

City of Salem



Invitation for Bids

T-01

McGlew Park Renovation

July 5, 2017 , 2:00 PM

BIDS DUE:

Monday, July 24, 2017

*Late bids will be rejected

Whitney C. Haskell
Purchasing Agent
93 Washington Street, 2nd Floor
Salem, MA 01970
whaskell@salem.com
(978) 619-5695

**INVITATION FOR BIDS
T-01
McGLEW PARK RENOVATION
COVER SHEET**

PLEASE PRINT OR TYPE:

Name of Bidder:	Contact Individual:		
Address:			
#	Street	City/Town	Zip Code
Phone:	Alternate Phone:		
Email Address:	Social Security/Federal Tax Identification Number:		
Authorized Signature: _____			

<p style="text-align: center;">INVITATION FOR BIDS T-01 MCGLEW PARK RENOVATION CHECKLIST</p>
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Submissions:

- ☒
- ☐ Completed Cover Sheet
- ☐ Bidder's Checklist (this sheet)
- ☐ Bid Form
- ☐ Unit Price List
- ☐ Signed Certificate of Non-Collusion
- ☐ Signed Tax Compliance Certification
- ☐ Certificate as to Corporate Bidder
- ☐ Section 3 Certification
- ☐ Reference Form
- ☐ Bidder Qualifications
- ☐ 5% Bid Deposit
- ☐ Prevailing Wage Certification
- ☐ Debarment Certification
- ☐ Labor Harmony and OSHA Certification
- ☐ Acknowledgement of Addenda: _____ *(if applicable)*
(#s)

INVITATION FOR BIDS
T-01
MCGLEW PARK RENOVATION
CERTIFICATIONS

FORM A
NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Proposer)

(Date)

FORM B
TAX COMPLIANCE

Pursuant to M.G.L. c. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Proposer)

(Federal Tax Identification or Social Security Number)

(Date)

FORM C
CERTIFICATE OF CORPORATE AUTHORITY *(if applicable):*

I, _____ certify that I am the _____ of the corporation named as Bidder in the Bid included herein, that _____, who signed said Bid on behalf of the Bidder was then _____ of said corporation, that I know his signature, that his signature thereon is genuine and that said Bid was duly signed, sealed and executed for and in behalf of said corporation by authority of its governing body.

(Corporate Seal)

(Secretary-Clerk)

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Proposer)

(Date)

FORM D
PREVAILING WAGES:

The undersigned bidder or quoter hereby certifies, under the pains and penalties of perjury, that the foregoing bid or quote is based upon the payment to laborers employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development and U.S. Department of Labor (Davis Bacon wage rates). The undersigned bidder or quoter agrees to indemnify the awarding authority for, from and against any loss, expenses, damages, action or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the failure of the said bid or quote to be based upon the payment of the said applicable prevailing wage rates, or (2) the failure of the bidder or quoter, if selected as the Contractor, to pay laborers employed on the project the said applicable prevailing wages.

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Proposer)

(Date)

FORM E
DEBARMENT:

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work by the United States Federal Government or in the commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Proposer)

(Date)

FORM F
LABOR HARMONY AND OSHA TRAINING:

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Proposer)

(Date)

FORM G
SECTION 3 CERTIFICATIONS FOR RFPS AND SEALED BIDS

This project is subject to the requirements of Section 3 of the Housing & Urban Development Act of 1968, as amended, 12 USC 170U and the regulations set forth in 24 CFR 135, which is to ensure that employment and other economic opportunities generated by certain HUD financial assistance shall, to the greatest extent feasible, and consistent with existing Federal, State and local laws and regulations, be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons.

Section 3 Business Concerns are businesses that can provide evidence that they meet one of the following:

- Business is 51% or more owned by Section 3 residents. A Section 3 Resident is 1) a Salem Housing Authority resident; or 2) a Salem resident whose total family income does not exceed 80% of the median income for the area as per the HUD local income limits; or 3) a resident of the Boston Metropolitan Statistical Area whose total family income does not exceed 80% of the median income for the area as per the HUD local income limits;
- At least 30% of the business's permanent, full-time employees are currently Section 3 residents, or within three years of the date of first employment with the firm were Section 3 residents; or
- Business provides evidence of a commitment to award more than 25% of the dollar amount of all subcontracts to businesses that fall within (1) or (2) above.

Any Business Concern seeking to qualify as a Section 3 Business shall demonstrate eligibility by completing the Section 3 Business Affidavit. A Section 3 business shall show that it has the ability to successfully carry out the terms and conditions of the proposed contract -- which shall include, among other factors, a demonstrated history of compliance with public policy requirements, including Section 3.

Whenever two or more equal sealed bids are received by qualified businesses, and one is from a Certified Section 3 Business, the Certified Section 3 Business will receive preference in awarding. If two or more qualified businesses are deemed Highly Advantageous in the Request for Proposals Process, and one is a Section 3 business concern, but their bid price is slightly higher than a non-Section 3 firm, the City of Salem can give preference to the Section 3 business in an effort to meet its numerical goals annually.

For more information, or to obtain a Section 3 Business Affidavit, please contact:

Jane A. Guy, Assistant Community Development Director
City of Salem Department of Planning and Community Development
120 Washington St.
Salem, MA 01970
978-619-5685; (F) 978-740-0404

For Awarded Contracts of \$100,000 or more

A Section 3 covered project involves the construction or rehabilitation of housing (including reduction of lead-based paint hazards), or other public construction including street repair, sewage line repair or installation, updates to building facades, etc. that are completed with federal assistance (i.e. CDBG, HOME funds, etc.) With respect to recipients of CDBG and HOME funding, all contractors or subcontractors receiving contracts in excess of \$100,000 to complete projects involving housing construction, rehabilitation, or other public construction are required to comply with the requirements of Section 3. Section 3 contracts include professional service contracts provided that the work to be performed is in connection with projects involving housing rehabilitation, housing construction, or other public construction.

Goals

The minimum numerical goal for employment is that 30 percent of the aggregate number of new hires shall be Section 3 residents — i.e., 1 out of 3 new employees needed to complete the project/activity shall be a Section 3 resident.

The minimum goals for contracting are:

- Ten percent of the total dollar amount of all contracts for building trades work for maintenance, repair, modernization or development of public or Indian housing or building trades work arising in connection with housing rehabilitation, housing construction and other public construction, shall be awarded to Section 3 businesses; and
- Three percent of the total dollar amount of all non-construction contracts, shall be awarded to Section 3 businesses.

The undersigned certifies under penalties of perjury, notwithstanding any other provision of Law to the contrary, that they will comply with all requirements of Section 3. Prior to the final payment, the Contractor shall provide a written report documenting how they have complied with this requirement.

(Signature of authorized individual submitting proposal)

(Printed Name)

(Name of Bidder (if different than name))

(Date)

INVITATION FOR BIDS
T-01
MCGLEW PARK RENOVATION
REFERENCE FORM

(1) Reference Name (Contact Person):	City/Town/Company:	
Address:		
Phone:	Fax:	Email:
Dates of Services Provided: ____ / ____ / ____ to ____ / ____ / ____		
Description of Services Provided:		

(2) Reference Name (Contact Person):	City/Town/Company:	
Address:		
Phone:	Fax:	Email:
Dates of Services Provided: ____ / ____ / ____ to ____ / ____ / ____		

Description of Services Provided:		
(3) Reference Name (Contact Person):	City/Town/Company:	
Address:		
Phone:	Fax:	Email:
Dates of Services Provided: ____ / ____ / ____ to ____ / ____ / ____		
Description of Services Provided:		

<p style="text-align: center;">INVITATION FOR BIDS T-01 MCGLEW PARK RENOVATION BIDDER QUALIFICATIONS</p>

Please furnish the following information with the 'Bid Form.' Failure to furnish any of the requested information may disqualify your firm as a potential Contractor.

A. BACKGROUND

- | | |
|--|---|
| 1. Company Name: | _____ |
| 2. Address: | _____ |
| 3. Telephone | _____ |
| 4. Fax | _____ |
| 5. Company Type: | <input type="checkbox"/> Corp. <input type="checkbox"/> Partnership <input type="checkbox"/> Proprietorship |
| 6. Name and Location of Parent Company, if applicable: | _____ |
| Name: | _____ |
| Address: | _____ |
| | _____ |
| Telephone: | _____ |
| 7. State and Year of Incorporation | _____ |
| 8. State Contractor License No(s). | _____ |
| 9. Individual to Contact: | _____ |
| Name: | _____ |
| Title: | _____ |
| Address: | _____ |
| | _____ |
| Telephone: | _____ |
| 10. Employees: | _____ |
| Number of Permanent Staff: | _____ |
| Average number of years with Co.: | _____ |
| Percent Massachusetts residents: | _____ |
| 11. Average annual contract volume: | _____ |
| 12. Type of Contractor | <input type="checkbox"/> Union <input type="checkbox"/> Non-Union <input type="checkbox"/> Both |

B. EXPERIENCE

- | | |
|---|-------|
| 1. Location and year founded: | _____ |
| 2. Years of Experience in Mass.: | _____ |
| 3. List completed and ongoing and completed projects for the last three years (attached sheet). | |
| 4. Percent of Work Subcontracted last 3 years: | _____ |
| 5. List subcontractors and type of work subcontracted for last three years (attached sheet). | |

C. FINANCIAL

- | | |
|---------------------|----------|
| 1. Current Backlog: | \$ _____ |
| 2. Bonding Company | _____ |

Name _____
Address: _____

Telephone: _____
Contact: _____
Bonding Limit: _____

3. Any lawsuits, alternate dispute resolutions such as arbitration, mediation or conciliation, or liens outstanding? If so, please describe (attach additional sheets if necessary)

4. Outside Accountant:

Name: _____
Address: _____

Telephone: _____
Contact: _____

5. Banking Reference

Name: _____
Address: _____

Telephone: _____
Contact: _____

6. Attach copy of latest audited financial statements (Balance Sheet and P&P) or unaudited if audited is not available.

D. EQUIPMENT

1. Describe equipment owned and located in Massachusetts (attached sheet).

E. MISCELLANEOUS

1. Have you ever failed to complete a project for any reason?

() No () Yes

If yes, give detail:

F. CERTIFICATION

1. I certify under penalty of law, that the above information furnished pursuant to this Form is true and accurate to the best of my knowledge.

(Signature)

(Company)

(Name)

(Title)

(Date)

PART 1. GENERAL INFORMATION

1.1 PROCUREMENT DESCRIPTION

The Project consists of selective demolition and removals, selective tree removals, exterior signage, new play structures and related safety surfacing, site furnishings, new bituminous concrete paving and paving repairs, granite wall, gabion wall, new chain link fencing and chain link fence repairs, grading, lawns and planting, clay sportsfield refurbishment, wood trail bridges, and irrigation. Contract Documents were prepared by Michelle Crowley Landscape Architecture.

It is expected that work will commence by August 24, 2017 and must be complete by May 31, 2018.

1.2 APPLICABLE LAW

This procurement will be conducted pursuant to Massachusetts General Laws Chapter 30, Section 39 M.

1.3 APPROVAL

Any contract(s) that may result from the procurement shall be subject to the approval of the Mayor of the City of Salem.

1.4 INCORPORATION BY REFERENCE

All requirements, specifications, terms and conditions described in this Invitation for Bids shall be incorporated by reference into any contract that may result.

1.5 TIME FOR AWARD

Any contract that may result from the procurement shall be awarded within thirty (30) days after the bid opening. The Contractor must agree to hold its bid prices firm for that period.

1.6 RIGHT TO CANCEL/REJECT

The City reserves the right to cancel this Invitation for Bids or reject in whole or in part any and all bids if the City determines that cancellation or rejection serves the best interests of the City or Town.

1.7 TAXATION

Purchases made by the City are exempt from the payment of Federal excise tax and the payment of Commonwealth of Massachusetts sales tax and any such taxes must not be included in the bid pricing.

Copies of the City and Town's tax exempt paperwork shall be available upon request of the selected contractor.

1.8 OBTAINING THE INVITATION FOR BIDS

The Invitation for Bids shall be available beginning, Wednesday, July 5, 2017.

The Invitation for Bids and related documents shall be available for free download from the City's Purchasing Department website at <http://salem.com/purchasing> under "Open Procurements."

Hardcopies of the Invitation for Bids and related documents may be obtained at the Office of the Purchasing Agent, 93 Washington Street, 2nd Floor, Salem, MA 01970, between the hours of 8:00 AM-4:00 PM on Monday-Wednesday, 8:00-7:00 PM on Thursday, and 8:00 AM-12:00 PM on Friday.

1.9 PRE-BID SITE VISIT

A pre-bid side visit will take place on Monday, July 17, 2017. at 10:00 AM.

PART 2. INSTRUCTIONS TO BIDDERS

2.1 REQUIREMENTS AND SUBMISSIONS

Below please find a description of the requirements and submissions that must be included as part of a bid. Bids must be sealed and marked as noted.

2.1.1 BID PRICING FORM

Every bid must include a completed 'Bid Pricing Form'. See attached. All material, equipment and labor is F.O.B. City of Salem.

2.1.2 NON-COLLUSION

Every bid must include a certification of good faith, certifying that the bid was made in good faith and without collusion or fraud. See 'Non-Collusion Form' attached.

2.1.3 TAX COMPLIANCE

Every bid must include a written certification that the bidder has complied with all state laws relating to taxes, reporting of employees and contractors, and child support. See 'Tax Compliance Form' attached.

2.1.4 CORPORATE BIDDER

If the bid is being submitted by a corporation, the bid must include a certification that the individual submitting the bid has been authorized to bind the corporation. See 'Certificate of Corporate Authority' attached.

2.1.5 REFERENCE FORM

Every bid must be accompanied by at least three (3) professional references.

2.1.6 BID DEPOSIT

Each bid must be accompanied by a deposit equal to five percent (5%) of the amount of the bid. The bid deposit may be in the form of a certified treasurer's or cashier's check payable to the City of Salem from a responsible bank or trust company; cash; or a bid bond.

2.1.7 PAYMENT BOND

The selected contractor shall be required to furnish a Payment Bond in the amount of fifty percent (50%) of the contract price, within ten days of the date of notification of the contract award.

2.1.8 PREVAILING WAGE

Wages for this project are subject to the prevailing wage rates as set by the Department of Labor Standards. A copy of the prevailing wage rates for this project is included in the Invitation for Bids, along with a Payroll Record Form and Statement of Compliance.

In the event that the option to renew is exercised, an updated prevailing wage rate sheet will be sent to the Contractor along with the contract amendment letter.

Certified Weekly Payroll documents shall be sent to the Office of the Purchasing Agent, 93 Washington Street, 3rd Floor, Salem, MA 01970. Payroll records must be sent three (3) business days after the close of the previous work week. See ‘Certification Regarding Payment of Prevailing Wage Rates’ attached.

2.1.9 DEBARMENT

Every bid must include a certification regarding the contractor’s debarment status. A debarred contractor is not eligible for the award of public contracts during the period of its debarment. See ‘Certification Regarding Debarment’ attached.

2.1.10 LABOR HARMONY AND OSHA CERTIFICATION

Every bid must include a certification regarding labor harmony training approved by the U.S. Occupation Safety and Health Administration completed by all employees to be employed at the worksite. See ‘Labor Harmony and OSHA Certification’ attached.

2.2 BID DELIVERY

Below please find a description of the manner in which sealed bids must be submitted.

2.2.1 DUE DATE AND TIME

Bids shall be received by the Office of the Purchasing Agent on or before **2:00 PM Monday, July 24, 2017**.

Any bid received after that time shall be rejected as non-responsive.

2.2.2 ADDRESS

Sealed bids shall be delivered to the Office of the Purchasing Agent, 93 Washington Street, 2nd Floor, Salem MA 01970.

2.2.3 HOURS OF OPERATION

Bids must be delivered during the normal hours of operation of the City of Salem:

Monday-Wednesday:	8:00 AM-4:00 PM
Thursday:	8:00 AM-7:00 PM
Friday:	8:00 AM-12:00 PM

2.2.4 COPIES

Bidders must submit one (1) original and one (1) copy of the bid.

2.2.5 LABELING

The outside of the envelope containing the sealed bid must be labeled with 1) the bid number 2) the bid opening date and time and 3) the name of the bidder.

2.3 SIGNATURES

A bid must be signed as follows: 1) if the bidder is an individual, by her/him personally; 2) if the bidder is a partnership, by the name of the partnership, followed by the signature of each general partner; and 3) if the bidder is a corporation, by the authorized officer, whose signature must be attested to by the clerk/secretary of the corporation, and with the corporate seal affixed.

2.4 QUESTIONS, CHANGES, MODIFICATIONS AND WITHDRAWALS

2.4.1 QUESTIONS/REQUESTS FOR CLARIFICATION

Questions concerning this Invitation for Bids must be submitted in writing to: Whitney Haskell at whaskell@saalem.com at least five (5) days prior to the bid opening date. Written responses will be mailed to all bidders on record as having picked up the Invitation for Bids.

2.4.2 CHANGES

If any changes are made to this Invitation for Bids, addenda will be issued. Addenda will be posted in the Office of the Purchasing Agent, on the website and e-mailed to all bidders on record as having picked up the Invitation for Bids.

2.4.3 MODIFICATIONS AND WITHDRAWALS

A bidder may correct, modify, or withdraw a bid by written notice received by the City of Salem prior to the time and date set for bid opening.

Modifications must be submitted in a sealed envelope clearly labeled "Modification No.____" to the address listed in part one of this section. Each modification must be numbered in sequence, and must reference the Invitation for Bids.

After the bid opening a bidder may not change any provision of the bid in a manner prejudicial to the interests of the City or fair competition. Minor informalities will be waived or the bidder will be allowed to correct them. If a mistake and the intended bid are clearly evident on the face of the bid document, the mistake will be corrected to reflect the intended correct bid, and the bidder will be notified in writing; the bidder may not withdraw the bid. A bidder may withdraw a bid if a mistake is clearly evident on the face of the bid document, but the intended correct bid is not similarly evident.

2.5 UNFORESEEN OFFICE CLOSURES

If, at the time of the scheduled bid opening, 93 Washington Street, 3rd Floor, Salem, MA 01970, is closed due to uncontrolled events such as fire, snow, ice, wind, or building evacuation, the bid opening will be postponed until 2:00 PM on the next normal business day. Bids will be accepted until that date and time.

2.6 BID OPENING PROCEDURE

At the time and place fixed for opening of bids, the City will cause to be opened and publicly read aloud every bid received within the time set for receiving bids, irrespective of any irregularities therein. Bidders and other persons properly interested may be present, in person or by representative.

PART 3. SPECIFICATIONS

See 'Project Manual.'

PART 4. EVALUATION AND SELECTION

4.1 RULE FOR AWARD

Any contract that results from this procurement, shall be awarded to the responsive and responsible bidder, offering the lowest price for the scope of work described herein.

PART 5. TERMS AND CONDITIONS

5.1 TERM OF CONTRACT

It is expected that work will commence by August 24, 2017 and must be complete by May 31, 2018.

