intended for golf green construction. As such, the amount of coarse material allowed is limited in order to produce a very smooth surface under extremely short mowing conditions to facilitate smooth roll of the small golf ball. Such conditions are not required for athletic field construction and the use of higher proportion of coarser sand material can be utilized. Table 2 includes a recommended sand particle size distribution (before amendments), but is not inclusive of all size distributions of sands that could be used to produce a high performance sand-based field. Additionally:

5.5.2.1 No more than 30 % in the combined very coarse sand, fine gravel, and gravel fractions.

5.5.2.2 At least 60 % of the total sand should be in the combined medium sand and coarse sand fractions.

**TABLE 2 Recommended Particle Size Distribution of Rootzone Sand<sup>A</sup>**

Size Fraction	Particle Diameter Range	Specified Range (%)
Gravel	>4.75 mm	0 %
Gravel	3.4 to 4.75 mm	<5 %
Fine gravel	2.0 to 3.4 mm	<20 %
Very coarse sand	1.0 to 2.0 mm	<20 %
Coarse sand	0.5 to 1.0 mm	25 to 50 %
Medium sand	0.25 to 0.5 mm	>25 %
Fine sand	0.15 to 0.25 mm	<10 %
Very fine sand	0.05 to 0.15 mm	<5 %
Silt	0.002 to 0.05 mm	<5 %
Clay	<0.002 mm	<3 %

<sup>A</sup> See 5.5.2.1-5.5.2.4 for additional recommendations.

5.5.2.3 No more than 15 % in the combined fraction less than 0.25 mm (fine sand, very fine sand, silt and clay fractions).

5.5.2.4 A Coefficient of Uniformity ( $CU = D_{60}/D_{10}$ ) value of 2.5 to 4.5.

5.5.3 *Sand Shape*—Although acceptable sand-based rootzones can be constructed with sands of all shapes, this factor is worth consideration in athletic field construction. Sand shape is generally classed as to angularity and sphericity. Angularity includes well-rounded, rounded, subrounded, subangular, angular, and very angular. Sphericity includes high sphericity, medium sphericity, and low sphericity. Sand shape should be classified according to Figure 1 of Test Method F1632. While no sand will have sand grains of uniform shape, there is normally a predominant shape of grains from a single sand source. The shape and dimension of sand grains affect its stability. For example, rounded grains are the least stable because of the lack of edges to interlock the grains. As such the sand grains tend to act like small ball bearings. Angular sands to have greater stability because the sharper edges have a greater grain-grain interlock and resistance to shear. Sands that have a predominance of grains that show extremes in angularity (extremely angular or extremely round) that fit outside the classification in Test Method F1632 should be avoided. Likewise, extremely high or low sphericity particles should be avoided, including plate-like particles. Many dune sand sources may contain sand grains that have internal fracture planes. During the salination process, dune sands can become rounded as they roll and skip along the surface as a function of the wind. However, during strong wind events, the grains can be moved at a high velocity, whereby the grains impacting upon each other develop ‘cracks’ or fracture planes within the grain. When rootzones are constructed with these sands, traffic and other weathering factors may cause the grains to fracture along these planes, resulting in the formation of silt-size quartz grains which may then be prone to particle migration and subsequent accumulation in layers. Sand grains should be examined under 20 to 50× magnification for sand size, shape, and potential fracture planes.

5.5.4 *Rootzone Amendments*—Two types of amendments are commonly included in a blend with sand that together make up the rootzone material. This would most commonly include a blend with soil or peat, or both.

5.5.4.1 *Soil*—Soil is commonly used as a component of a sand-based rootzone construction in order to provide some

enhanced capacity for moisture and nutrient retention and sometimes to improve the mechanical stability of the rootzone. Proportions of soil in a high performance rootzone mix typically range from 5 to 15 % by volume. The amount of soil to include in a blend depends upon the make-up of the soil component, and the effects of the soil additions to the physical performance characteristics of the resulting blend. Ideally, the soil component would be one that is composed purely of clay. Clay minerals generally have good moisture and nutrient retention capacities, and if present in high enough proportions may significantly improve rootzone stability by enhanced cohesive properties. When clay is included in a blend with sand in the appropriate proportion, the clay will coat the sand and form bridges between sand grains without clogging up the large pores (interstitial pores or packing voids) of the sand matrix. If a pure clay source is used, many sands will accommodate 10 to 15 % clay additions without clogging. However, care must be used in the blending and preparation process because a small increase in clay content can cause a drastic detrimental change in the performance of the rootzone. This is a primary reason for a well-designed calibration and quality control program. Other soils may be used as a component of a sand-based rootzone blend, but should be restricted to those soil textures that are low in silt content. Silt is normally a fine-grained, non-plastic soil material and is subject to migration and layering. Soils that exhibit a silt to clay ratio greater than 2 should not be used. Likewise, those soils with a fines (silt + very fine sand + fine sand) to clay ratio greater than 3 should be avoided. Generally, soils containing more than 6 % organic matter should not be used, nor any mucky-type soils. Peat may be used to increase the organic matter content in a three-way blend of sand-soil-peat.

5.5.4.2 *Peat*—Peat is commonly used as an amending source in a sand-based rootzone. Proportions of peat included in a blend (usually 15 to 20 % by volume) should give an organic matter content of 0.3 to 2.0 % by mass. As with soils, peat adds water and nutrient retention capacity, but will add little in terms of increased soil strength (cohesion). Peats can also slow water movement through excessively drained sands. Finer peats, whether by decomposition or by finer grinding, generally have a greater effect on slowing water movement. Three sources of peat have been used successfully to modify sands. They are moss peats (sphagnum and hypnum), reed-sedge peats (derived from reeds, sedges, marsh grasses, and other plants of the wetland), and peat humus, which is decomposed peat (usually derived from moss or reed-sedge sources). Peats to avoid in modifying sands are woody peat (derived from trees and shrubs) and sedimentary peat (derived from plants that grow in water and found on pond and lake bottoms). Peats can be classified according to fiber content (see Classification D4427). In general, moss peats fall into the fibric classification, which indicates the greatest fiber content; reed-sedge peats into the hemic classification (a mid-range of fiber content); and peat humus into the sapric classification (lowest fiber content). The acceptable sources of peat range in their physical and chemical properties and information in Table 3 can be utilized during the selection of a peat. Fibric peats are characterized by low ash contents, and low volume weights

**TABLE 3 Suitability Ratings of Properties of Organic Amendments for Utilization in High Performance Sand-based Athletic Field Rootzones**

Rating/Property	C/N Ratio	Ash Content	pH
Preferred	20:1 to 30:1	<12 %	4.5 to 7.0
Acceptable	30:1 to 50:1	12 to 17 %	3.5 to 4.5
Marginal	50:1 to 80:1	17 to 30 %	3.0 to 3.5
Unacceptable, or use only with caution	<20:1 or >80:1	>30	<3.0 or >7.0

(bulk densities). Because of a lower volume weight, a greater amount on a volume basis than with the other sources will be needed to achieve a desired organic matter content in the blend, which is reported on a mass basis. The low volume weight peats do not mix as readily as heavier peats when being mixed on-site by tillage, but this problem is largely negated by off-site mixing with various blending equipment. Off-site mixing is preferred for high performance sand-based rootzones. The fibric peats decompose more rapidly than hemic and sapric peats; however, their longevity is such that they provide benefits until organic additions from the turfgrass stand contribute significantly to the soil organic matter pool. With sphagnum moss peat, low pH may create the need for lime additions to the mix, and relatively low nitrogen (N) content and wide C/N ratio could lead to N tie-up by microorganisms and the need for additional N fertilization. Potential problems encountered with fibric peats are reduced with hemic peats, which are denser, somewhat lower in acidity, higher in N content, and more readily mixed. Also sapric, or decomposed peats, have fewer problems with pH, N content, and volume weight; however, they contain more ash and some low quality sapric peats may contain mineral soils that result in unacceptably high ash contents. The organic matter in sapric peats, already being in a somewhat decomposed state, is more stable than organic matter in the more fibrous peats. Peats considered for inclusion in high performance sand-based rootzones can be classified according to Classification [D4427](#), and further tested by methods listed in [5.5.5.3](#). Suggested recommendations for peat/organic amendments for high performance sand-based rootzones are given in [Table 3](#).