5.2 ASSIGNMENTS AND SUBCONTRACTING

The selected vendor shall not assign, sell, subcontract or otherwise transfer any interest in this contract without the prior written consent of the City. The successful bidder shall be fully responsible to the City for the acts and omissions of his subcontractor, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

5.3 PAYMENT

The City shall make every effort to furnish payment within thirty (30) days of receipt of a reasonably detailed invoice. Any invoice received must reference the contract number. Nothing contained in the contract shall create any contractual relation between any subcontractor and the City of Salem. The Successful Bidder shall cause appropriate provision to be inserted in all subcontracts relative to the work to require compliance by each subcontractor with the application provisions of the Contract for the improvements embraced in the site preparation.

Invoicing for all work must be done weekly and must be accompanied by copies of original bills for material used. Billing must separate labor and itemize materials

Weekly payroll record reporting forms (prevailing wage) and signed statement of compliance (form attached) must be submitted with all billing.

5.4 INSURANCE REQUIREMENTS

General- The Vendor shall before commencing performance of the Contract be responsible for providing and maintaining insurance coverage in force for the life of the Contract of the kind and in adequate amounts to secure all of the obligations under the Contract and with insurance companies licensed to write insurance in the Commonwealth of Massachusetts. All such insurance carried shall not be less than the kinds and amounts designated herein, and the Vendor agrees that the stipulation herein of the kinds and limits of coverage shall in no way limit the liability of the Vendor to any such kinds and amounts of insurance coverage. All policies issued shall indemnify and save harmless the City of Salem, its agents and employees from any and all claims for damages to persons or property as may rise out of the performance of this Contract.

Vendor's Comprehensive General Public Liability and Property Damage Liability Insurance - The Vendor shall carry Comprehensive General Liability Insurance providing for a limit of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages arising out of bodily injury to or death of one person, and subject to that limit for each person, a total limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of bodily injuries or death of two or more persons in any one accident; and Vendor's Comprehensive Property Damage Liability Insurance providing for a limit of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages arising out of injury to or destruction of property in any one accident, and subject to that limit per accident, a total (or aggregate) limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of injury to or destruction of property during the policy period.

Comprehensive Automotive and Property Damage Insurance - The Vendor shall carry Automobile Insurance covering all owned vehicles, hired vehicles or non-owned vehicles under the control of the Vendor while performing work under the Contract in the amount of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages arising out of bodily injuries to or death of one person and subject to that limit for each person, a total of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of bodily injuries to or death of two or more persons in any one accident; and Property Damage coverage in the amount of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages to or destruction of property.

The Vendor must carry Workman's Compensation Insurance in the amounts prescribed under Massachusetts State Law and meet all other City and State Laws and Regulations.

No cancellation(s) of such insurance, whether by the insurer or by the insured party shall be valid unless written notice thereof is given by the parties proposing cancellation to the other party and to the City of Salem at least fifteen (15) days prior to the intended effective date thereof, which date shall be expressed in said notice, which shall be sent by registered mail, return receipt requested. These provisions shall apply to the legal representative(s), trustee in bankruptcy, receiver, assignee, trustee, and successor(s) in interest of the Vendor.

All insurance coverage shall be at the sole expense of the Vendor and shall be placed with such company as may be acceptable to the City of Salem and shall constitute a material part of the contract documents.

Failure to provide written proof to City and continue in force such insurance as aforesaid shall be deemed a material breach of the contract, and may constitute sufficient grounds for immediate termination of the same.

5.5 CHANGE ORDERS AND ADJUSTMENTS

Any request for a change order or adjustment must be submitted in writing and contain, an explanation of the need for the change order, a statement of work including a cost breakdown of each addition, and a statement that the change order is in the best interest of the awarding authority. The City is not obligated to pay for change orders that are not approved in writing, by the original contract signatories. Three (3) copies of the change order shall be required.

5.6 INDEMNIFICATION

Unless otherwise provided by law, the Vendor will indemnify and hold harmless the City against any and all liability, loss, damages, costs or expenses for personal injury or damage to real or tangible personal property which the City may sustain, incur or be required to pay, arising out of or in connection with the performance of the Contract by reason of any negligent action/inaction or willful misconduct by the Contractor, its agents, servants or employees.

5.7 FEDERAL AND STATE LAW

The selected contractor shall comply with all applicable Federal, State and Local laws and ordinances.

5.8 STATEMENT OF WORK

Except as otherwise specifically stated in the bid and contract documents the selected contractor shall secure, at its own expense, all necessary permits and licenses and comply with all city and state

codes and regulations. The selected contractor shall provide and pay for all materials, equipment, labor, tools, temporary construction of every nature, charges, levies, fees, or other expenses incurred and all other services and facilities of every nature whatsoever for his performance of the Contract within the specified time, and required for this project. The selected contractor must provide all materials and equipment free of any lien, claim or encumbrance.

5.9 SAMPLE CONTRACT

See 'Sample Contract' attached.

SAMPLE CONTRACT

XXXXXXX

CITY OF SALEM

CONTRACT FOR SERVICES

Over \$10,000

This agreement is made and entered into by and between the City of Salem (hereinafter the CITY), a municipal corporation organized and existing under the laws of the Commonwealth of Massachusetts, and XXXXXXXXXXXXXXXXXXXXXXXX (hereinafter the CONTRACTOR).

ARTICLE I. DEFINITION.

This CONTRACT as used herein shall mean these articles, and the “contract documents” which include but are not limited to the following identified items and all documents, and forms submitted therewith, or attached hereby.

- ☐ Attachment A: Scope of Services, and/or other bid package materials
- ☐ Attachment B: Additional Contract Terms and Conditions
- ☐ Attachment C: Statement of Corporate Authority
- ☐ Addenda: N/A

ARTICLE II. AMOUNT AND DURATION.

This CONTRACT in an amount not to exceed XXXXXXXXXXXX (\$XXXXXXXX) shall commence upon issuance of the Notice to Proceed and shall be complete within XXXX (XX) calendar days, unless a written amendment to renew or extend this CONTRACT is executed in accordance with the provisions of this CONTRACT.

ARTICLE III. PERFORMANCE.

The Contractor agrees to provide all goods and/or services set forth in Invitation for Bids, Documents, Scope of Services, and the CONTRACTOR’s bid R-60 and/or as outlined in ATTACHMENT A - SCOPE OF SERVICES.

ARTICLE IV. TERMINATION.

Without Cause. The CITY may terminate this CONTRACT on sixty (60) calendar days notice, or may suspend this CONTRACT for up to sixty (60) calendar days upon receipt of notice, when in the best interests of the City by providing notice to the CONTRACTOR, which shall be in writing and shall be deemed delivered and received when given in person to the CONTRACTOR, or when received by fax, express mail, certified mail return receipt requested, regular mail postage prepaid or delivered by any other appropriate method evidencing actual receipt by the CONTRACTOR.

For Cause. If the CONTRACTOR is determined by the CITY to be in default of any term or condition of CONTRACT, the CITY may terminate this contract on thirty (30) days notice by providing notice to the CONTRACTOR, which shall be in writing and shall be deemed delivered and received when given in person to the CONTRACTOR, or when received by fax, express mail, certified mail return receipt requested, regular mail postage prepaid or delivered by any other appropriate method evidencing actual receipt by the CONTRACTOR. If the CITY is determined by the CONTRACTOR to be in default of any term or condition of this CONTRACT the CONTRACTOR may terminate this contract on thirty (30) days

notice by providing notice to the CITY, which shall be in writing and shall be deemed delivered and received when given in person to the CITY, or when received by fax, express mail, certified mail return receipt requested, regular mail postage prepaid or delivered by any other appropriate method evidencing actual receipt by the CITY.

Default. The following shall constitute events of default under this CONTRACT: a) any material misrepresentation made by the CONTRACTOR to the CITY, b) any failure to perform any of its obligations under this CONTRACT including, but not limited to the following: (i) failure to commence performance of this CONTRACT at the time specified in this CONTRACT due to a reason or circumstance within the CONTRACTOR'S reasonable control, (ii) failure to perform this CONTRACT with sufficient personnel and equipment or with sufficient material to ensure the completion of this CONTRACT within the specified time due to a reason or circumstance within the CONTRACTOR'S reasonable control, (iii) failure to performance this CONTRACT in a manner reasonably satisfactory to the CITY, (iv) failure to promptly re-perform with reasonable time the services that were rejected by the CITY as unsatisfactory, or erroneous, (v) discontinuance of the services for reasons not beyond the CONTRACTOR'S reasonable control, (vi) failure to comply with a material term of this CONTRACT, including, but not limited to, the provision of insurance and nondiscrimination, and (vii) any other acts specifically and expressly stated in this CONTRACT as constituting a basis for termination of this CONTRACT, and (viii) failure to comply with any and all requirements of state law, and/or regulations, and City ordinances, and/or regulations.

ARTICLE V. REMEDIES OF THE CITY.

The CITY may deduct the cost of any substitute contract or performance for expenses, losses, and all damages, including incidental and consequential damages as a result of any event of non-conformance or non-performance of the CONTRACTOR in complying with the terms of this CONTRACT, and shall withhold such expenses, losses, and damages from sums due, or to become due.

ARTICLE VI. REMEDIES OF THE CONTRACTOR.

If the damages, other than loss, non-conformance, or non-performance, are actually sustained by the CONTRACTOR due to any act or omission for which the CITY is legally responsible the CITY shall allow a sum equal to the amount of such damages sustained by the Contractor as determined by the CITY in writing, provided the Contractor shall have provided to all signatories of the contract a detailed written statement of such damages and cause thereof within 30 days of the act of omission by the CITY.

ARTICLE VII. ASSIGNABILITY.

The CONTRACTOR shall not assign, subcontract or in any way transfer any interest in this contract without the prior written consent of the Procurement Officer of said City. In the event of such occurrence the City reserves the right to deal with any assignee subcontractor or transferee directly and the contractor agrees to remain bound by all terms and conditions of this contract in accordance with its original tenor. The provisions of this CONTRACT shall be binding upon, and shall inure to the benefit of, the successors and assigns of the CONTRACTOR and any public body or bodies succeeding the interests of the CITY.

ARTICLE VIII. INDEMNIFICATION.

The CONTRACTOR shall assume the defense, indemnify and hold harmless the CITY, the CITY'S agents and employees, from and against all losses and all claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or recovered against them by reason of acts, in

actions, omissions, negligence, reckless or intentional misconduct of the said CONTRACTOR, its agent(s), officers, employees, or subcontractors; in the execution of the work or in guarding the same. Unless otherwise provided by law, the CITY may elect to indemnify the CONTRACTOR for claims arising in tort if it is determined that the CONTRACTOR performed its obligations under this CONTRACT pursuant to the direct supervision and control of the CITY or its designated agent(s).

ARTICLE IX. WORKER'S COMPENSATION AND OTHER INSURANCE.

The CONTRACTOR shall provide by insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 of the General Laws of Massachusetts (The Worker's Compensation Act) to all employees of the CONTRACTOR who are subject to the provisions of Chapter 152 of the General Laws of Massachusetts.

Failure to provide and continue in force such insurance during the period of this contract shall be deemed a material breach of this contract, shall operate as an immediate termination thereof, and CONTRACTOR shall indemnify the CITY for all losses, claims, and actions resulting from the failure to provide the insurance required by this Article.

Prior to commencement of any work and until completion of its work under this CONTRACT shall maintain the following insurance coverage, at its cost, from insurance acceptable to the CITY, giving evidence of such coverage to the CITY prior to execution of this CONTRACT, a copy of such insurance coverage to be attached herewith:

General - The Vendor shall before commencing performance of the Contract be responsible for providing and maintaining insurance coverage in force for the life of the Contract of the kind and in adequate amounts to secure all of the obligations under the Contract and with insurance companies licensed to write insurance in the Commonwealth of Massachusetts. All such insurance carried shall not be less than the kinds and amounts designated herein, and the Vendor agrees that the stipulation herein of the kinds and limits of coverage shall in no way limit the liability of the Vendor to any such kinds and amounts of insurance coverage. All policies issued shall indemnify and save harmless the City of Salem, its agents and employees from any and all claims for damages to persons or property as may rise out of the performance of this Contract.

Vendor's Comprehensive General Public Liability and Property Damage Liability Insurance - The Vendor shall carry Comprehensive General Liability Insurance providing for a limit of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages arising out of bodily injury to or death of one person, and subject to that limit for each person, a total limit of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of bodily injuries or death of two or more persons in any one accident; and Vendor's Comprehensive Property Damage Liability Insurance providing for a limit of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages arising out of injury to or destruction of property in any one accident, and subject to that limit per accident, a total (or aggregate) limit or not less than One Million Dollars (\$1,000,000.00) for all damages arising out of injury to or destruction of property during the policy period.

Comprehensive Automotive and Property Damage Insurance - The Vendor shall carry Automobile Insurance covering all owned vehicles, hired vehicles or non-owned vehicles under the control of the Vendor while performing work under the Contract in the amount of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages arising out of bodily injuries to or death of one person and subject to that limit for each person, a total of not less than One Million Dollars (\$1,000,000.00) for all damages arising out of bodily injuries to or death of two or more persons in any one accident; and

Property Damage coverage in the amount of not less than Five Hundred Thousand Dollars (\$500,000.00) for all damages to or destruction of property.

The Vendor must carry Workman's Compensation Insurance in the amounts prescribed under Massachusetts State Law and meet all other City and State Laws and Regulations.

No cancellation(s) of such insurance, whether by the insurer or by the insured party shall be valid unless written notice thereof is given by the parties proposing cancellation to the other party and to the City of Salem at least fifteen (15) days prior to the intended effective date thereof, which date shall be expressed in said notice, which shall be sent by registered mail, return receipt requested. These provisions shall apply to the legal representative(s), trustee in bankruptcy, receiver, assignee, trustee, and successor(s) in interest of the Vendor.

All insurance coverage shall be at the sole expense of the Vendor and shall be placed with such company as may be acceptable to the City of Salem and shall constitute a material part of the contract documents.

Failure to provide written proof to City and continue in force such insurance as aforesaid shall be deemed a material breach of the contract, and may constitute sufficient grounds for immediate termination of the same.

All required insurance must be endorsed to name the CITY as Additional Insured. All required insurance shall be endorsed to waive the insurer's rights of subrogation against the City. All policies and certificate for insurance must contain language that the insurance shall not be canceled, materially changed or non-renewed without at least thirty (30) days advance written notice to the CITY. The CONTRACTOR under this CONTRACT shall not allow its subcontractors to begin work until similar insurance has been so obtained and certificates of insurance approved by the CONTRACTOR.

ARTICLE X. CORPORATE CONTRACTOR.

If CONTRACTOR is a corporation, CONTRACTOR shall endorse the Certificate of Corporate Authority for the CONTRACTORS' signatory (Attachment C), or shall otherwise provide a form similar in nature and substance acceptable to the CITY.

If CONTRACTOR is a non-profit corporation, CONTRACTOR shall provide satisfactory proof of present status as a non-profit corporation. Such proof shall be in the form of a certification from the Massachusetts Secretary of State's office and/or from the Internal Revenue Service and shall provide the Federal Tax Identification Number of the non-profit corporation. This agreement shall not be enforceable against the CITY unless and until the CONTRACTOR complies with this section. Failure to inform the CITY in writing of revocation, or other loss of non-profit status shall be deemed a material breach of this contract and operate as an immediate termination thereof.

ARTICLE XI. SUBJECT TO APPROPRIATION.

The obligations of the CITY under this CONTRACT shall be subject to appropriation. In the absence of appropriation this CONTRACT shall be immediately terminated without liability for damages, penalties, or other charges.

In the requisite circumstances, the obligations of the CITY under this CONTRACT shall be subject to the formal award of the state, federal grant.

ARTICLE XII. DOCUMENTS, MATERIALS, ETC.

Any materials, reports, information, data, etc. given to or prepared or assembled by the CONTRACTOR under this CONTRACT are to be kept confidential and shall not be made available to any individual or organization by the CONTRACTOR (except agents, servants, or employees of the CONTRACTOR) without the prior written approval of the CITY, except as otherwise required by law. The CONTRACTOR understands that he/she/it may acquire or have access to "personal data" otherwise kept by the CITY. The CONTRACTOR shall comply with the provisions Chapter 66A of the General Laws of Massachusetts as it relates to public documents, and all other state and federal laws and regulations relating to confidentiality, security privacy and use of confidential data.

Any materials produced in whole or in part under this CONTRACT shall not be subject to copyright, except by the CITY, in the United States or any other country. The CITY shall have unrestricted authority to, without payment of any royalty, commission, or additional fee of any type or nature, publicly disclose, reproduce, distribute and otherwise use, and authorize other to use, in whole or in part, any reports, data or other materials prepared under this CONTRACT.

All data, reports, programs, software, equipment, furnishings, and any other documentation or product paid for by the CITY shall vest in the CITY at the termination of this CONTRACT. The CONTRACTOR shall at all times, during or after termination of this CONTRACT, obtain the prior written approval of the CITY before making any statement bearing on the work performed or data collected under this CONTRACT to the press or issues any material for publication through any medium.

ARTICLE XIII. AUDIT, INSPECTION, RECORD KEEPING.

At any time during normal business hours, and as often as the CITY may deem it reasonably necessary, there shall be made available in the office of the CONTRACTOR for the purpose of audit, examination, and/or to make excerpts or transcripts, all records, contracts, invoices, materials, payrolls, records of personnel, conditions of employment and other data relating to all matters covered by this agreement.

Further the CONTRACTOR agrees to make its work papers, records and other evidence of audit available to the CITY for a period of three years after final payment under his CONTRACT. The CITY shall be entitled to reproduce any or all such documents at its own expense, for which provision shall be made at such time.

ARTICLE XIV. WEEKLY PAYROLL RECORDS REPORT.

In accordance with Massachusetts General Law c. 149, s. 27B, a true and accurate record must be kept of all individuals employed on a public works construction project for which prevailing wage rates are applicable.

In addition, every contractor and subcontractor is required to submit, on a weekly basis, a copy of their weekly payroll records to the awarding authority. Once collected, the awarding authority is also required to preserve those records for three years.

ARTICLE XV. CONFLICT OF INTEREST.

CITY. No officer, member or employee of the CITY and no members of its governing body who exercise any function or responsibility in review or approval of the undertaking or carrying out of this CONTRACT shall participate in any decision relating to the CONTRACT which affects his/her personal interests or the interest of any corporation, partnership, or association in which he/she has a direct or

indirect pecuniary interest. None of the services to be provided by the CONTRACTOR shall be used for any partisan political activity or further the election or defeat of any candidate for political office in the CITY. Compliance with this section shall be material to the CONTRACT.

CONTRACTOR. CONTRACTOR agrees that his/her/its agents, servants, and employees have neither presently nor during the period of this CONTRACT any interest direct or indirect which would impair, detract, or conflict in any manner or degree with the performance of services required under this CONTRACT. The CONTRACTOR, his/her/its agents, servants or employees further stipulates that in the performance of this CONTRACT, no person having any such interest shall be employed. Conflicts of Interest include but are not limited to (a) immediate family relationships with officials of the CITY, (b) instances where the CONTRACTOR, his/her/it agents, servants or employees during the period of this CONTRACT was connected as an officer, employee or member of the governing body of the CITY, and (c) instances where the CONTRACTOR has an interest in any CITY department, its agents, servants or employees or parcels of land within the CITY. Compliance with this section shall be material to the CONTRACT.

ARTICLE XVI. PAYMENT.

The CITY agrees to make all reasonable efforts to pay to the CONTRACTOR the sum set forth in the CONTRACTOR'S bid or proposal within thirty (30) days of receipt of an invoice at the Office of the City Auditor detailing the work completed.

Subject to pending statutory appeal rights, CONTRACTOR agrees that all sums otherwise due and payable to the CITY for outstanding taxes, fines, fees and or other municipal charges may be deducted from the sum(s) otherwise payable under this CONTRACT prior to disbursement to the CONTRACTOR.

ARTICLE XVII. CONFLICT.

In the event there is a conflict between these Articles and Attachment A. Attachment A shall supersede these Articles.

ARTICLE XVIII. WAIVER AND AMENDMENT.

The provisions contained in this CONTRACT may be modified only as specifically provided by ATTACHMENT B - ADDITIONAL TERMS AND CONDITIONS. Amendments, or waivers of any additional term, condition, covenant, duty or obligation contained in this CONTRACT may be made only by written amendment executed by all signatories to the original agreement, prior to the effective date of the amendment.

To the extent allowed by law, all conditions, duties, and obligations contained in this CONTRACT may be waived only by written agreement by both parties.

Forbearance or indulgence in any form or manner by a party shall not be construed as a waiver, nor in any manner limit the legal or equitable remedies available to that party. No waiver by either party of any default or breach shall constitute a waiver of any subsequent default or breach of a similar or different matter.

ARTICLE XIX. CERTIFICATION.

IN WITNESS WHEREOF, THE CONTRACTOR CERTIFIES, UNDER THE PAINS AND PENALTIES OF PERJURY, THAT THE CONTRACTOR IS IN COMPLIANCE WITH EACH OF THE FOLLOWING:

TAXES. PURSUANT to M.G.L. c. 62C, s. 49A, the CONTRACTOR has filed all state tax returns and complied with all laws of the Commonwealth relating to taxes.

DEBARMENT. The CONTRACTOR is not currently debarred or suspended by the Commonwealth of Massachusetts, or any of its entities or subdivisions.

AMERICANS WITH DISABILITIES ACT. The CONTRACTOR is aware of the recently enacted Americans with Disabilities Act which prohibits discrimination based upon disability and shall meet any relevant standards, and/or conditions set out in the bid/proposal documents, bid/proposal specifications, and/or ATTACHMENT A - SCOPE OF SERVICES.

ARTICLE XX. FORUM AND CHOICE OF LAW

This CONTRACT and any performance herein shall be governed by and be construed in accordance with the laws of Commonwealth. Any and all proceedings or actions relating to subject matter herein shall be brought and maintained in the courts of the Commonwealth or the federal district court sitting in the Commonwealth, which shall have exclusive jurisdiction thereof. This paragraph shall not be construed to limit any other legal rights of the parties.

IN WITNESS WHEREOF the parties have hereto and to three other identical instruments set forth their hands the day and year first above written.

THE CITY:

Kimberley Driscoll,
Mayor

Whitney Haskell,
Purchasing Agent

Approved as to form:

Elizabeth Rennard, Esq.,
City Solicitor

Approved as Contract Manager:

XXXXX,
XXXXXXXXX

I certify that funds have been encumbered
in the amount of : \$XXXX

THE CONTRACTOR:

Authorized Signature

Print Name

Print Title

Company

Status (Corporate/Non- Corporate)

Taxpayer Identification Number

Date

Sarah Stanton,
Finance Director

ATTACHMENT A

SCOPE OF SERVICES

INSTRUCTIONS FOR DEPARTMENT AND CONTRACTOR: *Please attach for reference purposes a copy of all bid/proposal documents, including but not limited to (i) invitations/ instructions for bidders (ii) invitation/ instructions for proposers, (iii) general and specific conditions, and please provide a detailed description of all types of goods and/ or services that will be provided pursuant to this CONTRACT, not otherwise provided in any bid/proposal instructions, specifications, conditions or other documents.*

Please refer to the scope of services found in Invitation for Bids X-XX “XXXXXXXXXX” incorporated here by reference.

ATTACHMENT B

ADDITIONAL CONTRACT TERMS AND CONDITIONS

INSTRUCTIONS FOR DEPARTMENTS: *Please specify any additions or modifications to the terms and conditions (not to conflict with the public procurement laws or City ordinances or regulations):*

ATTACHMENT C

CERTIFICATE OF CORPORATE AUTHORITY

If the Contractor is a corporation, complete the following certification:

At a duly authorized meeting of the Board of Directors of the _____ (Name of the Corporation) held on _____ (Date), at which all the Directors were present or waived notice, it was voted that, _____ (Name), _____ (Officer) of this company, is authorized to execute Contracts and bonds in the name and behalf of said company, and affix its corporate seal thereto, and such execution of any Contract or obligation in this company's name on its behalf by such _____ (Officer) of the company, shall be valid and binding upon this company.

I hereby certify that I am the Clerk of the _____ (Name of the Corporation), that _____ (Name) is the duly elected _____ (Officer) of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as of the date of the Contract.

A true copy,

Attest: _____
(Clerk)

Place of Business: _____

Corporate Seal:

<p>PREVAILING WAGE RATES</p>



CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

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

RONALD L. WALKER, II
Secretary

WILLIAM D MCKINNEY
Director

Awarding Authority: City of Salem

Contract Number: T-01

City/Town: SALEM

Description of Work: Renovation of McGlew Park

Job Location: North Street, Salem, MA 01970

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2016	\$32.15	\$10.91	\$10.89	\$0.00	\$53.95
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2016	\$32.22	\$10.91	\$10.89	\$0.00	\$54.02
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2016	\$32.34	\$10.91	\$10.89	\$0.00	\$54.14
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$88.29	\$9.80	\$19.23	\$0.00	\$117.32
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$33.15	\$7.60	\$13.50	\$0.00	\$54.25
	12/01/2017	\$33.78	\$7.60	\$13.50	\$0.00	\$54.88
	06/01/2018	\$34.62	\$7.60	\$13.50	\$0.00	\$55.72
	12/01/2018	\$35.46	\$7.60	\$13.50	\$0.00	\$56.56
	06/01/2019	\$36.33	\$7.60	\$13.50	\$0.00	\$57.43
	12/01/2019	\$37.19	\$7.60	\$13.50	\$0.00	\$58.29
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	06/01/2017	\$34.90	\$11.50	\$7.10	\$0.00	\$53.50
	12/01/2017	\$35.90	\$11.50	\$7.10	\$0.00	\$54.50
	06/01/2018	\$36.90	\$11.50	\$7.10	\$0.00	\$55.50
	12/01/2018	\$37.90	\$11.50	\$7.10	\$0.00	\$56.50
	06/01/2019	\$38.90	\$11.50	\$7.10	\$0.00	\$57.50
	12/01/2019	\$39.90	\$11.50	\$7.10	\$0.00	\$58.50
	06/01/2020	\$40.90	\$11.50	\$7.10	\$0.00	\$59.50
	12/01/2020	\$41.90	\$11.50	\$7.10	\$0.00	\$60.50
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 2</i>	06/01/2017	\$33.15	\$7.60	\$13.50	\$0.00	\$54.25
	12/01/2017	\$33.78	\$7.60	\$13.50	\$0.00	\$54.88
	06/01/2018	\$34.62	\$7.60	\$13.50	\$0.00	\$55.72
	12/01/2018	\$35.46	\$7.60	\$13.50	\$0.00	\$56.56
	06/01/2019	\$36.33	\$7.60	\$13.50	\$0.00	\$57.43
	12/01/2019	\$37.19	\$7.60	\$13.50	\$0.00	\$58.29
For apprentice rates see "Apprentice- LABORER"						

BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2017	\$42.92	\$6.97	\$16.21	\$0.00	\$66.10
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Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$27.90	\$6.97	\$10.54	\$0.00	\$45.41
2	65	\$27.90	\$6.97	\$10.54	\$0.00	\$45.41
3	70	\$30.04	\$6.97	\$11.35	\$0.00	\$48.36
4	75	\$32.19	\$6.97	\$12.16	\$0.00	\$51.32
5	80	\$34.34	\$6.97	\$12.97	\$0.00	\$54.28
6	85	\$36.48	\$6.97	\$13.78	\$0.00	\$57.23
7	90	\$38.63	\$6.97	\$14.59	\$0.00	\$60.19
8	95	\$40.77	\$6.97	\$15.40	\$0.00	\$63.14

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (LYNN)</i>	03/01/2017	\$50.76	\$10.75	\$19.22	\$0.00	\$80.73
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Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Lynn

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.38	\$10.75	\$19.22	\$0.00	\$55.35
2	60	\$30.46	\$10.75	\$19.22	\$0.00	\$60.43
3	70	\$35.53	\$10.75	\$19.22	\$0.00	\$65.50
4	80	\$40.61	\$10.75	\$19.22	\$0.00	\$70.58
5	90	\$45.68	\$10.75	\$19.22	\$0.00	\$75.65

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2016	\$37.45	\$7.60	\$14.35	\$0.00	\$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2016	\$36.30	\$7.60	\$14.35	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2016	\$36.30	\$7.60	\$14.35	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2017	\$38.77	\$9.90	\$17.00	\$0.00	\$65.67
	09/01/2017	\$39.78	\$9.90	\$17.00	\$0.00	\$66.68
	03/01/2018	\$40.78	\$9.90	\$17.00	\$0.00	\$67.68
	09/01/2018	\$41.82	\$9.90	\$17.00	\$0.00	\$68.72
	03/01/2019	\$42.85	\$9.90	\$17.00	\$0.00	\$69.75

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - CARPENTER - Zone 2 Eastern MA
Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.39	\$9.90	\$1.63	\$0.00	\$30.92
2	60	\$23.26	\$9.90	\$1.63	\$0.00	\$34.79
3	70	\$27.14	\$9.90	\$12.11	\$0.00	\$49.15
4	75	\$29.08	\$9.90	\$12.11	\$0.00	\$51.09
5	80	\$31.02	\$9.90	\$13.74	\$0.00	\$54.66
6	80	\$31.02	\$9.90	\$13.74	\$0.00	\$54.66
7	90	\$34.89	\$9.90	\$15.37	\$0.00	\$60.16
8	90	\$34.89	\$9.90	\$15.37	\$0.00	\$60.16

Effective Date - 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.89	\$9.90	\$1.63	\$0.00	\$31.42
2	60	\$23.87	\$9.90	\$1.63	\$0.00	\$35.40
3	70	\$27.85	\$9.90	\$12.11	\$0.00	\$49.86
4	75	\$29.84	\$9.90	\$12.11	\$0.00	\$51.85
5	80	\$31.82	\$9.90	\$13.74	\$0.00	\$55.46
6	80	\$31.82	\$9.90	\$13.74	\$0.00	\$55.46
7	90	\$35.80	\$9.90	\$15.37	\$0.00	\$61.07
8	90	\$35.80	\$9.90	\$15.37	\$0.00	\$61.07

Notes:
Apprentice to Journeyworker Ratio:1:5
CEMENT MASONRY/PLASTERING
BRICKLAYERS LOCAL 3 (LYNN)

01/01/2017	\$45.67	\$12.20	\$19.41	\$1.30	\$78.58
07/01/2017	\$46.30	\$12.20	\$19.41	\$1.30	\$79.21
01/01/2018	\$46.54	\$12.20	\$19.41	\$1.30	\$79.45
07/01/2018	\$46.79	\$12.20	\$19.41	\$1.30	\$79.70
01/01/2019	\$47.03	\$12.20	\$19.41	\$1.30	\$79.94
07/01/2019	\$47.27	\$12.20	\$19.41	\$1.30	\$80.18
01/01/2020	\$47.52	\$12.20	\$19.41	\$1.30	\$80.43

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)
Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.84	\$12.20	\$12.41	\$0.00	\$47.45
2	60	\$27.40	\$12.20	\$14.41	\$1.30	\$55.31
3	65	\$29.69	\$12.20	\$15.41	\$1.30	\$58.60
4	70	\$31.97	\$12.20	\$16.41	\$1.30	\$61.88
5	75	\$34.25	\$12.20	\$17.41	\$1.30	\$65.16
6	80	\$36.54	\$12.20	\$18.41	\$1.30	\$68.45
7	90	\$41.10	\$12.20	\$19.41	\$1.30	\$74.01

Effective Date - 07/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.15	\$12.20	\$12.41	\$0.00	\$47.76
2	60	\$27.78	\$12.20	\$14.41	\$1.30	\$55.69
3	65	\$30.10	\$12.20	\$15.41	\$1.30	\$59.01
4	70	\$32.41	\$12.20	\$16.41	\$1.30	\$62.32
5	75	\$34.73	\$12.20	\$17.41	\$1.30	\$65.64
6	80	\$37.04	\$12.20	\$18.41	\$1.30	\$68.95
7	90	\$41.67	\$12.20	\$19.41	\$1.30	\$74.58

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
LABORERS - ZONE 2	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	06/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
OPERATING ENGINEERS LOCAL 4	12/01/2017	\$48.38	\$10.00	\$15.25	\$0.00	\$73.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR	06/01/2017	\$31.86	\$10.00	\$15.25	\$0.00	\$57.11
OPERATING ENGINEERS LOCAL 4	12/01/2017	\$32.55	\$10.00	\$15.25	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE)	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36
PAINTERS LOCAL 35 - ZONE 2						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.71	\$7.85	\$0.00	\$0.00	\$33.56
2	55	\$28.28	\$7.85	\$3.66	\$0.00	\$39.79
3	60	\$30.85	\$7.85	\$3.99	\$0.00	\$42.69
4	65	\$33.42	\$7.85	\$4.32	\$0.00	\$45.59
5	70	\$35.99	\$7.85	\$14.11	\$0.00	\$57.95
6	75	\$38.56	\$7.85	\$14.44	\$0.00	\$60.85
7	80	\$41.13	\$7.85	\$14.77	\$0.00	\$63.75
8	90	\$46.27	\$7.85	\$15.44	\$0.00	\$69.56

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN LABORERS - ZONE 2	06/01/2017	\$37.00	\$7.60	\$14.65	\$0.00	\$59.25
	12/01/2017	\$37.85	\$7.60	\$14.65	\$0.00	\$60.10
	06/01/2018	\$38.80	\$7.60	\$14.65	\$0.00	\$61.05
	12/01/2018	\$39.75	\$7.60	\$14.65	\$0.00	\$62.00
	06/01/2019	\$40.75	\$7.60	\$14.65	\$0.00	\$63.00
	12/01/2019	\$41.75	\$7.60	\$14.65	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS - ZONE 2	06/01/2017	\$38.00	\$7.60	\$14.65	\$0.00	\$60.25
	12/01/2017	\$38.85	\$7.60	\$14.65	\$0.00	\$61.10
	06/01/2018	\$39.80	\$7.60	\$14.65	\$0.00	\$62.05
	12/01/2018	\$40.75	\$7.60	\$14.65	\$0.00	\$63.00
	06/01/2019	\$41.75	\$7.60	\$14.65	\$0.00	\$64.00
	12/01/2019	\$42.75	\$7.60	\$14.65	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS LABORERS - ZONE 2	06/01/2017	\$37.75	\$7.60	\$14.65	\$0.00	\$60.00
	12/01/2017	\$38.60	\$7.60	\$14.65	\$0.00	\$60.85
	06/01/2018	\$39.55	\$7.60	\$14.65	\$0.00	\$61.80
	12/01/2018	\$40.50	\$7.60	\$14.65	\$0.00	\$62.75
	06/01/2019	\$41.50	\$7.60	\$14.65	\$0.00	\$63.75
	12/01/2019	\$42.50	\$7.60	\$14.65	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE 2	06/01/2017	\$38.00	\$7.60	\$14.65	\$0.00	\$60.25
	12/01/2017	\$38.85	\$7.60	\$14.65	\$0.00	\$61.10
	06/01/2018	\$39.80	\$7.60	\$14.65	\$0.00	\$62.05
	12/01/2018	\$40.75	\$7.60	\$14.65	\$0.00	\$63.00
	06/01/2019	\$41.75	\$7.60	\$14.65	\$0.00	\$64.00
	12/01/2019	\$42.75	\$7.60	\$14.65	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$37.75	\$7.60	\$14.65	\$0.00	\$60.00
	12/01/2017	\$38.60	\$7.60	\$14.65	\$0.00	\$60.85
	06/01/2018	\$39.55	\$7.60	\$14.65	\$0.00	\$61.80
	12/01/2018	\$40.50	\$7.60	\$14.65	\$0.00	\$62.75
	06/01/2019	\$41.50	\$7.60	\$14.65	\$0.00	\$63.75
	12/01/2019	\$42.50	\$7.60	\$14.65	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER <i>LABORERS - ZONE 2</i>	06/01/2017	\$37.00	\$7.60	\$14.65	\$0.00	\$59.25
	12/01/2017	\$37.85	\$7.60	\$14.65	\$0.00	\$60.10
	06/01/2018	\$38.80	\$7.60	\$14.65	\$0.00	\$61.05
	12/01/2018	\$39.75	\$7.60	\$14.65	\$0.00	\$62.00
	06/01/2019	\$40.75	\$7.60	\$14.65	\$0.00	\$63.00
	12/01/2019	\$41.75	\$7.60	\$14.65	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$58.86	\$9.80	\$19.23	\$0.00	\$87.89
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$42.04	\$9.80	\$19.23	\$0.00	\$71.07
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$63.06	\$9.80	\$19.23	\$0.00	\$92.09
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$88.23	\$9.80	\$19.23	\$0.00	\$117.26
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>ELECTRICIANS LOCAL 103</i>	03/01/2017	\$48.33	\$13.00	\$17.45	\$0.00	\$78.78
	09/01/2017	\$49.28	\$13.00	\$17.48	\$0.00	\$79.76
	03/01/2018	\$50.48	\$13.00	\$17.51	\$0.00	\$80.99
	09/01/2018	\$51.67	\$13.00	\$17.55	\$0.00	\$82.22
	03/01/2019	\$52.87	\$13.00	\$17.59	\$0.00	\$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2017	\$48.33	\$13.00	\$17.45	\$0.00	\$78.78
	09/01/2017	\$49.28	\$13.00	\$17.48	\$0.00	\$79.76
	03/01/2018	\$50.48	\$13.00	\$17.51	\$0.00	\$80.99
	09/01/2018	\$51.67	\$13.00	\$17.55	\$0.00	\$82.22
	03/01/2019	\$52.87	\$13.00	\$17.59	\$0.00	\$83.46

Classification

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

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$19.33	\$13.00	\$0.58	\$0.00	\$32.91
2	40	\$19.33	\$13.00	\$0.58	\$0.00	\$32.91
3	45	\$21.75	\$13.00	\$13.37	\$0.00	\$48.12
4	45	\$21.75	\$13.00	\$13.37	\$0.00	\$48.12
5	50	\$24.17	\$13.00	\$13.75	\$0.00	\$50.92
6	55	\$26.58	\$13.00	\$14.11	\$0.00	\$53.69
7	60	\$29.00	\$13.00	\$14.48	\$0.00	\$56.48
8	65	\$31.41	\$13.00	\$14.85	\$0.00	\$59.26
9	70	\$33.83	\$13.00	\$15.22	\$0.00	\$62.05
10	75	\$36.25	\$13.00	\$15.60	\$0.00	\$64.85