**5.5.4.3 Discussion**—Often the use of composts are proposed as substitutes for peat products. While in some instances, composts may produce satisfactory products for inclusion in a rootzone construction, the variability of compost products tends to be much higher than those of natural peat deposits. This variability is especially true over time and from season to season. Composts also typically contain higher ash content, may contain contaminants of soil or other earthy materials, may contain wood, and may not be completely stable in terms of chemical and physical properties. Composts may also contain high elevations of trace metals or salts, or both (although testing can be used to determine the level of these constituents). The use of composts in a high performance sand-based rootzone should be approached with a high degree of caution and employed with thorough quality control in the sourcing and construction phases. Under strict control and testing, composts have and may be used for high performance sand-based rootzone constructions. It is recommended that only compost products be used that have been used success-

fully in high performance sand-based field mixes in the past, and only in amounts sufficient to meet the performance parameters outlined in this guide. Mix design and testing should be performed by laboratories experienced in evaluating composts and compost amended mixes.

**5.5.4.4 Quality Control (QC) Program**—Every high performance sand-based rootzone should be constructed using a well designed and administered calibration and QC program. Such program should set the parameters to be included in the QC testing, the procedures for sampling, sampling intervals, handling the samples (chain of custody), the limits/tolerances or confidence intervals for accept/reject status within a sample, and the allowable variability of test parameters between samples.

**5.5.5 Rootzone Blending**—Rootzone blending is perhaps the most critical aspect of the construction process. Once amendment ratios are known, the components of the blend should be prepared.

**5.5.5.1 Sand**—The sand should have been previously processed, stockpiled, tested, approved, and quality control tested.

**5.5.5.2 Soil**—Any soil amendments should have been tested and approved and then prepared for blending by first shredding, screening, and the removal of any objectionable stones or other items. Once the soil has been prepared in this manner, the soil should be transported to the blending site for stockpiling. Once the material arrives on site, it should be protected from weather, particularly rain. During the processing and transportation of the soil component, it may be beneficial to mix or homogenize the soil material as much as is feasibly possible. Once homogenized and transported to the blending site, an additional sample should be taken and tested for conformance with the original tested material so that any adjustments in the blending proportions needed to compensate for variance in the soil stockpile may be made. It should be noted that soil components (particularly topsoils) are a potential source of weeds by seeds or plant parts. Consideration for eradication or fumigation of these materials may be warranted.

**5.5.5.3 Peat**—The peat product used for amending the sand should have been tested and approved prior to shipment of material to the blending site. Once the material arrives on site, it should be protected from weather, particularly rain. As peat is unloaded or unpackaged, it should be visually inspected for apparent uniformity within the shipment. If the project owner, project designer, or agronomist is sufficiently familiar with the peat material from past projects, the only QC testing that may be required for the peat is the calibration and QC for organic matter content of the resulting sand-peat mix. If the peat product/source is new or unfamiliar to the project personnel, additional QC tests should be performed at set testing intervals prior to blending. Peat QC test parameters may include ash content, organic matter, pH, fiber content, moisture content and volume weight (see Test Methods [D1997](#), [D2944](#), [D2974](#), [D2976](#), [D2980](#), and Classification [D4427](#)) and C/N ratio. The above advice also applies to composts used as organic amendments.

**5.5.5.4 Blending**—The blending operation should only proceed once all of the materials have been tested and approved

and transported to the blending site. It is recommended that blending operations proceed off-site as to the installation. Possible blending sites include: (1) the location for sand materials supply or stockpile; and (2) in an area adjacent to field site (such as a paved parking lot). The materials to be blended should be blended in a slightly moist to moist condition. Excessively wet material will not blend together properly and uniformly. Blending should be performed using commercial soil blending equipment designed for this purpose. The project designer should calculate production to include a minimum of 5 % (10 % preferred) additional rootzone material to account for shrinkage. Any leftover rootzone material could be stockpiled by the owner for use in future maintenance (topdressing) operations and for other repairs. The blending should be initiated with the preparation of a 'batch' for calibration purposes. A calibration batch stockpile is normally composed of a 100 ton minimum. The calibration batch should be sampled and tested to assure the blending equipment is properly calibrated before proceeding further. Each test for calibration may delay the blending operation 24 to 48 h, awaiting test results and recommendations from the testing laboratory. Another option would be to employ a commercial testing agent with the capacity to perform on-site testing with mobile laboratory equipment. The mobile laboratory may be utilized throughout the calibration and blending process to facilitate the logistics of the operation. It is recommended that 1 of 10 tests conducted by the mobile laboratory are duplicated at the regular laboratory facility to assure accuracy of the on-site testing data.

**5.5.5.5 Stockpile Storage and Transportation**—During the blending operation, and once the rootzone material has been blended and all QC approvals have been met, the stockpiled material should be protected against the effects of weather. If heavy rain is expected, the stockpiles should be covered, if possible. To protect against wind erosion of soil or organic components, the stockpiles should be kept moist on the surface of the stockpile. Once stockpiled rootzone material is to be transported to the construction site, care should be taken to ensure that the loading equipment and haul vehicles/containers are properly sanitized such to contain no foreign soil, aggregate, asphalt, and so forth that might contaminate the blended rootzone material. When the stockpile material is being picked up for loading, care should be exercised to assure that the bucket of the loading equipment is not picking up underlying soil or asphalt and that cleated tires or tracks are not 'tilling' other material into the rootzone mix.

**5.5.6 Grading Requirements**—All grades should conform to those grades and elevations as specified in the construction documents. The suggested method for grade evaluation and grade tolerances are:

**5.5.6.1** For general conformance, perform an as-built survey based upon an 8 m (25 ft) grid to be within:

- (1) *Subgrade*,  $\pm 12.5$  mm ( $\frac{1}{2}$  in.).
- (2) *Gravel Drainage Layer (if used)*,  $\pm 12.5$  mm ( $\frac{1}{2}$  in.).
- (3) *Surface/Finish*,  $\pm 6$  mm ( $\frac{1}{4}$  in.).

**5.5.6.2** For specific conformance and acceptability of grades between grid points (spot check), it is recommended that any observed (or suspected) high and low points be checked using a 3-m (10-ft) straight edge with tolerances based upon:

- (1) *Subgrade*,  $\pm 12.5$  mm ( $\frac{1}{2}$  in.) in any linear direction.
- (2) *Gravel Drainage Layer (if used)*,  $\pm 12.5$  mm ( $\frac{1}{2}$  in.) in any linear direction.
- (3) *Surface/Finish*,  $\pm 6$  mm ( $\frac{1}{4}$  in.) in any linear direction.

**5.5.6.3** Grades shall be correct, certified, and approved (at each phase: subgrade, gravel layer (if used), and finish grade) by the owner or project designer, or both, prior to proceeding to the next phase of construction. Correct and certified grade shall be given by the production of an as-built drawing/diagram depicting elevation and location data that has been prepared and stamped by a licensed surveyor. The certified as-built drawing/diagram shall be submitted for approval to the owner or project designer, or both, as specified in the construction documents prior to proceeding to the next phase of the field construction.

**5.6 Installation**—Installation procedures include the installation of the drainage trench backfill material, installation of any gravel drainage layers, delivery, and installation of the rootzone material, installation of the irrigation, finish grading of the site, and then turf establishment. Rootzone installation depth shall conform to project designer's specifications. Typical rootzone placement depths range from 15 cm (6 in.) to 30 cm (12 in.) for installations without a gravel drainage layer. If a gravel drainage layer is used, the rootzone placement depth must be correlated with the desired depth of well-aerated rootzone. Typically, the profile depth of a sand-based field installed over a gravel drainage layer ranges from 23 cm (9 in.) to 40 cm (16 in.).

**5.6.1 Installation of Drainage Materials**—Drainage trench installation should be completed to the point of backfill and compaction (see 5.4.3) prior to installation of the irrigation system. If a gravel drainage layer is a component of the system design, the installation of the gravel layer should be completed following the rough installation and pressure testing of the irrigation system.