Effective Date - 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$19.71	\$13.00	\$0.59	\$0.00	\$33.30
2	40	\$19.71	\$13.00	\$0.59	\$0.00	\$33.30
3	45	\$22.18	\$13.00	\$13.39	\$0.00	\$48.57
4	45	\$22.18	\$13.00	\$13.39	\$0.00	\$48.57
5	50	\$24.64	\$13.00	\$13.76	\$0.00	\$51.40
6	55	\$27.10	\$13.00	\$14.12	\$0.00	\$54.22
7	60	\$29.57	\$13.00	\$14.50	\$0.00	\$57.07
8	65	\$32.03	\$13.00	\$14.87	\$0.00	\$59.90
9	70	\$34.50	\$13.00	\$15.25	\$0.00	\$62.75
10	75	\$36.96	\$13.00	\$15.62	\$0.00	\$65.58

Notes: :

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

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR	01/01/2017	\$55.86	\$15.28	\$15.71	\$0.00	\$86.85
<i>ELEVATOR CONSTRUCTORS LOCAL 4</i>						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.93	\$15.28	\$0.00	\$0.00	\$43.21
2	55	\$30.72	\$15.28	\$15.71	\$0.00	\$61.71
3	65	\$36.31	\$15.28	\$15.71	\$0.00	\$67.30
4	70	\$39.10	\$15.28	\$15.71	\$0.00	\$70.09
5	80	\$44.69	\$15.28	\$15.71	\$0.00	\$75.68

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>	01/01/2017	\$39.10	\$15.28	\$15.71	\$0.00	\$70.09
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2017	\$42.15	\$10.00	\$15.25	\$0.00	\$67.40
	11/01/2017	\$42.88	\$10.00	\$15.25	\$0.00	\$68.13
	05/01/2018	\$43.59	\$10.00	\$15.25	\$0.00	\$68.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2017	\$43.61	\$10.00	\$15.25	\$0.00	\$68.86
	11/01/2017	\$44.34	\$10.00	\$15.25	\$0.00	\$69.59
	05/01/2018	\$45.06	\$10.00	\$15.25	\$0.00	\$70.31
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2017	\$22.41	\$10.00	\$15.25	\$0.00	\$47.66
	11/01/2017	\$22.83	\$10.00	\$15.25	\$0.00	\$48.08
	05/01/2018	\$23.26	\$10.00	\$15.25	\$0.00	\$48.51
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2017	\$48.33	\$13.00	\$17.45	\$0.00	\$78.78
	09/01/2017	\$49.28	\$13.00	\$17.48	\$0.00	\$79.76
	03/01/2018	\$50.48	\$13.00	\$17.51	\$0.00	\$80.99
	09/01/2018	\$51.67	\$13.00	\$17.55	\$0.00	\$82.22
	03/01/2019	\$52.87	\$13.00	\$17.59	\$0.00	\$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE <i>LOCAL 103</i> / COMMISSIONING <i>ELECTRICIANS</i>	03/01/2017	\$36.25	\$13.00	\$15.60	\$0.00	\$64.85
	09/01/2017	\$36.96	\$13.00	\$15.62	\$0.00	\$65.58
	03/01/2018	\$37.86	\$13.00	\$15.65	\$0.00	\$66.51
	09/01/2018	\$38.75	\$13.00	\$15.67	\$0.00	\$67.42
	03/01/2019	\$39.65	\$13.00	\$15.70	\$0.00	\$68.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER)	06/01/2017	\$38.49	\$10.00	\$15.25	\$0.00	\$63.74
OPERATING ENGINEERS LOCAL 4	12/01/2017	\$39.32	\$10.00	\$15.25	\$0.00	\$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER	06/01/2017	\$20.50	\$7.60	\$13.50	\$0.00	\$41.60
LABORERS - ZONE 2	12/01/2017	\$21.50	\$7.60	\$13.50	\$0.00	\$42.60
	06/01/2018	\$21.50	\$7.60	\$13.50	\$0.00	\$42.60
	12/01/2018	\$22.50	\$7.60	\$13.50	\$0.00	\$43.60
	06/01/2019	\$22.50	\$7.60	\$13.50	\$0.00	\$43.60
	12/01/2019	\$23.50	\$7.60	\$13.50	\$0.00	\$44.60
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER	03/01/2016	\$42.13	\$9.80	\$17.62	\$0.00	\$69.55
FLOORCOVERERS LOCAL 2168 ZONE I						

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.07	\$9.80	\$1.79	\$0.00	\$32.66
2	55	\$23.17	\$9.80	\$1.79	\$0.00	\$34.76
3	60	\$25.28	\$9.80	\$12.25	\$0.00	\$47.33
4	65	\$27.38	\$9.80	\$12.25	\$0.00	\$49.43
5	70	\$29.49	\$9.80	\$14.04	\$0.00	\$53.33
6	75	\$31.60	\$9.80	\$14.04	\$0.00	\$55.44
7	80	\$33.70	\$9.80	\$15.83	\$0.00	\$59.33
8	85	\$35.81	\$9.80	\$15.83	\$0.00	\$61.44

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
OPERATING ENGINEERS LOCAL 4	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS	06/01/2017	\$31.86	\$10.00	\$15.25	\$0.00	\$57.11
OPERATING ENGINEERS LOCAL 4	12/01/2017	\$32.55	\$10.00	\$15.25	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	01/01/2017	\$40.91	\$7.85	\$16.10	\$0.00	\$64.86
GLAZIERS LOCAL 35 (ZONE 2)						

Classification

Effective Date

Base Wage

Health

Pension

**Supplemental
Unemployment**

Total Rate

Apprentice - GLAZIER - Local 35 Zone 2

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.46	\$7.85	\$0.00	\$0.00	\$28.31
2	55	\$22.50	\$7.85	\$3.66	\$0.00	\$34.01
3	60	\$24.55	\$7.85	\$3.99	\$0.00	\$36.39
4	65	\$26.59	\$7.85	\$4.32	\$0.00	\$38.76
5	70	\$28.64	\$7.85	\$14.11	\$0.00	\$50.60
6	75	\$30.68	\$7.85	\$14.44	\$0.00	\$52.97
7	80	\$32.73	\$7.85	\$14.77	\$0.00	\$55.35
8	90	\$36.82	\$7.85	\$15.44	\$0.00	\$60.11

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
OPERATING ENGINEERS LOCAL 4	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - OPERATING ENGINEERS - Local 4
Effective Date - 06/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$25.51	\$10.00	\$0.00	\$0.00	\$35.51
2	60	\$27.83	\$10.00	\$15.25	\$0.00	\$53.08
3	65	\$30.15	\$10.00	\$15.25	\$0.00	\$55.40
4	70	\$32.47	\$10.00	\$15.25	\$0.00	\$57.72
5	75	\$34.79	\$10.00	\$15.25	\$0.00	\$60.04
6	80	\$37.10	\$10.00	\$15.25	\$0.00	\$62.35
7	85	\$39.42	\$10.00	\$15.25	\$0.00	\$64.67
8	90	\$41.74	\$10.00	\$15.25	\$0.00	\$66.99

Effective Date - 12/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$26.06	\$10.00	\$0.00	\$0.00	\$36.06
2	60	\$28.43	\$10.00	\$15.25	\$0.00	\$53.68
3	65	\$30.80	\$10.00	\$15.25	\$0.00	\$56.05
4	70	\$33.17	\$10.00	\$15.25	\$0.00	\$58.42
5	75	\$35.54	\$10.00	\$15.25	\$0.00	\$60.79
6	80	\$37.90	\$10.00	\$15.25	\$0.00	\$63.15
7	85	\$40.27	\$10.00	\$15.25	\$0.00	\$65.52
8	90	\$42.64	\$10.00	\$15.25	\$0.00	\$67.89

Notes:
Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2017	\$43.72	\$11.45	\$23.07	\$2.35	\$80.59
	08/01/2017	\$44.82	\$11.45	\$23.07	\$2.35	\$81.69
	02/01/2018	\$45.97	\$11.45	\$23.07	\$2.35	\$82.84
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	03/01/2017	\$48.33	\$13.00	\$17.45	\$0.00	\$78.78
	09/01/2017	\$49.28	\$13.00	\$17.48	\$0.00	\$79.76
	03/01/2018	\$50.48	\$13.00	\$17.51	\$0.00	\$80.99
	09/01/2018	\$51.67	\$13.00	\$17.55	\$0.00	\$82.22
	03/01/2019	\$52.87	\$13.00	\$17.59	\$0.00	\$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2017	\$43.72	\$11.45	\$23.07	\$2.35	\$80.59
	08/01/2017	\$44.82	\$11.45	\$23.07	\$2.35	\$81.69
	02/01/2018	\$45.97	\$11.45	\$23.07	\$2.35	\$82.84
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) PIPEFITTERS LOCAL 537 (Local 138)	03/01/2017	\$48.86	\$9.70	\$16.14	\$0.00	\$74.70
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC PIPEFITTERS LOCAL 537 (Local 138)	03/01/2017	\$48.86	\$9.70	\$16.14	\$0.00	\$74.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS LABORERS - ZONE 2	06/01/2017	\$33.15	\$7.60	\$13.50	\$0.00	\$54.25
	12/01/2017	\$33.78	\$7.60	\$13.50	\$0.00	\$54.88
	06/01/2018	\$34.62	\$7.60	\$13.50	\$0.00	\$55.72
	12/01/2018	\$35.46	\$7.60	\$13.50	\$0.00	\$56.56
	06/01/2019	\$36.33	\$7.60	\$13.50	\$0.00	\$57.43
	12/01/2019	\$37.19	\$7.60	\$13.50	\$0.00	\$58.29
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	09/01/2016	\$45.09	\$11.75	\$14.20	\$0.00	\$71.04
	09/01/2017	\$47.09	\$11.75	\$14.20	\$0.00	\$73.04
	09/01/2018	\$49.34	\$11.75	\$14.20	\$0.00	\$75.29
	09/01/2019	\$51.84	\$11.75	\$14.20	\$0.00	\$77.79
Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston Effective Date - 09/01/2016						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.55	\$11.75	\$10.45	\$0.00	\$44.75
2	60	\$27.05	\$11.75	\$11.20	\$0.00	\$50.00
3	70	\$31.56	\$11.75	\$11.95	\$0.00	\$55.26
4	80	\$36.07	\$11.75	\$12.70	\$0.00	\$60.52
Effective Date - 09/01/2017						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.55	\$11.75	\$10.45	\$0.00	\$45.75
2	60	\$28.25	\$11.75	\$11.20	\$0.00	\$51.20
3	70	\$32.96	\$11.75	\$11.95	\$0.00	\$56.66
4	80	\$37.67	\$11.75	\$12.70	\$0.00	\$62.12
Notes: Steps are 1 year						
Apprentice to Journeyworker Ratio:1:4						
IRONWORKER/WELDER IRONWORKERS LOCAL 7 (BOSTON AREA)	03/16/2017	\$44.65	\$7.80	\$20.85	\$0.00	\$73.30

Apprentice - IRONWORKER - Local 7 Boston

Effective Date - 03/16/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$26.79	\$7.80	\$20.85	\$0.00	\$55.44
2	70	\$31.26	\$7.80	\$20.85	\$0.00	\$59.91
3	75	\$33.49	\$7.80	\$20.85	\$0.00	\$62.14
4	80	\$35.72	\$7.80	\$20.85	\$0.00	\$64.37
5	85	\$37.95	\$7.80	\$20.85	\$0.00	\$66.60
6	90	\$40.19	\$7.80	\$20.85	\$0.00	\$68.84

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
LABORERS - ZONE 2	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79

For apprentice rates see "Apprentice- LABORER"

LABORER	06/01/2017	\$32.40	\$7.60	\$13.50	\$0.00	\$53.50
LABORERS - ZONE 2	12/01/2017	\$33.03	\$7.60	\$13.50	\$0.00	\$54.13
	06/01/2018	\$33.87	\$7.60	\$13.50	\$0.00	\$54.97
	12/01/2018	\$34.71	\$7.60	\$13.50	\$0.00	\$55.81
	06/01/2019	\$35.58	\$7.60	\$13.50	\$0.00	\$56.68
	12/01/2019	\$36.44	\$7.60	\$13.50	\$0.00	\$57.54

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - LABORER - Zone 2

Effective Date - 06/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.44	\$7.60	\$13.50	\$0.00	\$40.54
2	70	\$22.68	\$7.60	\$13.50	\$0.00	\$43.78
3	80	\$25.92	\$7.60	\$13.50	\$0.00	\$47.02
4	90	\$29.16	\$7.60	\$13.50	\$0.00	\$50.26

Effective Date - 12/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.82	\$7.60	\$13.50	\$0.00	\$40.92
2	70	\$23.12	\$7.60	\$13.50	\$0.00	\$44.22
3	80	\$26.42	\$7.60	\$13.50	\$0.00	\$47.52
4	90	\$29.73	\$7.60	\$13.50	\$0.00	\$50.83

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER	06/01/2017	\$32.40	\$7.60	\$13.50	\$0.00	\$53.50
LABORERS - ZONE 2	12/01/2017	\$33.03	\$7.60	\$13.50	\$0.00	\$54.13
	06/01/2018	\$33.87	\$7.60	\$13.50	\$0.00	\$54.97
	12/01/2018	\$34.71	\$7.60	\$13.50	\$0.00	\$55.81
	06/01/2019	\$35.58	\$7.60	\$13.50	\$0.00	\$56.68
	12/01/2019	\$36.44	\$7.60	\$13.50	\$0.00	\$57.54

For apprentice rates see "Apprentice- LABORER"

LABORER: CEMENT FINISHER TENDER	06/01/2017	\$32.40	\$7.60	\$13.50	\$0.00	\$53.50
LABORERS - ZONE 2	12/01/2017	\$33.03	\$7.60	\$13.50	\$0.00	\$54.13
	06/01/2018	\$33.87	\$7.60	\$13.50	\$0.00	\$54.97
	12/01/2018	\$34.71	\$7.60	\$13.50	\$0.00	\$55.81
	06/01/2019	\$35.58	\$7.60	\$13.50	\$0.00	\$56.68
	12/01/2019	\$36.44	\$7.60	\$13.50	\$0.00	\$57.54

For apprentice rates see "Apprentice- LABORER"

LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	06/01/2017	\$32.60	\$7.60	\$13.45	\$0.00	\$53.65
LABORERS - ZONE 2	12/01/2017	\$33.23	\$7.60	\$13.45	\$0.00	\$54.28
	06/01/2018	\$34.07	\$7.60	\$13.45	\$0.00	\$55.12
	12/01/2018	\$34.91	\$7.60	\$13.45	\$0.00	\$55.96
	06/01/2019	\$35.78	\$7.60	\$13.45	\$0.00	\$56.83
	12/01/2019	\$36.64	\$7.60	\$13.45	\$0.00	\$57.69

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.40	\$7.60	\$13.50	\$0.00	\$53.50
	12/01/2017	\$33.03	\$7.60	\$13.50	\$0.00	\$54.13
	06/01/2018	\$33.87	\$7.60	\$13.50	\$0.00	\$54.97
	12/01/2018	\$34.71	\$7.60	\$13.50	\$0.00	\$55.81
	06/01/2019	\$35.58	\$7.60	\$13.50	\$0.00	\$56.68
	12/01/2019	\$36.44	\$7.60	\$13.50	\$0.00	\$57.54
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.40	\$7.60	\$13.50	\$0.00	\$53.50
	12/01/2017	\$33.03	\$7.60	\$13.50	\$0.00	\$54.13
	06/01/2018	\$33.87	\$7.60	\$13.50	\$0.00	\$54.97
	12/01/2018	\$34.71	\$7.60	\$13.50	\$0.00	\$55.81
	06/01/2019	\$35.58	\$7.60	\$13.50	\$0.00	\$56.68
	12/01/2019	\$36.44	\$7.60	\$13.50	\$0.00	\$57.54
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2017	\$38.78	\$10.75	\$17.67	\$0.00	\$67.20

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

Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.39	\$10.75	\$17.67	\$0.00	\$47.81
2	60	\$23.27	\$10.75	\$17.67	\$0.00	\$51.69
3	70	\$27.15	\$10.75	\$17.67	\$0.00	\$55.57
4	80	\$31.02	\$10.75	\$17.67	\$0.00	\$59.44
5	90	\$34.90	\$10.75	\$17.67	\$0.00	\$63.32

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2017	\$50.80	\$10.75	\$19.22	\$0.00	\$80.77
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Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile
Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.40	\$10.75	\$19.22	\$0.00	\$55.37
2	60	\$30.48	\$10.75	\$19.22	\$0.00	\$60.45
3	70	\$35.56	\$10.75	\$19.22	\$0.00	\$65.53
4	80	\$40.64	\$10.75	\$19.22	\$0.00	\$70.61
5	90	\$45.72	\$10.75	\$19.22	\$0.00	\$75.69

Notes:
Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES)	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
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OPERATING ENGINEERS LOCAL 4

12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE
OPERATING ENGINEERS LOCAL 4

06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
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12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 1)
MILLWRIGHTS LOCAL 1121 - Zone 1

04/01/2017	\$38.62	\$9.90	\$18.50	\$0.00	\$67.02
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10/01/2017	\$39.52	\$9.90	\$18.50	\$0.00	\$67.92
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04/01/2018	\$40.42	\$9.90	\$18.50	\$0.00	\$68.82
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10/01/2018	\$41.32	\$9.90	\$18.50	\$0.00	\$69.72
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04/01/2019	\$42.22	\$9.90	\$18.50	\$0.00	\$70.62
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Apprentice - MILLWRIGHT - Local 1121 Zone 1
Effective Date - 04/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$21.24	\$9.90	\$5.31	\$0.00	\$36.45
2	65	\$25.10	\$9.90	\$15.13	\$0.00	\$50.13
3	75	\$28.97	\$9.90	\$16.10	\$0.00	\$54.97
4	85	\$32.83	\$9.90	\$17.06	\$0.00	\$59.79

Effective Date - 10/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$21.74	\$9.90	\$5.31	\$0.00	\$36.95
2	65	\$25.69	\$9.90	\$15.13	\$0.00	\$50.72
3	75	\$29.64	\$9.90	\$16.10	\$0.00	\$55.64
4	85	\$33.59	\$9.90	\$17.06	\$0.00	\$60.55

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MORTAR MIXER <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$23.47	\$10.00	\$15.25	\$0.00	\$48.72
	12/01/2017	\$23.99	\$10.00	\$15.25	\$0.00	\$49.24
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$27.54	\$10.00	\$15.25	\$0.00	\$52.79
	12/01/2017	\$28.15	\$10.00	\$15.25	\$0.00	\$53.40
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.71	\$7.85	\$0.00	\$0.00	\$33.56
2	55	\$28.28	\$7.85	\$3.66	\$0.00	\$39.79
3	60	\$30.85	\$7.85	\$3.99	\$0.00	\$42.69
4	65	\$33.42	\$7.85	\$4.32	\$0.00	\$45.59
5	70	\$35.99	\$7.85	\$14.11	\$0.00	\$57.95
6	75	\$38.56	\$7.85	\$14.44	\$0.00	\$60.85
7	80	\$41.13	\$7.85	\$14.77	\$0.00	\$63.75
8	90	\$46.27	\$7.85	\$15.44	\$0.00	\$69.56

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2017	\$42.31	\$7.85	\$16.10	\$0.00	\$66.26
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* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*

Classification

Effective Date

Base Wage

Health

Pension

Supplemental
Unemployment

Total Rate

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New**Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.16	\$7.85	\$0.00	\$0.00	\$29.01
2	55	\$23.27	\$7.85	\$3.66	\$0.00	\$34.78
3	60	\$25.39	\$7.85	\$3.99	\$0.00	\$37.23
4	65	\$27.50	\$7.85	\$4.32	\$0.00	\$39.67
5	70	\$29.62	\$7.85	\$14.11	\$0.00	\$51.58
6	75	\$31.73	\$7.85	\$14.44	\$0.00	\$54.02
7	80	\$33.85	\$7.85	\$14.77	\$0.00	\$56.47
8	90	\$38.08	\$7.85	\$15.44	\$0.00	\$61.37

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)

01/01/2017

\$40.37

\$7.85

\$16.10

\$0.00

\$64.32

PAINTERS LOCAL 35 - ZONE 2

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint**Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.19	\$7.85	\$0.00	\$0.00	\$28.04
2	55	\$22.20	\$7.85	\$3.66	\$0.00	\$33.71
3	60	\$24.22	\$7.85	\$3.99	\$0.00	\$36.06
4	65	\$26.24	\$7.85	\$4.32	\$0.00	\$38.41
5	70	\$28.26	\$7.85	\$14.11	\$0.00	\$50.22
6	75	\$30.28	\$7.85	\$14.44	\$0.00	\$52.57
7	80	\$32.30	\$7.85	\$14.77	\$0.00	\$54.92
8	90	\$36.33	\$7.85	\$15.44	\$0.00	\$59.62

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS)

06/01/2017

\$32.40

\$7.60

\$13.50

\$0.00

\$53.50

LABORERS - ZONE 2

12/01/2017

\$33.03

\$7.60

\$13.50

\$0.00

\$54.13

06/01/2018

\$33.87

\$7.60

\$13.50

\$0.00

\$54.97

12/01/2018

\$34.71

\$7.60

\$13.50

\$0.00

\$55.81

06/01/2019

\$35.58

\$7.60

\$13.50

\$0.00

\$56.68

12/01/2019

\$36.44

\$7.60

\$13.50

\$0.00

\$57.54

For Apprentice rates see "Apprentice- LABORER"

PAINTER / TAPER (BRUSH, NEW) *

01/01/2017

\$40.91

\$7.85

\$16.10

\$0.00

\$64.86

* If 30% or more of surfaces to be painted are new construction,

NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.46	\$7.85	\$0.00	\$0.00	\$28.31
2	55	\$22.50	\$7.85	\$3.66	\$0.00	\$34.01
3	60	\$24.55	\$7.85	\$3.99	\$0.00	\$36.39
4	65	\$26.59	\$7.85	\$4.32	\$0.00	\$38.76
5	70	\$28.64	\$7.85	\$14.11	\$0.00	\$50.60
6	75	\$30.68	\$7.85	\$14.44	\$0.00	\$52.97
7	80	\$32.73	\$7.85	\$14.77	\$0.00	\$55.35
8	90	\$36.82	\$7.85	\$15.44	\$0.00	\$60.11

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	01/01/2017	\$38.97	\$7.85	\$16.10	\$0.00	\$62.92
<i>PAINTERS LOCAL 35 - ZONE 2</i>						

Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.49	\$7.85	\$0.00	\$0.00	\$27.34
2	55	\$21.43	\$7.85	\$3.66	\$0.00	\$32.94
3	60	\$23.38	\$7.85	\$3.99	\$0.00	\$35.22
4	65	\$25.33	\$7.85	\$4.32	\$0.00	\$37.50
5	70	\$27.28	\$7.85	\$14.11	\$0.00	\$49.24
6	75	\$29.23	\$7.85	\$14.44	\$0.00	\$51.52
7	80	\$31.18	\$7.85	\$14.77	\$0.00	\$53.80
8	90	\$35.07	\$7.85	\$15.44	\$0.00	\$58.36

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER	12/01/2012	\$30.28	\$9.07	\$8.00	\$0.00	\$47.35
<i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>						

PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	08/01/2015	\$42.04	\$9.80	\$19.23	\$0.00	\$71.07
<i>PILE DRIVER LOCAL 56 (ZONE 1)</i>						
For apprentice rates see "Apprentice- PILE DRIVER"						

PILE DRIVER	08/01/2015	\$42.04	\$9.80	\$19.23	\$0.00	\$71.07
<i>PILE DRIVER LOCAL 56 (ZONE 1)</i>						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.02	\$9.80	\$19.23	\$0.00	\$50.05
2	60	\$25.22	\$9.80	\$19.23	\$0.00	\$54.25
3	70	\$29.43	\$9.80	\$19.23	\$0.00	\$58.46
4	75	\$31.53	\$9.80	\$19.23	\$0.00	\$60.56
5	80	\$33.63	\$9.80	\$19.23	\$0.00	\$62.66
6	80	\$33.63	\$9.80	\$19.23	\$0.00	\$62.66
7	90	\$37.84	\$9.80	\$19.23	\$0.00	\$66.87
8	90	\$37.84	\$9.80	\$19.23	\$0.00	\$66.87

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER	03/01/2017	\$48.86	\$9.70	\$16.14	\$0.00	\$74.70
<i>PIPEFITTERS LOCAL 537 (Local 138)</i>						

Apprentice - PIPEFITTER Local 537 (Local 138)

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$19.54	\$9.70	\$5.50	\$0.00	\$34.74
2	45	\$21.99	\$9.70	\$16.14	\$0.00	\$47.83
3	60	\$29.32	\$9.70	\$16.14	\$0.00	\$55.16
4	70	\$34.20	\$9.70	\$16.14	\$0.00	\$60.04
5	80	\$39.09	\$9.70	\$16.14	\$0.00	\$64.93

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:**

PIPELAYER	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
<i>LABORERS - ZONE 2</i>						
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79

For apprentice rates see "Apprentice- LABORER"

PLUMBER	03/01/2017	\$48.61	\$11.32	\$15.46	\$0.00	\$75.39
<i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PLUMBER/GASFITTER - Local 12 (Local 138)						
Effective Date - 03/01/2017						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$17.01	\$11.32	\$5.74	\$0.00	\$34.07
2	40	\$19.44	\$11.32	\$6.49	\$0.00	\$37.25
3	55	\$26.74	\$11.32	\$8.73	\$0.00	\$46.79
4	65	\$31.60	\$11.32	\$10.23	\$0.00	\$53.15
5	75	\$36.46	\$11.32	\$11.72	\$0.00	\$59.50
Notes: Steps are 1 yr Step 4 with lic\$55.65 Step5 with lic\$61.89						
Apprentice to Journeyworker Ratio:1:5						
PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	03/01/2017	\$48.86	\$9.70	\$16.14	\$0.00	\$74.70
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER <i>LABORERS - ZONE 2</i>	06/01/2017	\$33.40	\$7.60	\$13.50	\$0.00	\$54.50
	12/01/2017	\$34.03	\$7.60	\$13.50	\$0.00	\$55.13
	06/01/2018	\$34.87	\$7.60	\$13.50	\$0.00	\$55.97
	12/01/2018	\$35.71	\$7.60	\$13.50	\$0.00	\$56.81
	06/01/2019	\$36.58	\$7.60	\$13.50	\$0.00	\$57.68
	12/01/2019	\$37.44	\$7.60	\$13.50	\$0.00	\$58.54
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$31.86	\$10.00	\$15.25	\$0.00	\$57.11
	12/01/2017	\$32.55	\$10.00	\$15.25	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS LOCAL 42</i>	05/01/2017	\$24.21	\$8.49	\$11.54	\$0.00	\$44.24
	04/30/2018	\$24.21	\$8.49	\$11.96	\$0.00	\$44.66
	05/01/2018	\$24.24	\$8.49	\$12.46	\$0.00	\$45.19
	04/30/2019	\$24.24	\$8.49	\$12.92	\$0.00	\$45.65
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
RESIDENTIAL WOOD FRAME (All Other Work) <i>CARPENTERS -ZONE 2 (Residential Wood)</i>	06/01/2016	\$25.32	\$9.80	\$16.82	\$0.00	\$51.94
RESIDENTIAL WOOD FRAME CARPENTER **	04/01/2017	\$26.31	\$7.07	\$7.18	\$0.00	\$40.56
** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. <i>CARPENTERS -ZONE 2 (Residential Wood)</i>	10/01/2017	\$26.93	\$7.07	\$7.18	\$0.00	\$41.18
	04/01/2018	\$27.35	\$7.07	\$7.18	\$0.00	\$41.60
	10/01/2018	\$27.77	\$7.07	\$7.18	\$0.00	\$42.02
	04/01/2019	\$28.20	\$7.07	\$7.18	\$0.00	\$42.45
	10/01/2019	\$28.63	\$7.07	\$7.18	\$0.00	\$42.88

As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.

Apprentice - CARPENTER (Residential Wood Frame) - Zone 2

Effective Date - 04/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$15.79	\$7.07	\$0.00	\$0.00	\$22.86
2	60	\$15.79	\$7.07	\$0.00	\$0.00	\$22.86
3	65	\$17.10	\$7.07	\$7.18	\$0.00	\$31.35
4	70	\$18.42	\$7.07	\$7.18	\$0.00	\$32.67
5	75	\$19.73	\$7.07	\$7.18	\$0.00	\$33.98
6	80	\$21.05	\$7.07	\$7.18	\$0.00	\$35.30
7	85	\$22.36	\$7.07	\$7.18	\$0.00	\$36.61
8	90	\$23.68	\$7.07	\$7.18	\$0.00	\$37.93

Effective Date - 10/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.16	\$7.07	\$0.00	\$0.00	\$23.23
2	60	\$16.16	\$7.07	\$0.00	\$0.00	\$23.23
3	65	\$17.50	\$7.07	\$7.18	\$0.00	\$31.75
4	70	\$18.85	\$7.07	\$7.18	\$0.00	\$33.10
5	75	\$20.20	\$7.07	\$7.18	\$0.00	\$34.45
6	80	\$21.54	\$7.07	\$7.18	\$0.00	\$35.79
7	85	\$22.89	\$7.07	\$7.18	\$0.00	\$37.14
8	90	\$24.24	\$7.07	\$7.18	\$0.00	\$38.49

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79

For apprentice rates see "Apprentice- LABORER"

ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofing Waterproofing &Roofing Damproofg) ROOFERS LOCAL 33	02/01/2017	\$41.36	\$11.10	\$13.80	\$0.00	\$66.26
	08/01/2017	\$42.46	\$11.10	\$13.80	\$0.00	\$67.36
	02/01/2018	\$43.61	\$11.10	\$13.80	\$0.00	\$68.51
	08/01/2018	\$44.71	\$11.10	\$13.80	\$0.00	\$69.61
	02/01/2019	\$45.86	\$11.10	\$13.80	\$0.00	\$70.76

Apprentice - ROOFER - Local 33

Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.68	\$11.10	\$3.44	\$0.00	\$35.22
2	60	\$24.82	\$11.10	\$13.80	\$0.00	\$49.72
3	65	\$26.88	\$11.10	\$13.80	\$0.00	\$51.78
4	75	\$31.02	\$11.10	\$13.80	\$0.00	\$55.92
5	85	\$35.16	\$11.10	\$13.80	\$0.00	\$60.06

Effective Date - 08/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.23	\$11.10	\$3.44	\$0.00	\$35.77
2	60	\$25.48	\$11.10	\$13.80	\$0.00	\$50.38
3	65	\$27.60	\$11.10	\$13.80	\$0.00	\$52.50
4	75	\$31.85	\$11.10	\$13.80	\$0.00	\$56.75
5	85	\$36.09	\$11.10	\$13.80	\$0.00	\$60.99

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 ROOFERS LOCAL 33	02/01/2017	\$41.61	\$11.10	\$13.80	\$0.00	\$66.51
	08/01/2017	\$42.71	\$11.10	\$13.80	\$0.00	\$67.61
	02/01/2018	\$43.86	\$11.10	\$13.80	\$0.00	\$68.76
	08/01/2018	\$44.96	\$11.10	\$13.80	\$0.00	\$69.86
	02/01/2019	\$46.11	\$11.10	\$13.80	\$0.00	\$71.01

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 17 - A	02/01/2017	\$43.72	\$11.45	\$23.07	\$2.35	\$80.59
	08/01/2017	\$44.82	\$11.45	\$23.07	\$2.35	\$81.69
	02/01/2018	\$45.97	\$11.45	\$23.07	\$2.35	\$82.84

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - SHEET METAL WORKER - Local 17-A
Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.49	\$11.45	\$5.24	\$0.00	\$34.18
2	40	\$17.49	\$11.45	\$5.24	\$0.00	\$34.18
3	45	\$19.67	\$11.45	\$10.31	\$1.24	\$42.67
4	45	\$19.67	\$11.45	\$10.31	\$1.24	\$42.67
5	50	\$21.86	\$11.45	\$11.21	\$1.34	\$45.86
6	50	\$21.86	\$11.45	\$11.46	\$1.34	\$46.11
7	60	\$26.23	\$11.45	\$13.02	\$1.52	\$52.22
8	65	\$28.42	\$11.45	\$13.93	\$1.61	\$55.41
9	75	\$32.79	\$11.45	\$15.74	\$1.80	\$61.78
10	85	\$37.16	\$11.45	\$17.05	\$1.97	\$67.63

Effective Date - 08/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.93	\$11.45	\$5.24	\$0.00	\$34.62
2	40	\$17.93	\$11.45	\$5.24	\$0.00	\$34.62
3	45	\$20.17	\$11.45	\$10.31	\$1.26	\$43.19
4	45	\$20.17	\$11.45	\$10.31	\$1.26	\$43.19
5	50	\$22.41	\$11.45	\$11.21	\$1.35	\$46.42
6	50	\$22.41	\$11.45	\$11.46	\$1.36	\$46.68
7	60	\$26.89	\$11.45	\$13.02	\$1.54	\$52.90
8	65	\$29.13	\$11.45	\$13.93	\$1.64	\$56.15
9	75	\$33.62	\$11.45	\$15.74	\$1.82	\$62.63
10	85	\$38.10	\$11.45	\$17.05	\$2.00	\$68.60

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR

PAINTERS LOCAL 35 - ZONE 2

06/01/2013

\$25.81

\$7.07

\$7.05

\$0.00

\$39.93

Classification
Effective Date
Base Wage
Health
Pension
**Supplemental
Unemployment**
Total Rate
Apprentice - SIGN ERECTOR - Local 35 Zone 2
Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$12.91	\$7.07	\$0.00	\$0.00	\$19.98
2	55	\$14.20	\$7.07	\$2.45	\$0.00	\$23.72
3	60	\$15.49	\$7.07	\$2.45	\$0.00	\$25.01
4	65	\$16.78	\$7.07	\$2.45	\$0.00	\$26.30
5	70	\$18.07	\$7.07	\$7.05	\$0.00	\$32.19
6	75	\$19.36	\$7.07	\$7.05	\$0.00	\$33.48
7	80	\$20.65	\$7.07	\$7.05	\$0.00	\$34.77
8	85	\$21.94	\$7.07	\$7.05	\$0.00	\$36.06
9	90	\$23.23	\$7.07	\$7.05	\$0.00	\$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2016	\$32.44	\$10.91	\$10.89	\$0.00	\$54.24
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SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2016	\$32.73	\$10.91	\$10.89	\$0.00	\$54.53
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SPRINKLER FITTER SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2	03/01/2017	\$50.47	\$8.77	\$17.20	\$0.00	\$76.44
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Apprentice - SPRINKLER FITTER - Local 550 (Section B) Zone 2
Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$17.66	\$8.77	\$8.70	\$0.00	\$35.13
2	40	\$20.19	\$8.77	\$8.70	\$0.00	\$37.66
3	45	\$22.71	\$8.77	\$8.70	\$0.00	\$40.18
4	50	\$25.24	\$8.77	\$8.70	\$0.00	\$42.71
5	55	\$27.76	\$8.77	\$8.70	\$0.00	\$45.23
6	60	\$30.28	\$8.77	\$10.20	\$0.00	\$49.25
7	65	\$32.81	\$8.77	\$10.20	\$0.00	\$51.78
8	70	\$35.33	\$8.77	\$10.20	\$0.00	\$54.30
9	75	\$37.85	\$8.77	\$10.20	\$0.00	\$56.82
10	80	\$40.38	\$8.77	\$10.20	\$0.00	\$59.35

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

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
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	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2017	\$36.25	\$13.00	\$15.60	\$0.00	\$64.85
	09/01/2017	\$36.96	\$13.00	\$15.62	\$0.00	\$65.58
	03/01/2018	\$37.86	\$13.00	\$15.65	\$0.00	\$66.51
	09/01/2018	\$38.75	\$13.00	\$15.67	\$0.00	\$67.42
	03/01/2019	\$39.65	\$13.00	\$15.70	\$0.00	\$68.35

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 03/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$14.50	\$13.00	\$0.44	\$0.00	\$27.94
2	40	\$14.50	\$13.00	\$0.44	\$0.00	\$27.94
3	45	\$16.31	\$13.00	\$12.54	\$0.00	\$41.85
4	45	\$16.31	\$13.00	\$12.54	\$0.00	\$41.85
5	50	\$18.13	\$13.00	\$12.81	\$0.00	\$43.94
6	55	\$19.94	\$13.00	\$13.09	\$0.00	\$46.03
7	60	\$21.75	\$13.00	\$13.37	\$0.00	\$48.12
8	65	\$23.56	\$13.00	\$13.65	\$0.00	\$50.21
9	70	\$25.38	\$13.00	\$13.93	\$0.00	\$52.31
10	75	\$27.19	\$13.00	\$14.21	\$0.00	\$54.40

Effective Date - 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$14.78	\$13.00	\$0.44	\$0.00	\$28.22
2	40	\$14.78	\$13.00	\$0.44	\$0.00	\$28.22
3	45	\$16.63	\$13.00	\$12.55	\$0.00	\$42.18
4	45	\$16.63	\$13.00	\$12.55	\$0.00	\$42.18
5	50	\$18.48	\$13.00	\$12.82	\$0.00	\$44.30
6	55	\$20.33	\$13.00	\$13.10	\$0.00	\$46.43
7	60	\$22.18	\$13.00	\$13.39	\$0.00	\$48.57
8	65	\$24.02	\$13.00	\$13.66	\$0.00	\$50.68
9	70	\$25.87	\$13.00	\$13.95	\$0.00	\$52.82
10	75	\$27.72	\$13.00	\$14.22	\$0.00	\$54.94

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2017	\$49.70	\$10.75	\$19.22	\$0.00	\$79.67
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.85	\$10.75	\$19.22	\$0.00	\$54.82
2	60	\$29.82	\$10.75	\$19.22	\$0.00	\$59.79
3	70	\$34.79	\$10.75	\$19.22	\$0.00	\$64.76
4	80	\$39.76	\$10.75	\$19.22	\$0.00	\$69.73
5	90	\$44.73	\$10.75	\$19.22	\$0.00	\$74.70