**5.6.2 Installation of the Irrigation System**—Irrigation system shall be designed and installed to provide head to head coverage with uniform distribution (9). Suggested irrigation design uniformity values (CUIRR or Christiansen's coefficient of uniformity) are: (1) football, soccer, or other rectangular field designs:  $\geq 90$  %; and (2) baseball/softball, cricket, or other non-rectangular field designs:  $\geq 84$  %. Irrigation pipe should be installed to a depth sufficient to be protected from mechanical aeration maintenance practices. Normally, this would be at a depth of 36 cm (14 in.) or more from finished grade. In the case of shallow profile designs of less than 20 cm (8 in.), the irrigation lateral and mainlines may be installed within the subgrade below the depth of the entire drainage system. The installation of the irrigation lines below the drainage system serves to isolate the irrigation lines from potential damage from aeration or other maintenance practices. Irrigation mainlines

and lateral lines (with sleeving, if included) should be installed prior to placement of the gravel drainage layer (if used) or rootzone materials, or both. Irrigation lines crossing drainage trenches may be ‘sleeved’ across the drainage trench to facilitate subsequent irrigation system installation without disturbing the drainage trench system. Irrigation lines *should not* be installed within the same trenches as the drainage system in order to minimize the disturbance of one system to the other as they are being installed or repaired. The irrigation system mainlines should be pressure checked (24 h static pressure) before backfilling and prior to proceeding with the next construction phase.

**5.6.2.1 Complete Installation of Gravel Drainage Layer**—If a gravel drainage layer is used as a component of the rootzone design, this gravel layer may be installed once the irrigation system rough installation and a pressure check are completed.

**5.6.3 Delivery and Installation of the Rootzone**—The rootzone material should be transported to the site and dumped around the perimeter of the site. A small crawler tractor is ideally suited to spread the rootzone material working from the perimeter inward toward the center of the field. Wheeled tractors or larger tractors may cause excessive pressure that could lead to crushing of the drainage pipes, rutting of the subgrade, or over compaction of the rootzone material. As subsequent rootzone material is moved to the site for dumping, a plywood course should be constructed over the installed rootzone to facilitate the movement of trucks onto the field for dumping of the load. The plywood course not only protects the rootzone from rutting and excessive compaction, but also allows the trucks to deliver their load without becoming stuck in the sand. Under no circumstances should trucks or other equipment be allowed to travel over the uncovered subgrade. Once the delivery of the rootzone material is completed, the field may be shaped, rough-graded, and compacted as specified.

**5.6.4 Final Field Preparations**—Final field preparations include bringing the field to final grade and contour and may include pre-plant fertilization and pre-plant irrigation.

**5.6.4.1 Finished Grade**—Once the rootzone material has been installed and rough graded, the field should be graded to final (finish) grade and contour. It is strongly recommended that laser guided leveling equipment is specified and utilized for this critical aspect of the construction process. A smooth and uniform grade is a very important aspect of proper conditions for enhanced playability and safety of an athletic field. The specified grade and contour should conform to a  $\pm 6$  mm ( $\pm 1/4$  in.) within 3 m (10 ft) in any lateral distance for general conformance and specific conformance as outlined in **5.5.6**. Such tolerances are only achievable with laser-guided equipment. During the finish grade operation, compaction should be achieved by irrigating and rolling the surface utilizing a lightweight roller (less than 2 ton) with at least two passes in perpendicular directions. Finished grade should be within specified tolerances, correct and certified as specified (see **5.5.6**) before turf installation.

**NOTE 4**—In general, as the soil component in a sand-based rootzone increases, rolling should be performed with lighter equipment also giving a higher level of attention to the moisture content of soil component. In

any case, it is recommended that when using soil components with an increased potential to compact in a blend with sand, rolling shall be done with caution.

**5.6.4.2 Pre-Plant Operations**—Pre-plant operations may include the use of a pre-plant fertilizer or other soil fertility amendment. Applications can be made as a granular product that is spread across the field or as a liquid application that is sprayed across the field or injected into the irrigation system. Once the pre-plant materials are applied, it may be desirable to lightly irrigate or ‘water-in’ the applied materials. Any pre-plant operations must be performed with care to avoid rutting or disruption of the final grade in any manner. Only lightweight or walk-behind equipment is advisable.

**5.6.5 Turf Installation**—The turf to be used in the athletic field project should be thoughtfully considered and specified by the project’s project designer, owner, or project agronomist. It should be of a species and cultivar adapted to the local climate, capable of withstanding the stresses imposed on an athletic turf, while providing good playability and aesthetic characteristics. Depending upon turf species and cultivar selected, turf installation methods may include seeding, sprigging, plugging, or sodding. Any turf installation methods used must be carried out in a manner that protects the integrity of the finished grade. No heavy machinery such as tractors, hydrospray tanks, or trucks should be allowed on the surface, unless equipped with turf-type tires.

**5.6.5.1 Seeding and Sprigging**—Seeding and sprigging offer the most flexibility of the methods because they do not pose the risk of contamination of the rootzone with attached soil, they can be spread or planted mechanically or by the use of hydroseeding/hydrosprigging. If the project construction time-frame allows, seeding or sprigging are the preferred methods of establishment. Any mechanical sprigging equipment or seeders should be outfitted such to avoid disruption of finished grade. The use of heavy or large hydrosprig/hydroseed equipment intended for use in the hydroseeding or hydrosprigging of roadside and highway landscapes should be avoided, except where the equipment can be kept off the field and the hydroseed/hydrosprig material applied by use of a hose. Seeds or sprigs should be Certified turfgrass seed/sprigs (if available). Seeds or sprigs shall be free of, or below acceptable threshold levels for, objectionable or noxious weeds, foreign turfgrass cultivars, off-types of the same species, insects, nematodes, diseases, or any other objectionable material.

**5.6.5.2 Plugging**—Establishment of rapidly growing warm season turf cultivars that propagate by spreading through rhizomes or stolons (for example, seashore paspalum and bermudagrass), may be established by plugging. Plugging has some distinct advantages as an establishment method. Installed plugs have an established root system, and therefore are not as subject to stresses of drought should an interruption in water supply occur, or if limited water quantities are available for irrigation. If the growing medium of the plugs was a ‘soil-less’ mix, then minimum contamination of the rootzone can be expected. Plugs can be planted on a wide variety of spacings, depending upon the desired rate of grow-in desired and the turf cultivar utilized. Typical plug planting spacing ranges from 20 cm (8 in.) to 40 cm (16 in.) on center. Plugs should be free of weeds, contaminants, off-type turf, or any other objectionable

**TABLE 4 Sod-soil to Rootzone Sand Compatibility Recommendations**

Criteria	Preferred	Acceptable	Marginal	Unacceptable
D <sub>50</sub> R/D <sub>50</sub> S	<2.5	2.5 to 5.0	5 to 10	>10
Silt and clay (%)	<5	5 to 10	10 to 15	>15
Silt to clay ratio	<2	2 to 5	5 to 7	>7
Gravel (>2 mm) (%)	0	0 to 2	2 to 5	>5

R = Rootzone S = Sod-soil  
 Copyright 2001, Michael DePew. Used with permission.

**TABLE 5 Recommended Physical Properties of the Rootzone Mix (Test Method F1815)**

Physical Property	Specified Range
Total porosity	35 to 45 %
Bulk density (kg·m <sup>-3</sup> )	1.5 to 1.7
Air-filled porosity	15 to 25 %
Capillary porosity	15 to 25 %
Saturated hydraulic conductivity (cm/h)	≥25
(Saturated hydraulic conductivity [in./h])	(≥10)

material. Plugs for athletic fields are best planted by hand. Another method of plug establishment is sometimes utilized whereby a mechanical planter processes sod into irregular pieces and then plants them as ‘plugs.’ This method of plugging irregular sod pieces may also be used for satisfactory establishment of turf and can be done mechanically with due caution to avoid disruption or rutting of the finished grade.

5.6.5.3 *Discussion*—Plugging as used in this guide defines the use of discreet media-rooted turf plugs (as often coming in a plastic media tray). This method of plugging should not be confused with the practice of planting irregular sod pieces, which is also referred to as plugging in some areas. Plugging by the use of irregular sod pieces is a practice more closely resembling a sprigging operation and the establishment of turf by this practice should conform to the specifications as given for mechanical sprigging.

5.6.5.4 *Sodding*—Sodding offers the quickest establishment of any turf installation method. Sod can come in rolls or slabs of various dimension and thickness. If sod is to be used, it is preferable to wash the soil from the sod before installation to avoid contamination of the rootzone. If washed sod is not available, then only sod grown in sand or loamy sand soil should be considered. Any sod-soil considered for installation in the project should meet the criteria as outline in [Table 4](#). Big-roll sod is the preferred sod type in order to reduce the seams in the finished installation. Sod delivery and installation procedures should be such to avoid compaction and disruption of the finished grade. (Sod may also be planted mechanically as irregular sized pieces in a process called ‘plugging,’ see [5.6.5.2](#).) Sod deliveries should be made off the field and the sod moved in on a pallet-by-pallet or roll-by-roll basis as appropriate. Specialized sod handling and installation equipment only should be used during this process to protect the finished grade. For example, with big-roll sod installations, rubber-tracked handling and installation equipment is commercially available.

5.6.5.5 *Recommended Sod Specifications*—If sod is the chosen turf establishment method, the following criteria is a recommended specification for the sod to be used:

(1) *Certified Turfgrass Sod*—Superior sod grown from Certified (if available), high quality seed (stolons) of known origin, or from plantings of Certified grass seedlings or stolons. It shall be inspected by a sports turf consultant and owners’ representative at the sod farm at which it is grown to ensure satisfactory genetic identity and purity, overall high quality, and freedom from noxious weeds, as well as excessive quantities of other crop and weedy plants at time of harvest. All seed or original plant material in mixture should be Certified.

Turfgrass sod shall meet the published state or government standards for Certification of the species and cultivar as specified.

(2) Sod may be washed (soil-less) or a special “sand base” material meeting compatibility specifications for sand-based athletic fields as given in [Table 4](#). Sod-soil containing greater than 15 % silt and clay are unacceptable. In most cases, sod thickness should not contain a soil layer greater than 12.5 mm (½ in.). Thick cut (>12.5 mm or >½ in.) sod may be used in cases where insufficient time exists for establishment of sod before play is initiated. In any case, sod-soil should meet appropriate compatibility criteria as given in [Table 4](#).

(3) *Strip Size*—Sod shall be big roll turf cut to the supplier’s standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 12.5 mm (½ in.) on width and plus or minus 5 % on length. Broken strips and torn or uneven ends will not be accepted.

(4) *Time Limitations*—Sod shall be harvested, delivered, and transplanted within a 12 h period unless a suitable preservation method is approved by the project designer or project agronomist prior to delivery. Sod not transplanted within this period shall be inspected and approved by the project agronomist and project designer prior to its installation.

(5) *Thatch*—Sod shall be relatively free of thatch. A maximum of 12.5 mm (½ in.) (uncompressed) thatch will be permitted.

(6) *Diseases, Nematodes, and Insects*—Sod supplier should be required to supply (and warrant) sod that shall be relatively free (below established acceptable threshold levels) of diseases, parasitic nematodes, and soil-borne insects.

(7) *Weeds*—Sod shall be free of objectionable grassy and broad leaf weeds.

(8) Sod supplier to identify specific fields for harvest, inspection, and submit a fertility and management program schedule for 6 months prior to harvest.

## 6. Recommended Rootzone Performance Criteria

6.1 Several criteria should be considered for proper design of high performance sand-based rootzone construction. These include physical performance criteria, chemical performance criteria, and mechanical performance criteria. The rootzone performance criteria should be considered on the entire rootzone mix rather than on any component separately.

6.2 *Recommended Physical Performance Specifications*—Physical performance criteria (as determined at 40 cm tension for water retention and air-filled porosity) include permeability or saturated hydraulic conductivity, water retention, air-filled

**TABLE 6 Recommended Chemical Properties of the Rootzone Mix**

Chemical Property	Specified Range
pH (Test Method <b>D4972</b> )	5.0 to 7.5
Calcium carbonate equivalent, preferred	<5 %
Calcium carbonate equivalent, marginal	5 to 15 %
Organic matter (Test Methods <b>F1647</b> )	0.5 to 2.5 %
Nutrient content	Adjust for local conditions
Heavy metals or other phytotoxic ions	Adjust for local conditions, do not exceed regulated thresholds

**TABLE 7 Recommended Mechanical Properties of the Rootzone Mix**

Mechanical Property	Specified Range
Friction angle (degrees) (Test Method <b>D3080</b> ) or, alternatively	38 to 50
Angle of repose (degrees) (Test Method <b>C1444</b> )	35 to 45
CBR (%) (Test Method <b>D1883</b> )	12 to 25
Coefficient of Uniformity (CU) of sand component	2.5 to 4.5

porosity, and bulk density. The recommended physical performance criteria are given in **Table 5**. The physical performance criteria should be given priority over the sand size distribution specifications.

**6.3 Recommended Chemical Performance Specifications**—Chemical performance criteria include pH, calcium carbonate equivalent, organic matter content, nutrient content and the presence of any heavy metals or phytotoxic ions/substances. The recommended chemical performance criteria are given in **Table 6**.

**6.4 Recommended Mechanical Performance Specifications**—Mechanical performance criteria (for sands) includes shear resistance (specified as friction angle determined by direct, simple, or triaxial shear methodologies (see Test Method **D3080**) when compacted to an initial standard proctor density of 85 % and at 40 cm soil tension (see Test Methods **D698**), California Bearing Ratio (confined CBR) at 40 cm soil tension and 85 % standard proctor density (see Test Method **D1883**) and coefficient of uniformity ( $CU = D_{60}/D_{10}$ ) of the sand component.

**7. Keywords**

7.1 athletic field; baseball; clay; cricket; football; natural turf; sand; soccer; softball; soil; sports field; sports turf; turfgrass

**APPENDIX**

(Nonmandatory Information)

**X1. RESOURCE MATERIALS**

X1.1 For additional information related to sports fields, consult the following sources of information:

X1.1.1 Sports Turf Managers Association (STMA). STMA, 805 New Hampshire, Suite E, Lawrence, KS 66044, <http://www.sportsturfmanager.com>.

X1.2 For additional information related to soil modification for athletic field construction, you may desire to consult the following publications:

X1.2.1 Adams, W. A., and Gibbs, R. J., *Natural Turf for Sport and Amenity: Science and Management*, (Oxford Press, 1994).

X1.2.2 Davis, W. B., Paul, J. L., and Bowman, D., “The Sand Putting Green Construction and Management,” *University of California Bulletin, Publication # 21448*, University of California, ANR Communication Services, 1990.

X1.2.3 Davis, W. B., Farnham, D. S., and Gowans, K. D., “The Sand Football Field,” *California Turfgrass Culture*, Vol. 24(3), 1974, pp. 17–20.

X1.2.4 Goss, R. L., and Cook, T., “Construction and Maintenance of Natural Grass Athletic Fields,” *PNW Publication 0240*, Washington State University Cooperative Extension, 1983.

X1.2.5 Harper, J. C., “Athletic Fields—Specification, Outline, Construction, and Maintenance,” Penn State University, 1983.

X1.2.6 Keith J. Karnok, ed., *Turfgrass Management Information Directory*, Third Edition, (Hoboken, New Jersey: John Wiley & Sons, Inc.).

X1.2.7 Landschoot, P. J., “Using Composts to Improve Turf Performance,” *Cooperative Extension Circular 5M49ps5733*, Penn State University, 1996.

X1.2.8 Peacock, C. H., “Athletic Fields: Design, Construction, and Maintenance,” *Bulletin 202*, University of Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, 1999.

X1.2.9 Taylor, D. H., Blake, G. R., and White, D. B., “Construction and Maintenance of Athletic Fields,” *University of Minnesota Extension Bulletin 3105*, 1987.