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2016	\$37.70	\$7.60	\$14.35	\$0.00	\$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2016	\$36.42	\$7.60	\$14.35	\$0.00	\$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2016	\$36.30	\$7.60	\$14.35	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2017	\$45.93	\$10.00	\$15.25	\$0.00	\$71.18
	12/01/2017	\$46.92	\$10.00	\$15.25	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2016	\$33.02	\$10.91	\$10.89	\$0.00	\$54.82
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2016	\$48.58	\$7.60	\$14.75	\$0.00	\$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2016	\$50.58	\$7.60	\$14.75	\$0.00	\$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2016	\$40.65	\$7.60	\$14.75	\$0.00	\$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2016	\$42.65	\$7.60	\$14.75	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	12/01/2016	\$32.44	\$10.91	\$10.89	\$0.00	\$54.24
WAGON DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2017	\$32.65	\$7.60	\$13.50	\$0.00	\$53.75
	12/01/2017	\$33.28	\$7.60	\$13.50	\$0.00	\$54.38
	06/01/2018	\$34.12	\$7.60	\$13.50	\$0.00	\$55.22
	12/01/2018	\$34.96	\$7.60	\$13.50	\$0.00	\$56.06
	06/01/2019	\$35.83	\$7.60	\$13.50	\$0.00	\$56.93
	12/01/2019	\$36.69	\$7.60	\$13.50	\$0.00	\$57.79
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>	06/01/2017	\$46.38	\$10.00	\$15.25	\$0.00	\$71.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2017	\$47.38	\$10.00	\$15.25	\$0.00	\$72.63
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>	03/01/2017	\$48.61	\$11.32	\$15.46	\$0.00	\$75.39
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$26.61	\$7.50	\$1.80	\$0.00	\$35.91
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$27.14	\$7.75	\$1.81	\$0.00	\$36.70
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$37.70	\$7.50	\$8.87	\$0.00	\$54.07
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$38.45	\$7.75	\$9.53	\$0.00	\$55.73
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$31.05	\$7.50	\$8.89	\$0.00	\$47.44
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$31.66	\$7.75	\$9.44	\$0.00	\$48.85
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$24.39	\$7.50	\$1.73	\$0.00	\$33.62
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$24.88	\$7.75	\$1.75	\$0.00	\$34.38
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$37.70	\$7.50	\$12.95	\$0.00	\$58.15
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$38.45	\$7.75	\$13.61	\$0.00	\$59.81
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$33.26	\$7.50	\$9.63	\$0.00	\$50.39
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$33.92	\$7.75	\$10.21	\$0.00	\$51.88
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$24.39	\$7.50	\$1.73	\$0.00	\$33.62
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$24.88	\$7.75	\$1.75	\$0.00	\$34.38
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$19.96	\$7.50	\$1.60	\$0.00	\$29.06
For apprentice rates see "Apprentice- LINEMAN"	09/03/2017	\$20.35	\$7.75	\$1.61	\$0.00	\$29.71
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/28/2016	\$44.35	\$7.50	\$15.83	\$0.00	\$67.68
	09/03/2017	\$45.23	\$7.75	\$16.61	\$0.00	\$69.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 08/28/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$26.61	\$7.50	\$3.30	\$0.00	\$37.41
2	65	\$28.83	\$7.50	\$3.36	\$0.00	\$39.69
3	70	\$31.05	\$7.50	\$3.43	\$0.00	\$41.98
4	75	\$33.26	\$7.50	\$5.00	\$0.00	\$45.76
5	80	\$35.48	\$7.50	\$5.06	\$0.00	\$48.04
6	85	\$37.70	\$7.50	\$5.13	\$0.00	\$50.33
7	90	\$39.92	\$7.50	\$7.20	\$0.00	\$54.62

Effective Date - 09/03/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$27.14	\$7.75	\$3.31	\$0.00	\$38.20
2	65	\$29.40	\$7.75	\$3.38	\$0.00	\$40.53
3	70	\$31.66	\$7.75	\$3.45	\$0.00	\$42.86
4	75	\$33.92	\$7.75	\$5.02	\$0.00	\$46.69
5	80	\$36.18	\$7.75	\$5.09	\$0.00	\$49.02
6	85	\$38.45	\$7.75	\$5.15	\$0.00	\$51.35
7	90	\$40.71	\$7.75	\$7.22	\$0.00	\$55.68

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2016	\$28.98	\$4.25	\$3.12	\$0.00	\$36.35
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2016	\$27.31	\$4.25	\$3.07	\$0.00	\$34.63
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2016	\$27.31	\$4.25	\$3.07	\$0.00	\$34.63
TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/31/2016	\$18.51	\$3.55	\$0.00	\$0.00	\$22.06
<p>This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground.</p> <p>This classification does not apply to wholesale tree removal.</p>						
TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/31/2016	\$16.32	\$3.55	\$0.00	\$0.00	\$19.87

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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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.

PROJECT MANUAL

PROJECT:	McGLEW PARK Salem, Massachusetts
OWNER:	CITY OF SALEM Department of Planning and Community Development Salem, MA T 978-619-5695 F 978-745-7461
ARCHITECT:	MICHELLE CROWLEY LANDSCAPE ARCHITECTURE 281 Summer Street Boston, Massachusetts 022210 T 617-338-8400

OWNER AND OWNER'S CONSULTANTS

OWNER:

CITY OF SALEM
Department of Planning and Community Development
Salem, MA
T 978-619-5695
F 978-745-7461

ARCHITECT
(LANDSCAPE ARCHITECT):

MICHELLE CROWLEY LANDSCAPE ARCHITECTURE
281 Summer Street
Boston, Massachusetts 022210
T 617-338-8400

ARCHITECT AND ARCHITECT'S CONSULTANTS

ARCHITECT

(LANDSCAPE ARCHITECT):

MICHELLE CROWLEY LANDSCAPE ARCHITECTURE
281 Summer Street
Boston, Massachusetts 02210
617-338-8400

ENVIRONMENTAL ENGINEER:

Tighe & Bond
446 Main Street
Worcester, Massachusetts 01970
T 413-572-3222

STRUCTURAL ENGINEER:

David Martin
Becker Structural Engineers, Inc
75 York Street
Portland, Me 04101
T 207-879-1838

DOCUMENT 000110
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SECTION 004200

BID FORM

- A. The undersigned proposes to furnish all labor and materials required for construction of:

McGlew Park
North Street
Salem, MA 01970

in accordance with the accompanying Contract Documents prepared by

Michelle Crowley Landscape Architecture, LLC.
281 Summer Street, Floor 6
Boston, Massachusetts 02210
Telephone: (617) 338-8400

for the contract price specified below, subject to additions and deductions according to the terms of the Contract Documents.

- B. This bid includes addenda numbered _____.

- C. The proposed Contract Price is _____dollars (\$) .

- D. Alternates: Should any or all alternates specified be elected by the Owner, add or deduct the following amounts from the Contract Price listed above (Refer to Section 012300, ALTERNATES):

Alternate No. 1: _____
(Add)

Alternate No. 2: _____
(Add)

Alternate No. 3: _____
(Add)

Alternate No. 4: _____
(Add)

Alternate No. 5: _____
(Add)

Alternate No. 6: _____
(Add)

- E. Unit Prices: The proposed Contract Price listed above includes all excavation, soil removal, and backfilling per the contract documents, Contractor is to assume even cut and fill. Unit prices are given for changes in the work only. (Refer to Section 012200, UNIT PRICES)
- F. The Owner may require the Contractor to provide a Performance Bond (Document 006113.13) and Labor and Material Payment Bond (Document 006113.16), each in the amount of 100 percent of the Contract Amount. The undersigned shall indicate in the space below the cost of said bonds. Should the bonds be required, the cost of the bonds will be added to the Contract Amount. The additional cost of providing a 100 percent Performance Bond and a 100 percent Labor and Material Payment Bond is \$_____.
- G. The undersigned agrees that, if he is selected as General Contractor, he will within ten days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Owner, execute Document 005210, AGREEMENT in accordance with the terms of this General Bid and furnish a Performance Bond and a Labor and Materials Payment Bond, each of a surety company qualified to do business under the laws of the **Commonwealth of Massachusetts** and satisfactory to the Owner, and each in the sum of one hundred percent (100%) of the Contract Price, the premiums for which are to be paid by the General Contractor and are included in the Contract Price.
- H. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed, or to be employed on the Work.
- I. Commencement and Completion of Work: The undersigned agrees to commence initial portion of work on the Contract within ten (10) calendar days from receipt of written notice to proceed issued by the Owner within fourteen (14) calendar days after execution of the Contract Agreement and to thereafter diligently and continuously carry on the work. He agrees to complete initial planting work as required by completed Owner-Contractor Agreement, and to perform maintenance and planting work as scheduled and as required by Owner.

Date: _____

(Name of Bidder)

(Seal)

BY: _____

(Title)

(Business Address)_____
(City and State)

END OF BID FORM

DOCUMENT 01100

SUMMARY

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 PROJECT IDENTIFICATION AND DESCRIPTION OF WORK

- A. Project Identification: The name of the Project on Contract Documents is Bid No. T-01 McGlew Park Renovation, Salem, Massachusetts.
- B. The Project consists of selective demolition and removals, selective tree removals, exterior signage, new play structures and related safety surfacing, site furnishings, new bituminous concrete paving and paving repairs, granite wall, gabion wall, new chain link fencing and chain link fence repairs, wood fencing, grading, lawns and planting, clay sportsfield refurbishment, wood trail bridges, and irrigation. Contract Documents were prepared by Michelle Crowley Landscape Architecture.

1.02 CONTRACT

- A. Form of Contract between Owner and Contractor will be AIA Document A107, Standard Form of Agreement Between Owner and Contractor for Construction Projects of Limited Scope where the Basis of Payment is a Stipulated Sum.

1.03 CONTRACTOR'S USE OF PREMISES

- A. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine construction operations to areas within the Limits of Work areas as indicated on Drawings.
 - 2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. SANITATION: Use special care in maintaining the Work areas free from food debris and food wrappers. Provide covered trash containers and be responsible for the sanitary collection and prompt removal of such trash in these containers from the park grounds on a daily basis.
- C. FLAMMABLE LIQUID STORAGE: All flammable liquids and/or gas shall be stored and used in accordance with applicable State and Federal regulations.

- D. ALCOHOLIC BEVERAGES: Alcoholic beverages shall not be brought to or consumed on the park premises. Intoxicated personnel will not be permitted on the premises.
- E. SECURITY: Contractors shall be responsible for security of their own materials from theft and vandalism. This includes the personal tools and materials of the men working for the Contractor and subcontractors.
- F. The Contractor shall be responsible for excluding all but authorized personnel from work sites.
- G. Move any stored Products, under Contractor's control, which interfere with operations of the Owner or separate contractor.
- H. Obtain and pay for the use of additional storage or work areas needed for operations.
- I. Contractor shall obtain permit/permission for laydown area if required.

1.04 WORK RESTRICTIONS

- A. Work on this Project is permitted by City Ordinance between the hours of 7:00AM and 4:00PM in a five-day week.
 - 1. Any variation to this work schedule must be approved by the City.
- B. No work shall be done on this Contract on Sundays, or Holidays. Work will not be allowed on the day before or the day after a long weekend, which involves a holiday without the prior approval of the Owner.
- C. The Contractor may do work on Saturdays subject to the Contractor obtaining the appropriate approvals from the City in advance.
- D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's and Owner's written permission.
- E. Maintain a daily sign-in record of all personnel on the job site.
- F. Worker Parking will be in areas designated by the Owner. Owners of vehicles parked in unauthorized areas will be warned once, then subject to being towed at their expense. Limited trade vehicles will be allowed to park adjacent to the Project Site.
 - 1. Vehicles shall not be driven on or parked over tree roots, lawns, or plantings.
- G. Protect public and personnel from hazardous conditions with orange construction fencing and necessary warning signs.
- H. Prior to doing any digging, Contractor must contact Dig Safe and to ensure all underground services are properly located.

- I. Job sites are to be maintained clean and free from trash and debris.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

DOCUMENT 012200

UNIT PRICES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section covers those items for which indefinite quantities can be expected and, therefore, pre-agreed prices per unit of work are established as means to determine adjustments to the Contract Price after actual quantities are determined.

1.02 RELATED REQUIREMENTS

- A. Refer to GENERAL CONDITIONS for limitations.
- B. Examine Contract Documents for requirements that affect work of this Section.

1.03 QUANTITIES AND COST ADJUSTMENTS

- A. As soon as the work involved in each unit cost item has been completed, submit documentation to establish the actual quantities provided. Submit to the Architect for review and issuance of Change Order.
- B. Change Order amount for each unit cost item will be based on actual quantities multiplied by the unit cost. This unit cost includes all mark-ups applicable taxes, overhead, and profit as described below.

1.04 UNIT PRICES

- A. Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those required by the Contract Documents, by authorization of the Owner, the below unit prices shall, at the option of the Owner, be the basis of payment to the Contractor or credit to the Owner, for such increase or decrease in the work. The Unit Prices shall represent the exact net amount per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Owner (in the case of decreases). No additional adjustment will be allowed for overhead, profit, insurance, or other direct or indirect expenses of the Contractor or Subcontractors. No additional adjustments will be allowed for over excavation, overblasting, or other work without the prior written approval of the Owner.

<u>Unit</u>	<u>Add</u>	<u>Deduct</u>
1. Debris removal, per ton.	\$_____	\$_____
2. Disposal of Soils, per ton.	\$_____	\$_____
3. Fill material, as specified, per c.y.	\$_____	\$_____
4. Excavation and salvage of existing granite blocks, each	\$_____	\$_____
5. Changes in earthwork, per c.y.	\$_____	\$_____
6. Asphalt pavement, pedestrian, complete in-place, per sq yd	\$_____	\$_____
7. Asphalt pavement, vehicular, complete in place, per sq yd.	\$_____	\$_____
8. Wood Fiber Play Surfacing, including base, per sq. yd.	\$_____	\$_____
9. Rubberized Safety Play Surfacing, per sq. ft.	\$_____	\$_____
10. Gabion Wall, complete, per linear ft.	\$_____	\$_____
11. Granite Wall, complete, per linear ft.	\$_____	\$_____
12. Backless bench with footings, complete, each	\$_____	\$_____
13. Basketball hoop with footings, complete, each	\$_____	\$_____
14. Removable Bollard (F-BL2) receptacle and bollard, complete, each	\$_____	\$_____
15. Bike rib, complete, each	\$_____	\$_____
16. 8'-0" high chain link fence, new mesh only, paint existing chain link post and rails per LF	\$_____	\$_____
17. 5'-0" high chain link fence per LF	\$_____	\$_____
18. 6'-0" wood fence, per LF	\$_____	\$_____
19. Wood gate, each	\$_____	\$_____
20. Park sign with footing, complete, each	\$_____	\$_____
21. Trash Receptacle with footing, complete, each	\$_____	\$_____
22. Drinking fountain with footing, complete, each	\$_____	\$_____
23. Hydroseed, furnished and installed complete, per sq. ft.	\$_____	\$_____
24. Refurbish Lawn- aerate and over-seed, per sq. ft.	\$_____	\$_____
25. Mulch, furnished and installed complete, per sq ft.	\$_____	\$_____
26. Deciduous Tree – Acer rubrum 'Armstrong', 3" cal., furnished and installed, complete	\$_____	\$_____

27. Deciduous Tree – Acer sacchrum, 3" cal., furnished and installed complete, each	\$_____	\$_____
28. Deciduous Tree – Crataegus viridis 'Winter King', 3" cal., furnished and installed complete, each	\$_____	\$_____
29. Planting soil, as specified, per c.y.	\$_____	\$_____

B. The above unit prices shall include all labor, materials, dewatering, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for. Changes shall be processed in accordance with the provisions of the Document 005210, AGREEMENT FORM governing Changes in the Work and Section 012600, CONTRACT MODIFICATION PROCEDURES.

C. The above unit prices shall be guaranteed through July 31, 2018.

END OF SECTION

DOCUMENT 012300

ALTERNATES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. For each of the alternates Scheduled at the end of this Section, state the amount in the proposal to be added to or deducted from the Contract Sum for the work.

1.02 ALTERNATES

- A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Owner's option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents. Selection may occur prior to the Contract Date, or may, by the Agreement, be deferred for possible selection at a subsequent date.
- B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.
- C. Provide written proposals for each alternate on the Form of Proposal for Owner's consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.
- D. Selection of Alternates: Selection of alternates to be included in the work will be by the Owner.
- E. Notification: Immediately following award of Contract, prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted, rejected, or deferred for consideration at a later date. Include full description of negotiated modifications to alternates, if any.

1.03 DESCRIPTION OF ALTERNATES

- A. Alternates shall include the following:
 - 1. Alternate No. 1- Contractor shall provide an add price for furnishing and installing (5) Benches (F-B) as shown on Drawing L2.0 and detailed on L5.4 and as specified in Section 129300 SITE FURNISHINGS.

2. Alternate No. 2- Contractor shall provide an add price for furnishing and installing (1) Drinking Fountain (F-DF) as shown on Drawing L2.0 and detailed on L5.4 and as specified in Section 224713 DRINKING FOUNTAIN.
3. Alternate No. 3- Contractor shall provide an add price for furnishing and installing Timber Bridge A (P-TA) as shown on Drawing L2.0 and detailed on L5.6 and as specified in Section 061533 WOOD DECKING.
4. Alternate No. 4- Contractor shall provide an add price for furnishing and installing Timber Bridge B (P-TB) as shown on Drawing L2.0 and detailed on L5.6 and as specified in Section 061533 WOOD DECKING.
5. Alternate No. 5- Contractor shall provide an add price for furnishing and installing Stonedust Paving with Steel Edging (P-SD) as shown on Drawing L2.0 and detailed on L5.0 and as specified in Section 321543 STONE DUST SURFACING.
6. Alternate No. 6- Contractor shall provide an add price for furnishing and installing (4) Bike Ribs (F-BR) as shown on Drawing L2.0 and detailed on L5.4 and as specified in Section 129300 SITE FURNISHINGS.

PART 2 PRODUCTS

Not Used

PART 1 EXECUTION

Not Used

END OF SECTION

DOCUMENT 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements required for handling modifications to the Contract Documents, including, but not limited to:
 - 1. Preliminary procedures.
 - 2. Documentation of proposals and claims.
 - 3. Request For Interpretation (RFI).
 - 4. Architect's Supplemental Instructions (ASI).
 - 5. Request For Proposal (RFP).
 - 6. Construction Change Directive (CCD).
 - 7. Change Order (CO).

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 012200, UNIT PRICES: The amounts of established unit prices. Documentation of proposals and claims.
 - 2. Conditions of the Contract: Methods of determining cost or credit to Owner resulting from changes in Work made on a time and material basis, and Contractor's claims for additional costs.
 - 3. Section 012900, PAYMENT PROCEDURES. Request For Proposal (RFP).
 - 4. Section 013300, SUBMITTAL PROCEDURES.
 - 5. Section 016000, PRODUCT REQUIREMENTS; Substitutions.
 - 6. Section 017700, CLOSEOUT PROCEDURES.

1.03 DEFINITIONS/FORMS

- A. Change Order (CO): AIA Document G701
 - 1. Definition: A written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:
 - a. Changes in the Work
 - b. The amount of the adjustment, if any, in the Contract Sum; and
 - c. The extent of the adjustment, if any, in Contract Time.

- B. Request For Interpretation (RFI. CSI Form 13.2A):
 - 1. Definition: A form to be used by Contractor requesting additional information regarding the Contract Documents.
- C. Construction Change Directive (CCD) AIA Document G714:
 - 1. Definition: A written order to the Contractor, signed by Owner and Architect which amends the Contract Documents as described, and authorizes Contractor to proceed with a change which affects the Contract Sum or the Contract Time, for inclusion in a subsequent Change Order.
- D. Architect's Supplemental Instructions (ASI):
 - 1. Definition: A written order, instructions, or interpretations, signed by Architect making minor changes in the Work not involving a change in Contract Sum or Contract Time.
 - 2. Form: Architect's Supplemental Instructions (ASI) Form.
- E. Request For Proposal (RFP) AIA Document G709:
 - 1. Definition: A request to the Contractor, signed by the Architect, for submission of an itemized quotation for changes in the Contract Sum or Contract Time. This is not a Change Order or a direction to proceed with the Work.

1.04 PRELIMINARY PROCEDURES

- A. Architect may initiate change by submitting a RFP to Contractor. Request will include:
 - 1. Detailed description of the Change, Products, and location of the change in the Project.
 - 2. Supplementary or revised Drawings and Specifications.
 - 3. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not, authorized.
 - 4. A specific period of time during which the requested price will be considered valid.
 - 5. Such request is for information only, and is not an instruction to execute the changes, nor to stop Work in progress.
- A. Contractor may initiate changes by submitting a written notice to Architect, containing:
 - 1. Description of the proposed changes.
 - 2. Statement of the reason for making the changes.
 - 3. State of the effect on the Contract Sum and the Contract Time.
 - 4. Statement of the effect on the work of separate contractors.
 - 5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.05 CONSTRUCTION CHANGE DIRECTIVE

- A. In lieu of Request For Proposal (RFP), Architect may issue a Construction Change Directive (CCD) for Contractor to proceed with a change for subsequent inclusion in a Change Order.
- B. Authorization will describe change in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change, and will designate the method of determining any change in the Contract Sum and any change in

Contract Time.

- C. Architect will sign and date the Construction Change Directive and send it to the Owner for authorization for the Contractor to proceed with the changes.
- D. Once authorized by the Owner, the Architect will send the Construction Change Directive to the Contractor. Contractor shall sign and date the Construction Change Directive to indicate agreement with the terms therein.

1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Architect to evaluate the quotation.
- B. On request provide additional data to support time and cost computations including, but not limited to:
 - 1. Labor required.
 - 2. Equipment required.
 - 3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 - 4. Taxes, insurance, and bonds.
 - 5. Credit for work deleted from Contract, similarly documented.
 - 6. Overhead and profit.
 - 7. Justification for any change in Contract Time.
- C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus additional information:
 - 1. Name of the Owner's authorized agent who ordered the work, and date of the order.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time record, summary of hours worked, and hourly rates paid.
 - 4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing quantities.
 - c. Subcontracts.
- D. Document requests for substitutions for Products as specified in Section 016000, PRODUCT REQUIREMENTS.

1.07 PREPARATION OF CHANGE ORDERS

- A. Architect will prepare each Change Order.
- B. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.

1.08 LUMP-SUM/FIXED PRICE CHANGE ORDER

- A. Content of the Change Orders will be based on either:
 - 1. Architect's Request For Proposal and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
 - 2. Contractor's Proposal for a change, as recommended by Architect.

- B. Owner and Architect will sign and date the Change Order as authorization for the Contractor to proceed with the changes.
- C. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.

1.09 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Architect's definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as recommended by Architect.
 - 3. Survey of completed Work.
- B. The amounts of the unit prices to be:
 - 1. Those stated in the Agreement.
 - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the Work:
 - 1. Owner and Architect will sign and date the Change Order as authorization for Contractor to proceed with the changes.
 - 2. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.
- D. When quantities of the items cannot be determined prior to start of the Work:
 - 1. Architect and Owner will issue a Construction Change Directive directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
 - 2. At completion of the change, Architect will determine the cost of such work based on the unit prices and quantities used.
 - a. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
 - 3. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
 - 4. Owner and Contractor will sign and date the Change Order to indicate their agreement with the terms therein.

1.10 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE DIRECTIVE

- A. Architect and Owner will issue a Construction Change Directive directing Contractor to proceed with the changes.
- B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.
- C. Architect will determine the allowable cost of such work, as provided in Document 005210, AGREEMENT.
- D. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.

- E. Owner and Contractor will sign and date the Change Order to indicate their agreement therewith.

1.11 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Progress Schedule to reflect each change in Contract Time.
 - 1. Revise sub-schedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

DOCUMENT 012900

PAYMENT PROCEDURES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for submitting the following:
 - 1. Schedule of values.
 - 2. Application for Payment.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 017700, CLOSEOUT PROCEDURES; Final payment.

1.03 SCHEDULE OF VALUES

- A. Timing: Submit Schedule of Values allocated to the various portions of the Work within ten days after award of Contract.
- B. When requested by Architect, submit substantiating data supporting the values submitted.
- C. Intent: Unless objections are stated by Architect, the Schedule of Values will be used as the basis for the Contractor's Applications for Payment.
- D. Form and Content of Schedule of Values: Type schedule on 8-1/2 in. x 11 in. white paper. Contractor's standard forms and automated printout will be considered for approval by Architect upon Contractor's request. Identify schedule with title of Project and location, Architect's project number, name and address of Architect, name and address of Contractor, Contract designation, and date of submission.
 - 1. Line Item Categories: Follow the Table of Contents of Project Manual for major category items.
 - 2. List installed value of component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- E. Sub-Values: For each major line item, list sub-values of major products or operations under the item.
- F. Overhead and Profit: For the various portions of the Work, include a directly proportional amount of the Contractor's overhead and profit.
- G. Stored Material: For items on which progress payments will be requested for stored

materials, break down the value into the following sub-values:

1. The cost of material, delivered and unloaded at Project Site, with taxes paid.
2. Installation cost including overhead and profit.

H. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.04 APPLICATION FOR PAYMENT

- A. Format: Submit itemized applications typed on AIA Document G702, Application and Certificate for Payment, and continuation sheets AIA Document G703 or other Architect- approved form.
- B. Provide itemized data on continuation sheet. Format, schedules, line items and values shall match those of the Schedule of Values accepted by Architect.
- C. Initial Application for Payment: Administrative actions and submittals that must precede submittal of initial application for payment, include the following:
1. List of subcontractors, suppliers, and fabricators.
 2. Schedule of values.
 3. Progress schedule.
 4. Submittal schedule.
 5. Copies of permits and other communications from authorities.
 6. Performance and payment bonds (if required).
 7. Unit price schedule (if required).
- D. Preparation of Application for Payment: Execute each Application for Payment consistent with previous applications and payments certified by Architect and paid for by Owner. Provide partial lien waivers for Work in progress, and full lien waivers for completed Work. Fill in required information, including Change Orders information executed prior to date of submittal of this application. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets. Execute certification with signature of responsible officer of Contractor. Fill out continuation sheets as follows:
1. Fill in total list of scheduled component items of Work, with item number and scheduled dollar value for each item.
 2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.
 3. List each Change Order executed prior to date of submission at end of continuation sheets. List by Change Order Number, and description, as if an original item of work.
- E. Substantiating Data for Progress Payments: When Owner or Architect requires substantiating data, submit suitable information with cover letter, identifying Project name, Architect's Project number, application number and date, and detailed list of enclosures. Submit one copy of data and cover letter for each copy of application.
1. For stored products, identify Item number and identification as shown on application along with description of specific material.
- F. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. Show on this Application for Payment any Certificates of Partial Substantial Completion issued previously for Owner Occupancy of portions of the Work. Administrative actions and

submittals that must precede submittal of this Application for Payment, include the following:

1. Occupancy permits.
2. Warranties.
3. Test/adjust/balance records.
4. Maintenance instructions.
5. Meter readings.
6. Final cleaning.
7. Application for reduction of retainage.
8. Consent of surety.
9. Notification of shifting insurance coverages.
10. Final progress photographs.
11. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

G. Preparation of Final Application for Payment: Fill in Application form as specified for progress payments. Use continuation sheet for presenting the final statement of accounting as specified in Section 017700, CLOSEOUT PROCEDURES. Administrative actions and submittals that must precede submittal of final Application for Payment, include the following:

1. Completion of Project closeout requirements.
2. Completion of incomplete Work.
3. Assurances that unsettled claims will be settled.
4. Transmittal of Project record documents to Owner.
5. Certified property survey transmitted to Owner.
6. Proof that taxes, fees, and similar obligations have been paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish, and similar elements.

H. Submittal Procedure: Submit Application for Payment to Architect at intervals stipulated in the Agreement, and as follows:

1. Number of Copies: Five copies of each Application.
2. When Architect finds Application properly completed and correct, he will transmit Certificate for Payment to Owner, with copy to Contractor.

PART 2 PRODUCTS:
Not Used

PART 3 EXECUTION:
Not Used

END OF SECTION

DOCUMENT 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies supervisory and administrative requirements for coordination of Work, including, but not limited to:
 - 1. Coordination of work of employees and subcontractors.
 - 2. Coordination drawings.
 - 3. Expedition of work to assure compliance with schedules.
 - 4. Coordination of Work with that of other contractors and work by Owner.
 - 5. Compliance with orders and instructions of Architect or Owner.
 - 6. Conservation.
 - 7. Administrative and supervisory personnel.
 - 8. Project meetings.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 012900, PAYMENT PROCEDURES.
 - 2. Section 017329, CUTTING AND PATCHING.
 - 3. Section 013300, SUBMITTAL PROCEDURES.
 - 4. Section 015000, TEMPORARY FACILITIES AND CONTROLS.
 - 5. Section 017700, CLOSEOUT PROCEDURES.

1.03 COORDINATION BY CONTRACTOR

- A. Coordinate the Work of the Contract, including mechanical and electrical work, and other subcontractors. Anticipate areas where the installation of mechanical and electrical work will be restricted, congested, or difficult. Consult various affected subcontractors.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.

5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.
- 1.04 SUBMITTALS
- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Refer to further requirements specified in this Section, and Division 15 and Division 16 Sections for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within **15** days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including mobile and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
- 1.05 ADMINISTRATIVE AND SUPERVISORY PERSONNEL
- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
- 1.06 PROJECT MEETINGS, GENERAL
- A. Agendas: Prepare agendas for Project Meetings. Distribute copies to parties in attendance.
- B. Meeting Notices: Prepare and distribute written notices of Project Meetings four working days in advance of each meeting.
- C. Arrangements: Make physical arrangements for Project Meetings.
- D. Preside at Project Meetings.
- E. Minutes: Record minutes of Project Meetings, including significant procedures and decisions.
- F. Distribution of Minutes: Reproduce and distribute copies of Project Meeting minutes within three working days after each meeting to participants of meeting, to parties affected by decisions made at meetings, and to Architect.
- 1.07 PRE-CONSTRUCTION MEETING
- A. Schedule within 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, designated by Contractor.

C. Attendance: Require and notify the following to attend

1. Owner's Representative.
2. Architect and his Professional Consultants.
3. Resident Project Representative.
4. Contractor's Superintendent.
5. Major Subcontractors.
6. Major suppliers.
7. Others as appropriate.

D. Suggested Agenda:

1. Discussion of major subcontractors and suppliers.
2. Projected Construction Progress Schedules.
3. Critical work sequencing.
4. Major equipment deliveries and priorities.
5. Project Coordination, including designation of responsible personnel.
6. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal Requests.
 - c. Submittals.
 - d. Change Orders.
 - e. Application for Payment.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents.
9. Use of premises:
 - a. Office, work, and storage areas.
 - b. Owner's requirements.
10. Construction facilities, controls, and construction aids.
11. Temporary utilities.
12. Safety and first-aid procedures.
13. Security procedures.
14. Housekeeping procedures.

1.08 PRE-INSTALLATION CONFERENCES

- A. Conduct pre-installation conferences at site prior to construction activities which require coordination. Installers, manufacturer's representatives, and fabricators of materials or systems affected shall be required to attend. Advise Architect of scheduled meeting dates.
- B. Do not allow affected work to proceed if the conference cannot be successfully concluded. Initiate actions necessary to resolve impediments to performance of the work and reconvene the conference at the earliest feasible date.

1.09 PROGRESS MEETINGS

- A. Schedule regular periodic meetings, as required.
- B. Hold called meetings as required by progress of the Work.
- C. Location of the meetings: Project field office of Contractor.
- D. Attendance: Require and notify the following to attend:
 1. Architect, and his professional consultants as needed.
 2. Subcontractors, as appropriate to the agenda.
 3. Suppliers, as appropriate to the agenda.
 4. Others.

E. Suggested Agenda:

1. Review and approval of minutes of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Progress Schedule.
5. Review of off-site fabrication, and delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Progress Schedule.
8. Progress schedule during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
 - a. Effect on Construction Progress Schedule and on completion date.
 - b. Effect on other contracts of the Project.
14. Other business.

1.10 COORDINATION MEETINGS

- A. Conduct Coordination Meetings as necessary to properly coordinate the trades. Require representation of parties involved in coordination or planning of activities involved.

1.11 SPECIAL MEETINGS

- A. Conduct Special Meetings as required throughout the course of the Work. Special meeting issues may include, but are not limited to:
1. Safety issues.
 2. Labor issues.
 3. Special schedule issues.

1.12 COORDINATION DRAWINGS

- A. General: Submit coordination drawings for areas where close and careful coordination of trades is required. The Contractor shall be fully responsible for coordinating trades, coordinating construction sequence and schedules, and coordinating actual installed location and interface of work.
- B. Timing: Prior to fabricating materials or beginning work, supervise and direct the creation of one complete set of Coordination Drawings showing complete coordination and integration of work, including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, and electrical disciplines.
- C. Intent: Coordination Drawings are for the Contractor's use during construction and are not to be construed as replacing Shop Drawings or Record Drawings. Architect's review of submitted Coordination Drawings shall not relieve Contractor from his overall responsibility for the coordination of work of the Contract.
- D. Base Sheets: Contractor shall prepare and provide one accurately scaled digitally prepared set of Coordination Drawings showing all landscape architectural and structural work. Base sheets shall be at appropriate scale.
- E. Plumbing: Contractor shall circulate Coordination Drawings to plumbing subcontractor and require plumbing subcontractor to accurately and neatly show actual size and location of all plumbing equipment and work. Plumbing subcontractor shall note apparent conflicts, suggest alternate solutions, and return the Coordination Drawings to the Contractor.

- F. Electrical: Contractor shall circulate Coordination Drawings to electrical subcontractor and require electrical subcontractor to accurately and neatly show actual size and location of electrical equipment and work. Electrical subcontractor shall note apparent conflicts, suggest alternate solutions, and return Coordination Drawings to Contractor.
- G. Other Subcontractors: The Contractor shall circulate Coordination Drawings to other subcontractors whose work might conflict with other work. Require these subcontractors to accurately and neatly show actual size and location of their equipment and work. These subcontractors shall note apparent conflicts, suggest alternate solutions, and return Coordination Drawings to the Contractor.

1.13 EXISTING UTILITIES

- A. Contractor shall notify public and private utility companies as required by law in advance of construction so that existing utilities may be accurately located and identified by the appropriate agency or utility.
- B. Give advance notice to public and private utility companies as required by law, and provide proper disposition, subject to Architect approval of existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that interfere with work, whether or not they are specifically indicated on Drawings. The Contractor shall immediately notify Architect and appropriate authorities when coming across an unknown utility line, and await decision as to how to dispose of same. When an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged, Contractor shall notify Architect and utility company involved, and assure protection, support, or moving of utilities to adjust them to new work. Contractor shall be responsible for damage caused to existing, active utilities under work of this Contract, whether or not such utilities are indicated on Drawings, including resultant damages or injuries to persons or properties.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

DOCUMENT 013300

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements required for handling modifications to the Contract Documents, including, but not limited to:
 - 1. Progress schedules.
 - 2. Submittal schedule.
 - 3. Shop drawings.
 - 4. Product data.
 - 5. Samples.
 - 6. Progress reports.
 - 7. Construction photographs.
- A. Administrative Submittals: Refer to requirements specified in other Division 1 Specification Sections, and other Contract Documents, for administrative submittals, including:
 - 1. Permits.
 - 2. Applications for payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of subcontractors.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 011000, SUMMARY OF WORK.
 - 2. Section 012900, PAYMENT PROCEDURES.
 - 3. Section 013100, PROJECT MANAGEMENT AND COORDINATION; Coordination drawings.
 - 4. Section 014000, QUALITY REQUIREMENTS; Test reports.
 - 5. Section 016000, PRODUCT REQUIREMENTS; Manufacturer's instructions.
 - 6. Section 016000, PRODUCT REQUIREMENTS; Contractor's list of Products.
 - 7. Section 017000, EXECUTION REQUIREMENTS; Survey and layout data submittals.
 - 8. Section 017700, CLOSEOUT PROCEDURES; Closeout submittals

1.03 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. **Architect reserves** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in this Section for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on **Architect's** receipt of submittal.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow **21** days for initial review of each submittal.
 - 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to **Architect** before being returned to Contractor.
 - 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 5. Allow **15** days for processing each resubmittal.
 - 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

- G. Additional Copies (Electronic files preferred): Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. **Architect will return submittals, without review**, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: **Use sample form at end of Section.**
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.
- J. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
- K. Contractor's Construction Schedule: Comply with requirements specified within this Section.
- L. Submittals Schedule: Comply with requirements specified within this Section.
- M. Application for Payment: Comply with requirements in Section 012900 PAYMENT PROCEDURES.
- N. Schedule of Values: Comply with requirements in Section 012900 PAYMENT PROCEDURES.
- O. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. **Use CSI Form 1.5A**, a copy of which is included at the end of this Section. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.04 PROGRESS SCHEDULE

- A. Timing: Submit progress schedule within 15 calendar days of Award of Contract.
- B. Preparation of Progress Schedule: Prepare construction schedule in format agreed upon with Architect and Owner.
 - 1. Schedule shall indicate as a minimum the following: (1) activity, (2) duration, (3) earliest start and finish times, (4) latest start and finish times, (5) float times, and (6) indication of "critical" and "non-critical" path activities.
- C. Format of Listings: Order chronologically by start of each unit of Work. List units of Work by Specification Section title.
- D. Content of Progress Schedule: Show complete sequence of construction by activity. Show dates of beginning and completion of each major element of construction.
- E. Distribution: Print and distribute progress schedule to Architect, Owner, subcontractors, and other parties affected. Post copies in field office. Instruct recipients to report promptly to Contractor in writing problems apparent from projections shown on schedule.
- F. Revisions: Update and reissue progress schedule monthly in conjunction with Application for Payment.

1.05 SUBMITTAL SCHEDULE

- A. Timing: Prepare and issue complete Submittal Schedule no later than ten working days after Architect accepts Progress Schedule.
- B. Preparation: Coordinate Submittal Schedule with Progress Schedule, and Schedule of Values.
- C. Content of Submittal Schedule: Prepare schedule in order by Specification Section. Provide the following information for each submittal:
 - 1. Scheduled date of initial submittal.
 - 2. Specification Section number.
 - 3. Submittal type.
 - 4. Name of subcontractor or supplier.
- D. Distribution: Print and distribute Submittal Schedule to Architect, Owner, subcontractors, and other parties affected. Post copies in field office.
- E. Revisions: Update and reissue Submittal Schedule monthly in conjunction with Application for Payment.