**REFERENCES**

- (1) Soil Science Society of America, *Glossary of Soil Science Terms*, Soil Science Society of America, Madison, WI, 1997.
- (2) USDA, Soil Conservation Service, Soil Survey Staff, "Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys," *USDA Handbook 436*, U.S. Government Print Office, 1975 .
- (3) USDA, Soil Conservation Service, Soil Survey Staff, "Soil Survey Manual," *USDA Handbook 18*, U.S. Government Print Office, 1993.
- (4) USDA, Soil Conservation Service, Soil Survey Staff, "Keys to Soil Taxonomy," 7th ed., Pocahontas Press, Blacksburg, VA, 1997.
- (5) Dixon, J. B., and Weed, S. B., *Minerals in Soil Environments*, 2nd ed., Soil Science Society of America, Madison, WI, 1989.
- (6) Brownell, W. E., *Structural Clay Products*, (Applied mineralogy; v. 9), Springer-Verlag, Wien-New York, 1976.
- (7) U.S. Department of Defense, USACE, "Drainage and Erosion Control—Mobilization Construction, Chapter 5, Backfill for Subsurface Drains," *Engineering Manual EM 1110-3-136*, U.S. Government Print Office, Washington, DC, 1984, <http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-3-136/c-5.pdf>.
- (8) USGA, Green Section, *USGA Recommendations For A Method Of Putting Green Construction*, USGA, Golf House, Far Hills, NJ, 1993, <http://www.usga.org/green/coned/greens/recommendations.html#gravel>.
- (9) Christiansen, J. E., "Irrigation by Sprinkling," *California Agricultural Experimental Station Bulletin 670*, University of California: Berkeley, CA, 1942.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or [service@astm.org](mailto:service@astm.org) (e-mail); or through the ASTM website ([www.astm.org](http://www.astm.org)). Permission rights to photocopy the standard may also be secured from the ASTM website ([www.astm.org](http://www.astm.org)/COPYRIGHT).

NOT FOR BUILDING

## PROPOSAL

For: **Contract No. PW/20-15 Cypress Street Playground**

Town of Brookline, Brookline, Massachusetts.

### Location

The work referred to herein is in the Town of Brookline, County of Norfolk, Commonwealth of Massachusetts, as described in the enclosed specifications and proposal forms on file in the Engineering Division Office and extends as follows:

### **To the Party of the First Part:**

The undersigned, as bidder, declares that the only persons or parties interested in this proposal as principals are those named herein:- that this proposal is made without collusion with any other person, firm or corporation; that he has carefully examined the location of the proposed work, the Notice to Contractors, the Instruction to Bidders and all attachments referred to therein, the proposed form of contract, the "**STANDARD SPECIFICATIONS**" and plans therein referred to and the Special Provisions and Additions hereto annexed; and he proposes and agrees, if this proposal is accepted, that he will contract with the Party of the First Part, in the form of the contract referred to herein and to be annexed hereto, to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all materials specified in the contract, in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefore the following unit prices, to wit:

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
102.51	22	Individual Tree Protection @				
		Per Each				
102.52	1,900	Tree Protection Fencing @				
		Per Linear Foot				

CARRIED FORWARD		
-----------------	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

105.40	7	Tree Removal (6" DBH and smaller) @				
		Per Each				
105.50	25	Tree Removal (6" DBH and larger) @				
		Per Each				
105.60	6	Salvage Existing Deciduous Tree (6" DBH and smaller) @				
		Per Each				
120.10	1	Salvage Existing Items Indicated @				
		Per Lump Sum				
120.20	1	Remove and Dispose of Miscellaneous Equipment @				
		Per Lump Sum				
120.30	1	Remove and Dispose of Paving @				
		Per Lump Sum				
120.40	1	Remove and Dispose of Chain Link Backstops, Perimeter Fencing @				
		Per Lump Sum				
		Void				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

120.70	1	Remove & Dispose of Engineered Wood Chip Surfacing @				
		Per Lump Sum				
123.00	1	Excavate to Design Subgrade @				
		Per Lump Sum				
124.00	1	Turf Grass Removal (2" Depth) @				
		Per Lump Sum				
125.00	2200	Strip and Stockpile Existing Topsoil @				
		Per Cubic Yard				
126.00	590	Strip and Remove Infield Mix @				
		Per Cubic Yard				
130.10	3	Construction Entrance Pad @				
		Per Each				
130.20	600	Straw Wattles (12" Diameter) @				
		Per Linear Foot				
130.30	8	Inlet Sediment Control @				
		Per Each				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

130.40	4500	Erosion Control Blanket @				
		Per Square Foot				
201.10	1	Catch Basin with Frame and ADA Grate @				
		Per Each				
201.15	5	Area Drain (PVC) with Frame and ADA Grate @				
		Per Each				
201.20	80	Trench Drain with ADA Grate @				
		Per Linear Foot				
201.30	7	Manhole, E.C.C. @				
		Per Each				
220.00	7	Drainage Structure Adjusted @				
		Per Each				
256.04	25	4" Diam PVC Pipe (SDR 35) @				
		Per Linear Foot				
256.06	135	6" Diam PVC Pipe (SDR 35) @				
		Per Linear Foot				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

256.12	6200	12" HDPE Perforated Flat Drain Pipe @				
		Per Linear Foot				
256.15	20	8" Diam. HDPE Solid Drain Pipe @				
		Per Linear Foot				
256.16	120	12" Diam. HDPE Solid Drain Pipe @				
		Per Linear Foot				
256.17	320	4" Diam. PVC Perf. Pipe (with stone and Fabric) @				
		Per Linear Foot				
256.18	1	4" Diam. HDPE Clean Out @				
		Per Each				
256.30	1100	12" Diam. HDPE Perf. Collector Pipe (with stone and Fabric) @				
		Per Linear Foot				
256.60	1	Stormwater Infiltration System-Davis Street @				
		Per Lump Sum				
256.61	1	Stormwater Infiltration System-Tappan Street @				
		Per Lump Sum				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Brought Forward						

303.60	28	6" Ductile Iron water Pipe (Mechanical Joint) @				
		Per Linear Foot				
347.10	756	3/4" Copper 'Type K' Tubing @				
		Per Linear Foot				
347.11	70	2" PVC Pipe @				
		Per Linear Foot				
347.20	20	2" Copper Pipe 'Type K' Tubing @				
		Per Linear Foot				
347.40	1	Spray Deck Vault with Hatch @				
		Per Lump Sum				
371.10	1	Irrigation System @				
		Per Lump Sum				
374.10	2	Backflow Preventer, Water Meter, and Cabinet @				
		Per Lump Sum				
376.20	1	Hydrant - Removed and Reset @				
		Per Lump Sum				

CARRIED FORWARD						
-----------------	--	--	--	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

389.10	4	Accessible Drinking Fountain @				
		Per Each				
402.10	2000	Dense Graded Crushed Stone @				
		Per Cubic Yard				
402.30	1200	ASTM F2396 Drainage Layer (4" Min) @				
		Per Cubic Yard				
444.00	250	Geotextile Fabric (under the Wood Fiber) @				
		Per Square Yard				
450.10	140	Bituminous Concrete Pavement @				
		Per Ton				
460.03	80	Hot Mix Asphalt - Miscellaneous @				
		Per Ton				
485.10	700	Granite Cobblestone Pavers @				
		Per Square Foot				
485.20	9960	Porous Precast Concrete Pavers @				
		Per Square Foot				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Brought Forward						

504.00	150	Granite Curb Type VA4 - Straight @				
		Per Linear Foot				
504.10	100	Granite Curb Type VA4 - Radius @				
		Per Linear Foot				
504.20	500	Curb Removed and Reset @				
		Per Linear Foot				
644.10	2450	72" Chain Link Fence and Gates (temporary) @				
		Per Linear Foot				
644.20	585	42-inch Chain Link Fence @				
		Per Linear Foot				
644.30	340	48-inch Chain Link Fence @				
		Per Linear Foot				
644.40	270	72-inch Chain Link Fence @				
		Per Linear Foot				
644.50	310	78-inch Chain Link Fence @				
		Per Linear Foot				

CARRIED FORWARD						
-----------------	--	--	--	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Brought Forward						

644.60	145	96-inch Chain Link Fence @				
		Per Linear Foot				
644.70	2	Softball Chain Link Backstop @				
		Per Each				
660.10	184	Stainless Steel Handrail @				
		Per Linear Foot				
685.10	170	Granite Block Wall @				
		Per Cubic Yard				
685.20	7	Granite Blocks for Splash Pad Elements @				
		Per Each				
685.30	1	Granite Block Wall Engraved Lettering @				
		Per Lump Sum				
701.01	25	Reinforced Cement Concrete Slabs for Trash/Recycling Containers, Cabinets, and Transformers @				
		Per Square Yard				
701.02	3000	Cement Concrete Sidewalks @				
		Per Square Yard				

CARRIED FORWARD				
-----------------	--	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

701.03	100	Cement Concrete Wheelchair Ramp @				
		Per Square Yard				
701.04	112	Reinforced Concrete Slab at Playground Hillside @				
		Per Square Yard				
701.05	140	Reinforced Cement Concrete Pad at Dugouts (12") @				
		Per Square Yard				
701.06	90	Reinforced Cement Concrete Spray Deck (8") @				
		Per Square Yard				
701.07	120	Concrete curb at PIP rubber surfacing @				
		Per Linear Foot				
701.10	120	Cast Iron Detectable Warning Panel @				
		Per Square Foot				
701.20	15	Tree Grates @				
		Per Each				
701.30	390	Steel Edging @				
		Per Linear Foot				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

702.10	5640	Color Sealcoat at Basketball Court @				
		Per Square Foot				
707.10	1371	Composite Wood Bench Seat Top @				
		Per Square Foot				
707.20	54	Composite Wood Bench Back @				
		Per Linear Foot				
707.70	6	Sculptural Benches @				
		Per Each				
720.10	1	Play Structures (5-12 yrs, 2-5 yrs, Swing Sets, Single Play Elements, etc.) @				
		Per Lump Sum				
721.35	4	Swing Mats at 5-12 Play Structure @				
		Per EACH				
723.00	1	Poured-In-Place Rubber Safety Surfacing (depth varies) @				
		Per Lump Sum				
724.00	145	Fibar at 5-12 Play Structure @				
		Per Square yard				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Brought Forward						

xx		VOID				
xxx		VOID				
730.10	1	Splash Pad @				
		Per Lump Sum				
735.10	2	Pitching Rubber, Home Plate, Bases @				
		Per Each				
735.20	2	Basketball Goals, Backboards, Rims, Nets @				
		Per Each				
751.00	2890	Existing Topsoil Screened, Amended, Rehandled and Spread @				
		Per Cubic Yard				
751.20	2800	Root Zone Mix @				
		Per Cubic Yard				
751.30	286	Infield Mix @				
		Per Cubic Yard				

CARRIED FORWARD						
-----------------	--	--	--	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

751.40	110	Structural Soil @				
		Per Cubic Yard				
760.00	70	Aged Pine Bark Mulch @				
		Per Cubic Yard				
765.01	2580	Liming, Fertilizing, Seed Mix Lawn Area @				
		Per Square Yard				
765.02	3551	Aeration and Slice Seeding Existing Lawn and Critical Root Zone Areas @				
		Per Square Yard				
765.03	10760	Athletic Field Seed Mix Area @				
		Per Square Yard				
771.10	15	Acer rubrum "Brandywine" (3"-3 1/2" cal.) @				
		Per Each				
771.11	2	Acer saccharium "Green Mountain" (2 - 2 1/2" cal.) @				
		Per Each				
771.12	16	Gleditsia triacanthos inermis "Skyline" (3 - 3 1/2" cal.) @				
		Per Each				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

771.13	3	Prunus cerasifera "Thundercloud" (3 -3 ½" cal.) @				
		Per Each				
771.14	3	Prunus sargentii (2 -2 ½" cal.) @				
		Per Each				
771.15	2	Prunus kwanzan (2 -2 ½" cal.) @				
		Per Each				
771.16	5	Quercus palustris (3 -3 ½" cal.) @				
		Per Each				
771.17	8	Ulmus americana "Valley Forge" (3 -3 ½" cal.) @				
		Per Each				
771.18	28	Cornus scircea (24 -30" spread) @				
		Per Each				
771.19	13	Ilex verticillata "Winter Gold" (24 -30" spread) @				
		Per Each				
771.20	15	Ilex verticillata "Winter Red" (24 -30" spread) @				
		Per Each				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

771.21	1	Pachysandra procumbens, Allegheny Spurge, Flats of 50 @				
		Per Lump Sum				
771.22	1	Carex flacca 'Blue Zinger', Blue Sedge, #2 pot @				
		Per Lump Sum				
771.23	1	Carex pensylvanica, Pennsylvania Sedge, #2 pot @				
		Per Lump Sum				
771.24	1	Liriapi spicata, Creeping Liriopi, #2 pot @				
		Per Lump Sum				
771.25	1	Rhus aromatica 'Gro-Low', Gro-Low Sumac, #2 pot @				
		Per Lump Sum				
804.20	1	Electrical conduit and wiring for Sport Lighting @				
		Per Lump Sum				
804.30	1	Electrical conduit and wiring for Pedestrian Lighting @				
		Per Lump Sum				
804.40	8	Pedestal Electrical Outlet at Dugout @				
		Per Each				

			CARRIED FORWARD			
--	--	--	-----------------	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Brought Forward						

804.50	1	Sports Lighting System @				
		Per Lump Sum				
804.60	1	Pedestrian Lights @				
		Per Lump Sum				
804.70	1	New Electrical Service with Cabinet @				
		Per Lump Sum				
804.80	22	Lighting HandHoles @				
		Per Each				
816.40	1	Modify Existing Traffic Signal Controller Cabinet @				
		Per Lump Sum				
851.00	1	Temporary Traffic Control @				
		Per Lump Sum				
874.4	8	Traffic Sign Removed and Stacked @				
		Per Each				

		VOID				
--	--	------	--	--	--	--

CARRIED FORWARD						
-----------------	--	--	--	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			

878.00	10	Install Town Furnished Galvanized Post Anchors @				
		Per Each				
901.10	1	Poured-in-Place Terraced Seating at Basketball Court @				
		Per Lump Sum				
		VOID				
		VOID				
		VOID				
901.20	350	Poured-in-Place Concrete Seat Walls @				
		Per Linear Foot				
901.30	1	Two Riser Reinforce Cement Concrete Stairs at Splash Pad @				
		Per Lump Sum				

CARRIED FORWARD				
-----------------	--	--	--	--

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
			Brought Forward			
901.40	80	Poured-in-Place Concrete Retaining Wall @ ADA ramp @				
		Per Linear Foot				

901.50	1	Poured-in-Place Concrete Retaining Walls at Play Ramps (3 Locations) @				
		Per Lump Sum				
901.60	1	Reinforced Concrete Stairs ( with platform and cheek walls) @				
		Per Lump Sum				
		Void				

TOTAL BASE BID Written in Words						

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
<b>Alternate #1 – Field Seating and Pavement</b>						
485.20	150	Porous Precast Concrete Pavers @				
		Per Square Foot				
707.10	440	Composite Wood Bench Seat Top @				
		Per Square Foot				
701.02	110	Cement Concrete Sidewalks @				
		Per Square Yard				
901.70	1	Poured-In-Place Terraced Seating at Scooper Field @				
		Per Lump Sump				
TOTAL ALTERNATE #1 Written in Words						

NOT FOR BIDDING

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
<b>Alternate #2 – Composite Wood Deck</b>						
707.30	1	Composite Wood Deck @				
		Per Square Foot				
505.00	65	Granite Step @				
		Per Linear Foot				
701.4	1	Concrete Ramp with Rail				
		Per Lump Sum				
TOTAL ALTERNATE #2 Written in Words						

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
<b>Alternate #3 – Dugout Structure</b>						
950.40	4	Dugout Structure @				
		Per Each				
TOTAL ALTERNATE #3 Written in Words						

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Alternate #4 – Play Houses at Playground						
950.40	2	Play House @				
		Per Each				
TOTAL ALTERNATE #4 Written in Words						

Item No.	Quantity	Items with Unit Price Written in Words	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
Alternate #5 – Site Furniture						
707.40	1	Picnic Table @				
		Per Each				
707.41	1	Picnic Table ADA @				
		Per Each				
707.50	1	Bike Rack @				
		Per Each				
707.60	1	Team Benches @				
		Per Each				
707.80	1	Café Table (4 seat) @				
		Per Each				
707.90	1	Café Table (5 seat) @				
		Per Each				
TOTAL ALTERNATE #5 Written in Words						

The above prices are to include and cover the furnishing of all materials (except as herein otherwise specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction; and the doing of all the above-mentioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof on or before **November 30, 2021**.

If this proposal shall be accepted and the undersigned shall fail to contract as aforesaid and to give a bond in the sum to be determined as aforesaid with surety satisfactory to the Party of the First Part, within six (6) business days from the date of the mailing of a notice from the Party of the First Part to him, according to the address herewith given, that the contract is ready for signature, the Party of the First Part may, at its option, determine that the bidder has abandoned the contract, and thereupon this proposal, and the acceptance thereof shall be null and void, and the proposal guaranty submitted covering this proposal shall become the property of the Town of Brookline, otherwise the said proposal guaranty shall be returned to the undersigned.

The bidder hereby certifies he shall comply with the minority manpower ratio and specific action steps contained in the appendix EEO attached hereto, including compliance with the minority contractor compliance specified in Section V of said appendix. The contractor receiving the award of the contract shall be required to obtain from each of its subcontractors and submit to the contracting or administering agency prior to the performance of any work under said contract a certification by said subcontractor, regardless of tier, that it will comply with the minority manpower ratio and specific affirmative action steps contained in the appendix EEO.

Full name and address of individual or concern submitting this bid:

---

---

---

Signed \_\_\_\_\_

Title \_\_\_\_\_

NOTICE: Bid should be signed in ink by a person having proper legal authority, and the person's title should be given, such as "owner" in the case of an individual, "partner" in the case of a general partnership, "president", "treasurer", or other authorized officer in the case of a corporation.

**AFFIDAVIT**

State of \_\_\_\_\_ ) Date \_\_\_\_\_ 20\_\_\_\_  
 ) ss.:  
County of \_\_\_\_\_ )

The undersigned being duly sworn, deposes and says that (s)he is the

\_\_\_\_\_  
(sole owner; partner; president, treasurer, or other duly authorized official of a corporation)

of \_\_\_\_\_, for Contract  
(name of bidder as appearing in submitted proposal)

Number **PW/20-15 for: "Cypress Street Playground"**

in the Town of Brookline on \_\_\_\_\_. The undersigned certifies under  
(date bids were opened)

the penalties of perjury that this bid is in all respects, bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

\_\_\_\_\_  
Name of person signing bid

\_\_\_\_\_  
Name of Company

\_\_\_\_\_  
**Affix Corporate Seal**

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Notary Public

My Commission expires \_\_\_\_\_

\_\_\_\_\_  
**Affix Notary Seal**

If bidder is a corporation, give the State in which incorporated:

---

If bid is submitted by joint venturers, this should be stated here:

\_\_\_\_\_ ; and if any of the joint venturers is a corporation, an attested copy of the vote of the corporation authorizing the joint venture should be attached hereto.

The proposed surety on the bond to be given is:

\_\_\_\_\_  
Name

\_\_\_\_\_  
Home Office Address

\_\_\_\_\_  
Massachusetts Address (if different)

NOT FOR BIDDING

**CERTIFICATE OF VOTE**

I, \_\_\_\_\_, Clerk of

\_\_\_\_\_, hereby certify

that, at a meeting of the Board of Directors of said Corporation duly held on

\_\_\_\_\_, 20\_\_\_\_\_, at which a quorum was present and voting throughout, the following vote was duly passed and is now in full force and effect:

"VOTED: That \_\_\_\_\_ be and  
(Name of Officer authorized to sign for Corporation)

he hereby is authorized, directed and empowered for, in the name and on behalf of this Corporation, to sign, seal with the corporate seal, execute, acknowledge and deliver all contracts, bonds and other obligations of this Corporation; the execution of any such contract, bond or

obligation by such \_\_\_\_\_ to be valid and binding  
(Name of Officer)

upon this Corporation for all purposes, and that a certificate of the Clerk of This Corporation setting forth this vote shall be delivered to the Town of Brookline; and that this vote shall remain in full force and effect unless and until the same has been altered, amended or revoked by a subsequent vote of such directors and a certificate of such later vote attested by the Clerk of this Corporation is delivered to the Town of Brookline."

I further certify that \_\_\_\_\_  
(Name of Officer)

is the duly elected \_\_\_\_\_ of said Corporation.  
(Title)

Signed \_\_\_\_\_  
(Clerk - Secretary)

\_\_\_\_\_  
Place of Business

\_\_\_\_\_  
Date of Contract

\_\_\_\_\_  
**Affix Corporate Seal**

\* \_\_\_\_\_  
Countersignature (Name and Title)

\* In the event that the Clerk or Secretary is the same person as the Officer authorized to sign that contract or other instrument for the Corporation, this certificate must be countersigned by another officer of the Corporation.

## STATEMENT OF BIDDER'S QUALIFICATIONS

All information requested below must be submitted. Answers must be clear and comprehensive. Questions should be answered on separate attached sheets. The bidder may submit any additional information he desires.

- 1.0 How many years have you been engaged in the contracting business under your present firm or trade name?
  
- 2.0 Contracts on hand: List each of them, showing the gross amount of each contract and the appropriate anticipated dates of completion. Give the name and address of the client and the name of the person supervising for the client.
  
- 3.0 List the Municipal, State and Private contracts you have been awarded in the past five years, stating the approximate cost for each, and the month and year completed. Give the name and address of the client and the name of the person supervising for the client. (Contractor must have five years experience in Municipal work of similar nature.)
  
- 4.0 List your major equipment that is available for this contract.
  
- 5.0 List subcontractor(s) you expect to use on this contract and the dollar value of work.
  
- 6.0 Bonding capacity of your company.



**IF BID IS BY A PARTNERSHIP FILL IN INFORMATION BELOW**

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
Address

\_\_\_\_\_  
City or Town State ZIP

\_\_\_\_\_  
Treasury Reporting Number

\_\_\_\_\_  
Telephone Number

\*\*\*\*\*

\_\_\_\_\_  
Partner

\_\_\_\_\_  
Partner

\_\_\_\_\_  
Home Address

\_\_\_\_\_  
Home Address

\_\_\_\_\_  
City or Town State Zip

\_\_\_\_\_  
City or Town State Zip

\_\_\_\_\_  
Social Security Number

\_\_\_\_\_  
Social Security Number

\_\_\_\_\_  
Home Telephone Number

\_\_\_\_\_  
Home Telephone Number

NOT FOR BIDDING

**IF BID IS BY AN INDIVIDUAL FILL IN INFORMATION BELOW**

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
Address

\_\_\_\_\_  
City or Town                      State Zip

\_\_\_\_\_  
Social Security Number

\_\_\_\_\_  
Home Telephone Number

\_\_\_\_\_  
Firm Telephone Number

NOT FOR BIDDING

**TOWN OF BROOKLINE**

**MASSACHUSETTS**

**CONTRACT**

CLAUSE 1 - This agreement, made this \_\_\_\_\_ day of \_\_\_\_\_, in the year two thousand and eighteen, between the Town of Brookline by its Select Board, acting on behalf of said Town, and not individually, and without incurring any individual liability thereby, hereinafter called the Town as party of the first part and \_\_\_\_\_ party of the second part, hereinafter called the Contractor.

CLAUSE 2 - WITNESSETH, That the parties to this agreement, each in consideration of the agreements on the part of the other herein contained, do hereby agree, the Town of Brookline for itself and said Contractor for itself and its successors and assigns, as follows:

The Contractor agrees to furnish all equipment, machinery tools and labor, to furnish and deliver all materials required to be furnished and delivered in and about the improvement and to do and perform all work in **Contract No. PW/20-15, Cypress Street Playground** in strict conformity with the provisions herein contained and in the Notice to Contractors, Instruction to Bidders, Special Provisions and Additions hereto attached and the "STANDARD SPECIFICATIONS" on file at the office of the Commissioner of Public Works in Brookline and with the plans referred to therein.

The "STANDARD SPECIFICATIONS" herein referred to shall consist of the following documents as modified by the said Instruction to Bidders, including Amendments to Division II (Construction Details), Amendments to Division III (Materials Specifications) and Special Provisions and Supplementary Specifications attached hereto:

1. The 1988 edition of STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES of the Commonwealth of Massachusetts, Department of Public Works and;
2. AMENDMENTS AND SUPPLEMENTAL SPECIFICATIONS to the said STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES in effect on date project was advertised.

All said plans, the said "STANDARD SPECIFICATIONS", the said Instruction to Bidders, Amendments to Division II (Construction Details), Amendments to Division III (Materials Specifications), Proposal, Special Provisions and Supplementary Specifications are hereby specifically made a part of this contract as fully and to the same effect as if the same had been set forth at length herein.

CLAUSE 3 - In consideration of the foregoing premises, the Town agrees to pay and the Contractor agrees to receive as full compensation for all work required but not shown on the plans for the items herein mentioned, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements (except as excluded in Subsection 7.18) or

from any delay (see Subsection 8.04) or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description connected with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such unit process as are set out in the accompanying Proposal, and for all work required, for which there is no item in the Proposal, such compensation as is provided for in the aforesaid "STANDARD SPECIFICATION".

In witness whereof, the said Contractor has caused these presents to be signed and its corporate seal to be hereto affixed by

\_\_\_\_\_ Its \_\_\_\_\_

thereto duly authorized, and the said Town executed these presents by its Select Board, acting for said Town, and not individually, and without incurring and individual liability, on the year and day above written.

Town of Brookline

By \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

By \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Approved as to Form:

\_\_\_\_\_

Town Counsel

Select Board

Contractor

\_\_\_\_\_ Seal

Certified in accordance with  
Chapter 44, Section 31C and  
based upon Engineering estimates

\_\_\_\_\_

Comptroller

**PERFORMANCE BOND**

Know all persons by these presents, that \_\_\_\_\_ name, address \_\_\_\_\_ as principal, and \_\_\_\_\_ as surety, are held and firmly bound unto the Town of Brookline, Massachusetts in the sum of \$ \_\_\_\_\_ in lawful money of the United States of America, to be paid to the Town of Brookline, Massachusetts, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas the said principal has made a Contract with the Town of Brookline, acting through its Select Board (“Awarding Authority”), bearing the date of \_\_\_\_\_, 2020 for the construction of Contract No.: **PW/ 20-15** Project Name: **Cypress Street Playground.**

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said Contract and any extensions thereof that may be granted by the Town of Brookline, with or without notice to the surety, and during the life of any guarantee required under the Contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise it shall remain in full force and effect.

In the event that the Contract is abandoned by the Contractor, or is terminated by the Town of Brookline under the provisions of said Contract, said surety shall, if requested in writing by the Town of Brookline, take such action as is necessary to complete the Contract.

In witness whereof we hereunto set our hand and seals this \_\_\_\_\_ day of \_\_\_\_\_, 2020.

\_\_\_\_\_  
(Print Name of General Contractor) (Seal)

BY \_\_\_\_\_  
(Signature- Title)

\_\_\_\_\_  
(Print Name of Surety) (Seal)

BY \_\_\_\_\_  
(Signature- Title)

Surety Address \_\_\_\_\_  
\_\_\_\_\_

**PAYMENT BOND**

Know all persons by these presents, that Name and address \_\_\_\_\_ as principal, and \_\_\_\_\_ as surety, are held and firmly bound unto the Town of Brookline, Massachusetts in the sum of Amount \$ \_\_\_\_\_ in lawful money of the United States of America, to be paid to the Town of Brookline, Massachusetts, for which payments, well and truly made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas the said principal has made a Contract with the Town of Brookline, acting through its Select Board ("Awarding Authority"), bearing the date of \_\_\_\_\_, 2020 for the construction of Contract No.: **PW/20-15** Project Name: **Cypress Street Playground**.

Now the condition of this obligation is such that if the principal shall pay for all labor performed or furnished and for all materials used or employed in said Contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purpose or items set out in, and to be subject to, provisions of Massachusetts General laws Chapter 30 section 39A, and Chapter 149, section 29, as amended, then this obligation shall become null and void; otherwise it shall remain in full force and effect.

In witness whereof we hereunto set out hand and seals this \_\_\_\_\_, day of \_\_\_\_\_, 2020.

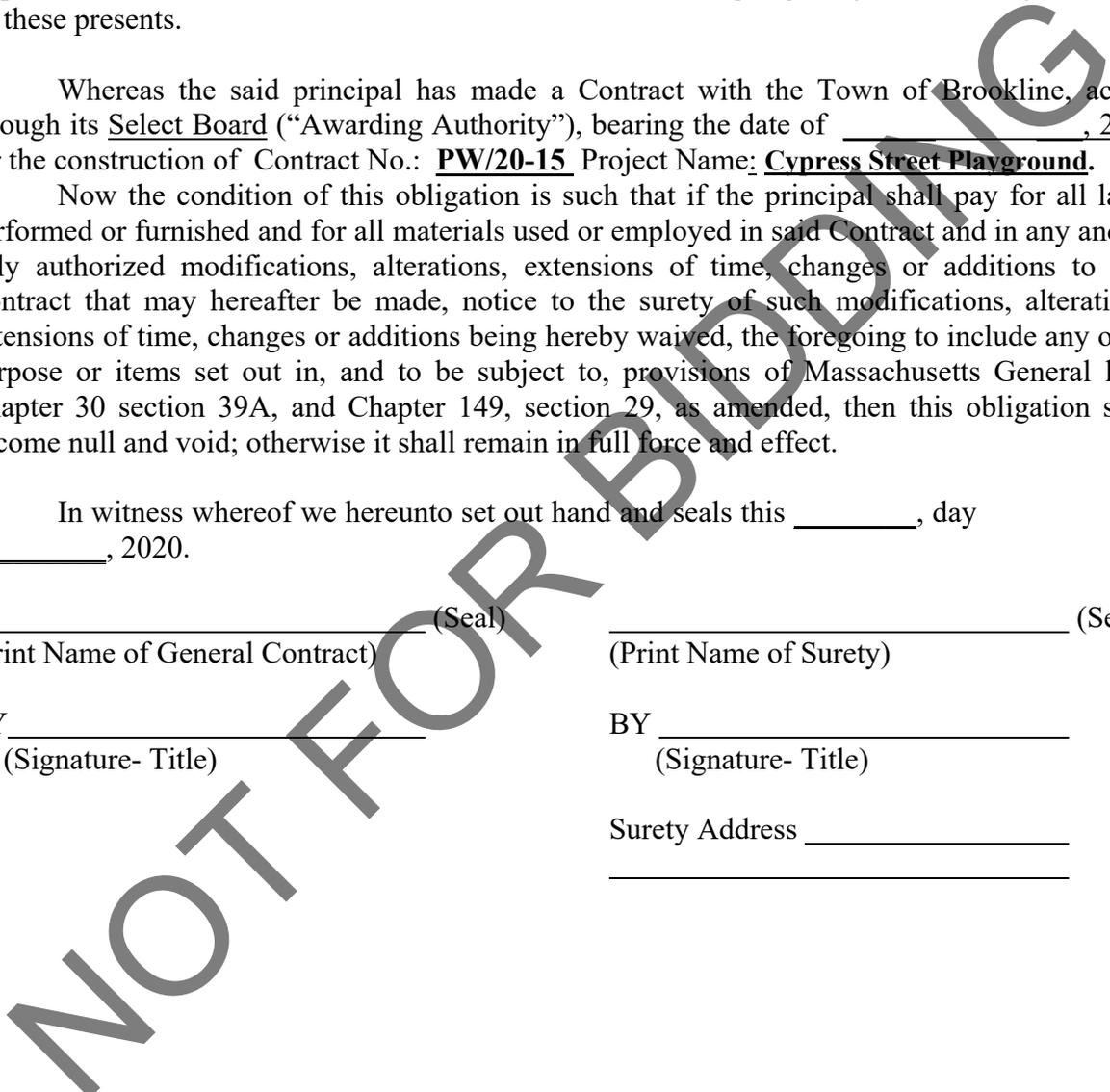
\_\_\_\_\_  
(Print Name of General Contract) (Seal)

\_\_\_\_\_  
(Print Name of Surety) (Seal)

BY \_\_\_\_\_  
(Signature- Title)

BY \_\_\_\_\_  
(Signature- Title)

Surety Address \_\_\_\_\_  
\_\_\_\_\_



**STATE TAX CERTIFICATE**

Pursuant to M.G.L. Ch. 62C, sec. 49A, I certify under the penalties of perjury that I, to the best of my knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

\_\_\_\_\_  
Social Security Number\*  
or Federal Identification Number\*

\_\_\_\_\_  
Signature of Individual or  
Corporate Name

by: \_\_\_\_\_  
Corporate Officer  
(If applicable)

\* Submission of a Social Security Number or a Federal Identification Number is voluntary.