1.06 SHOP DRAWINGS

- A. Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this Project on reproducible sheets. Show adjacent conditions and related work. Show accurate field dimensions where appropriate. Identify materials and products shown. Note special coordination required. Standard information prepared without specific reference to Project is not considered shop drawings.
- B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings.
- C. Show every component of fabricated item, notes regarding manufacturing process, coatings and finishes, identifying numbers conforming to Contract Documents (i.e. stair

numbers, door numbers, etc.), dimensions, and appropriate trade names. Show anchorage and fastening details, including type, size and spacing. Show material gage and thickness. Indicate welding details and joint types.

- D. Shop Drawing Sheet Size: Except for templates, patterns, and other full-size drawings, submit shop drawings on sheets at least 8-1/2 in. x 11 in., but no larger than 36 in. x 48 in.
- E. Submittal Quantities: Submit shop drawings in following quantities:
 - 1. Architectural: For shop drawings submitted for Architect's review, submit one reproducible and one black line print of each sheet.
 - 2. Consultants: For shop drawings that require Consultant's review, submit one reproducible and two black line prints of each sheet.

1.07 PRODUCT DATA

- A. Definition: Product data includes manufacturer's standard published literature, such as installation instructions, catalog cuts, color charts, rough-in diagrams, and wiring diagrams. When product data must be prepared specifically because standard published data is not suitable for use, submit as shop drawing.
- B. Preparation: Mark each copy of product data to show applicable choices and options. Where published product data includes information on several products and choices, mark copies to clearly indicate information applicable to this Project.
- C. Do not submit product data until compliance with requirements of Contract Documents has been confirmed.
- D. Submittal Quantities: Submit product data in following quantities:
 - 1. Architectural Work: Submit number of copies required by Contractor, plus additional two copies to be retained by Architect.
 - 2. Consultant's Work: Submit number of copies required by Contractor, plus an additional three copies to be retained by Consultant, and an additional one copy to Architect. Forward copy of transmittal to Consultant. Consultant's review and comments will be made on copies returned to Architect, who will forward them to Contractor.
- E. Installer Copy: Verify that installer of Work possesses a current copy of Architect-approved product data prior to installation.

1.08 SAMPLES

- A. Submit samples identical with materials and products to be installed. Where indicated, prepare samples to match Architect's sample. Label sample with description, source, manufacturer's name, and catalog number. Submit samples along with certifications that products comply with referenced standards.
- B. Architect Review: Architect will review samples for confirmation of visual intent, color, pattern, texture, and type. Architect will not test samples for compliance with other specified requirements, which shall remain exclusive responsibility of Contractor.
- C. Submittal Quantities: When variation in color, pattern, or texture can be expected in finish work, submit multiple samples (minimum of three) to show approximate limits of variations. Submit samples in following quantities:
 - 1. Initial Selection: For initial selection of color, texture, and pattern, submit one full set of manufacturer's available samples.

2. Verification Samples: Submit three sets of samples selected. One set will be returned to Contractor for use at Project Site for quality control comparisons.

- D. Distribution: Distribute additional sets of approved samples to subcontractors, suppliers, installers, and others required for proper performance of Work. Indicate distribution on transmittal forms.

1.09 BI-WEEKLY PROGRESS REPORTS

- A. Prepare bi-weekly (every two weeks) construction Progress Reports. Record following information concerning events on Project Site:
 1. List of subcontractors at site.
 2. General weather conditions.
 3. Accidents and unusual events.
 4. Meetings and significant decisions.
 5. Orders and requests by governing authorities.
 6. Change orders received.
 7. Equipment or system tests and start-ups.
 8. Partial completions and occupancies.
 9. Authorized substantial completions.
- B. Distribution: Distribute copies to Architect weekly.

1.10 CONSTRUCTION PHOTOGRAPHS

- A. General: Take construction record photographs in digital format, monthly during course of Work.
- B. Provide photographs in digital format taken at completion of major stages of construction, including:
 1. Tree protection and site clearing.
 2. Site grading
 3. Demolition.
 4. Excavations.
 5. Concrete foundations.
 6. Bituminous pavements.
 7. Safety surfacing
 8. Rail Fence.
 9. Play equipment.
 10. Landscaping.
- C. View different views approved by Architect. Provide three images of each view.
- D. Digital Images: Provide images in uncompressed JPEG format, produced by a digital camera with minimum sensor size of 4.0 megapixels.
- E. Identify and date each image.
- F. Views Required: Illustrate condition of construction and state of progress.
- G. Delivery of Images: Deliver electronic images as soon as processed, to Owner, Architect, and Project Record File.
 1. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken.
- H. Preconstruction Photographs: Before commencement of demolition, take color digital

photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Take eight photographs to show existing conditions adjacent to property before starting the Work.
2. Take eight photographs of existing buildings and structures either on or adjoining property to accurately record physical conditions at start of construction.
3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

1.11 ARCHITECT'S ACTION

- A. General: Architect will review submittals, stamp and indicate action, and return to Construction Manager. Architect will review submittals for conformance with design intent only. Architect's review and approval of submittals shall be held to limitations stated in the Conditions of the Contract. In no case shall approval or acceptance by Architect be interpreted as release of Construction Manager of responsibility to fulfill requirements of Contract Documents. No acceptance or approval of submittals, nor any indication or note marked by Architect on submittals, shall constitute authorization for increase in Contract Sum.
- B. Action Stamp: Architect will stamp each submittal with an action stamp. Stamp will indicate action taken as follows:
 1. "APPROVED": No corrections, no marks, Proceed: Resubmission not required.
 2. "APPROVED AS NOTED": Minor amount of corrections; all items can be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.
 3. "REVISE AND RESUBMIT": Submittal does not conform to Contract Documents, and requires too many corrections. Architect will state reasons for rejection. Correct as noted and resubmit.
 4. "REJECTED": Submittal does not conform to Contract Documents, and requires too many corrections, and is rejected for other justifiable reasons. Architect will state reasons for rejection. Do not fabricate.
- C. Other Action: Submittal for information or record purposes will be returned with no action marked.
- D. Required Resubmittals: Make corrections or changes to submittals required by Architect and resubmit until accepted. Revise initial shop drawings or product data, and resubmit as specified for initial submittal. Indicate changes made other than those requested by Architect. Submit new samples as required for initial submittal.

1.12 DISTRIBUTION BY CONTRACTOR

- A. Distribution: Accepted Submittals, make prints and copies and distribute to Owner, subcontractors, suppliers, fabricators, and other parties requiring information from submittal for proper coordination and performance of Work. Print copies of shop drawings from accepted reproducible only.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION



SUBMITTAL TRANSMITTAL

Project: _____ Date: _____
A/E Project Number: _____

TRANSMITTAL To (Contractor): _____ Date: _____ Submittal No. _____
A From (Subcontractor): _____ By: _____ ☐ Resubmission

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title and Paragraph / Drawing Detail Reference

- ☐ Submitted for review and approval
☐ Resubmitted for review and approval
☐ Complies with contract requirements
☐ Will be available to meet construction schedule
☐ A/E review time included in construction schedule

- ☐ Substitution involved - Substitution request attached
☐ If substitution involved, submission includes point-by-point comparative data or preliminary details
☐ Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission: _____

☐ One copy retained by sender

TRANSMITTAL To (A/E): _____ Attn: _____ Date Rec'd by Contractor: _____
B From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

- ☐ Approved
☐ Approved as noted

- ☐ Revise / Resubmit
☐ Rejected / Resubmit

Other remarks on above submission: _____

☐ One copy retained by sender

TRANSMITTAL To (Contractor): _____ Attn: _____ Date Rec'd by A/E: _____
C From (A/E): _____ ☐ Other By: _____ Date Trnsmt'd by A/E: _____

- ☐ Approved
☐ Approved as noted
☐ Not subject to review
☐ No action required
☐ Revise / Resubmit
☐ Rejected / Resubmit
☐ Approved as noted / Resubmit

- ☐ Provide file copy with corrections identified
☐ Sepia copies only returned
☐ Point-by-point comparative data required to complete approval process
☐ Submission Incomplete / Resubmit

Other remarks on above submission: _____

☐ One copy retained by sender

TRANSMITTAL To (Subcontractor): _____ Attn: _____ Date Rec'd by Contractor: _____
D From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ One copy retained by sender



SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project: _____

To (A/E): _____

From (Contractor): _____
Date: _____
A/E Project Number: _____
Contract For: _____

List Subcontractors and Major Material Suppliers proposed for use on this Project as required by the Construction Documents. Attach supplemental sheets if necessary.

Section Number	Section Title	Firm	Address	Phone Number (Fax Number)	Contact
-------------------	------------------	------	---------	------------------------------	---------

☐ Attachments

Signed by: _____ Date: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

DOCUMENT 013529

HEALTH AND SAFETY PLAN

PART 1 GENERAL

A. SUMMARY

1. Section Includes

- a. Develop a site specific Health and Safety Plan (HASP) specifically addressing the potential hazards that may be encountered. This plan shall meet all OSHA requirements.

B. REFERENCES

1. OSHA Regulation 29 CFR 1910.120
2. OSHA Regulation 29 CFR 1926.62

C. SUBMITTALS

1. Informational Submittals: Submit the following within seven (7) days after the Effective Date of the Notice to Proceed.
 - a. Site-specific HASP including the Emergency Response Plan for review, including provisions for decontamination and a contingency plan for unforeseen emergencies. The Architect's review is only to determine if the HASP meets basic regulatory requirements and the minimum requirements of this section. The review will not determine the adequacy of the HASP to address all potential hazards, as that remains the sole responsibility of the Contractor.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

DOCUMENT 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.

1.02 REQUIREMENTS

- A. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
- B. The Owner reserves the right, at his sole discretion, to select and pay for the services of an Independent Testing Laboratory to perform specified services and testing as may be in the Owner's best interest.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.03 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
 - 2. Respective sections of specifications: Certification of products.

1.04 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Society for Testing and Materials (ASTM):

E329

Inspection and Testing Agencies for Concrete, Steel, and
Bituminous Materials as Used in Construction

1.05 LABORATORY DUTIES

- A. Cooperate with Architect and Contractor; provide qualified personnel promptly on notice.
- B. Acquaint Owner, Architect, and Contractor's superintendent with testing procedures and with all special conditions encountered at the site.
- C. Inspections, sampling, and testing of materials and construction methods shall be as specified in individual technical specification sections.
 - 1. Comply with specified standards, ASTM, ANSI, and other recognized authorities.
 - 2. Conduct and interpret the tests and state in each report whether the test specimens comply with the requirements, and specifically state any deviations therefrom.
 - 3. Obtain Contractor's written acknowledgment of each inspection, sampling, and test made.
- D. Promptly notify Architect and Contractor of irregularities or deficiencies of Work or Products which are observed during performance of services.
- E. Promptly submit written report of each test and inspection; one copy each to Architect, Owner, Contractor, and one copy to Project Record Documents File. Each report shall include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Testing laboratory name, address, and telephone number.
 - 4. Name and signature of laboratory inspector.
 - 5. Date and time of sampling or inspection.
 - 6. Record of temperature and weather conditions.
 - 7. Date of test.
 - 8. Identification of Product and Specification section.
 - 9. Location of sample or test in the Project.
 - 10. Type of inspection or test.
 - 11. Results of tests and compliance with Contract Documents.
 - 12. Interpretation of test results, when requested by Architect.
 - 13. Observations regarding compliance with Contract Documents.
- F. Perform properly authorized additional services as required by the Owner.

1.06 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 - 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the Work, except as specifically authorized by the specifications.
 - 3. Perform any duties of the Contractor.

1.07 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to Work, and to Manufacturer's operations.

1. Monitor each inspection, sampling, and test.
 2. Provide Laboratory or Agency with written acknowledgment of each inspection, sampling, and test.
 3. Within 24 hours notify Architect and Owner in writing of reasons for not acknowledging Laboratory results.
- B. Secure and deliver to the Laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the Laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- D. Furnish copies of Product test reports as required.
- E. Furnish incidental labor and facilities:
1. To provide access to Work to be tested.
 2. To obtain and handle samples at the Project site or at the source of the Product to be tested.
 3. To facilitate inspections and tests.
 4. For storage and curing of test samples.
- F. Furnish verification of materials and equipment compliance with Contract Documents.
- G. Identify materials to be tested or inspected by Testing Laboratory or Agency.
- H. After determination of need for testing or inspecting by Owner, notify Laboratory sufficiently in advance, minimum five days, of operations to allow for its assignment of personnel and scheduling of tests.
1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- I. Make arrangements with laboratory and pay for additional samples and tests required:
1. For the Contractor's convenience; or
 2. When initial tests indicate Work does not comply with Contract Documents.

1.08 CONDUCT OF INSPECTIONS AND TESTS

- A. The Contractor shall notify the Owner, Architect, and Testing Laboratory in sufficient time before the performance of work to permit the proper conduct of Owner-authorized inspections and tests.
- B. Representatives of Testing Laboratory shall inspect the manufacture, assembly, and placement of materials as required and as authorized by the Owner, and shall report their findings to the Architect, Owner, and Contractor.
- C. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection when such defect is discovered nor shall it obligate the Owner to accept such work.

1.09 TESTS REQUIRED

- A. General Construction Tests: More detailed testing requirements are given in individual Specification Sections. The Owner shall retain the right to make any additional tests the Architect deems necessary or appropriate. The Contractor is responsible for providing his own tests to determine that materials meet specified requirements. The scope of tests required and paid for by the Owner (unless otherwise noted below) shall include as a minimum the following:
1. Earthwork: Lab tests to determine suitability of all fill materials shall be paid for by Contractor. Owner reserves the right to retain and pay for his own testing for checking purposes.
 2. Earthwork: Proctor tests for compaction.
 3. Bituminous Concrete Paving: Field and lab tests for asphalt paving.
 4. Concrete Paving and General Concrete Work: Concrete mix design testing shall be paid for by Contractor. Owner reserves the right to retain and pay for his own testing for checking purposes
 5. Metals: Strength; dimension; coating thickness; bolt torque; welding X-ray or ultrasonic tests.
 6. Playground Safety Surfacing: Shock absorbency, weathering, slip resistance and flammability.
 7. Sealants: Chemical analysis; adhesive strength; compatibility with adjacent materials; elasticity.
 8. Paints and Finishes: Chemical analysis; coating thickness.
- B. Plumbing: At least the following tests will be performed. Conform to requirements specified in individual Division 22 Specification Sections. The test shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on site representative:
1. Water supply piping hydrostatic pressure test.
 2. Sanitary piping test before fixture installation: Cap pipes and fill to highest point in system.
 3. Plumbing fixture operation.
- C. Electrical Power System Testing: At least the following tests will be performed. Conform to requirements specified in individual Division 16 Specification Sections. The tests shall be performed and paid for by the subcontractor and witnessed by the Contractor and Owner's on-site representative:
1. Polarity tests.
 2. Operation of all circuits.
 3. Testing of emergency system.
 4. Security systems.
 5. Generation system.
 6. Grounding systems.
- D. Electrical Lighting System Testing: Conform to requirements specified in individual Division 26 Specification Sections. At least the following tests shall be performed and paid for by the subcontractor:
1. Operation of every component of entire system.
- E. Contractor's Responsibilities: The Contractor shall notify the Owner, Architect, and Testing Laboratory personnel at least 48 hours prior to performance of work requiring testing. The Contractor shall fully cooperate with testing agencies and permit free access to all areas at all times. The Contractor shall permit taking samples at any time

during construction, either before or after installation. Prior to notice to proceed with construction, the Contractor shall submit a Testing Log of planned tests and scheduled test dates. Tests shall be numbered based on type of work, type of test, and sequence. The Testing Log shall be maintained by the Contractor and updated weekly.

1. Coordination: The Contractor shall coordinate all testing, including all testing and inspections to be paid for by the Owner. The Contractor will arrange testing and sampling performed by the Owner's testing agency and will have prepared test record forms. Upon receipt of test results, the Owner will distribute copies with test results as follows:

Contractor [2 copies].

Architect [2 copies].

- F. Follow-up and Corrective Action: The Contractor and the Owner will note the test record on the Testing Log to acknowledge test procedures and results. If follow-up or corrective action is needed, the Contractor shall submit to the Owner two written copies of proposed follow-up or corrective plans and obtain the Owner's written approval before proceeding.

1. Cost of Testing: If tests indicate that materials or work do not comply with requirements, the Contractor shall pay for all retesting, and shall remove and replace non-complying work at no additional cost to the Owner.

- G. Local Authority Inspections: The Contractor is also responsible for coordinating and cooperating with local requirements for inspections.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

DOCUMENT 014339

MOCK-UP REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. Furnish and install mock-ups suitable to illustrate finish colors, materials and methods of construction. Maintain mock-ups as standard of colors, patterns, materials, performance and workmanship for entire project.
- B. Contractor shall be required to set aside a minimum of 200 square feet of area dedicated exclusively for mock-up construction and exhibition for the entire life of the Contract.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
 - 1. Section 011000, SUMMARY.
 - 2. Section 013300, SUBMITTAL PROCEDURES.
 - 3. Section 014000, QUALITY REQUIREMENTS; Test reports.
 - 4. Section 016000, PRODUCT REQUIREMENTS; Manufacturer's instructions.
 - 5. Section 017700, CLOSEOUT PROCEDURES; Closeout submittals.
 - 6. Individual Specification Sections that specify field mock-ups of individual pieces of the Work.

1.03 SUBMITTALS

- A. Shop Drawings of Mock-Ups: Provide large scale shop drawings for fabrication, installation and erection of all parts of each mock-up. Provide plans, elevations, and details of anchorage, connections and accessory items.
- B. Photographs of Mock-Ups: Submit photographs of mock-ups after completion of installation and acceptance of each mock-up.
- C. Samples: Refer to individual Specification Sections for submittal requirements of mock-up components and coordinate accordingly

1.04 QUALITY ASSURANCE

- A. Design Modifications: Make design modifications to work only as required to meet performance requirements and to coordinate the work. Indicate proposed design modifications on shop drawings. Maintain original design concept without altering profiles and alignments indicated.

1.05 MOCK-UP SCHEDULE

- A. Contractor shall prepare "Mock-Up Site" immediately following mobilization to allow the maximum quantity of time for Architect's viewing and examination.
- B. Mock-ups shall be completed for Architect's examination at least 45 days prior to scheduled start of construction or fabrication, as applicable for each type of work, unless otherwise specified.
- C. Contractor shall be responsible for all mock-ups required under each individual specification section.

PART 2 PRODUCTS

2.01 MATERIALS AND PRODUCTS

- A. Provide materials, components, and products for exterior assembly as specified in individual specification sections.

PART 3 EXECUTION

3.01 GENERAL

- A. Refer to PART 1, GENERAL PORTIONS OF THE VARIOUS Specification Sections for specific requirements regarding condition of surfaces, mockup size, erection, and erection tolerances.

3.02 MOCK-UP PROCEDURES

- A. Provide mock-ups and field samples of finishes at project as required by individual Specification Sections.
 - 1. Mock-ups shall not be used in final, completed work.
 - 2. Architect may reject, or withhold action on mock-ups requiring coordination with other mock-ups until related mock-ups are constructed and reviewed by Architect.
- B. Contractor shall erect field samples and mock-ups at the Project "Mock-Up Site", at location acceptable to Architect. Size of individual mock-up, protection of mock-up and removal and disposal of mock-up shall be as specified in individual Specification Section.
- C. Contractor's Preparation of Mock-ups: Place permanent label or title block on each mock-up for identification. Indicate Project Name, Architect's Project Number,

Specification Section number and title, date of mock-up, name and address of Owner, name and address of Architect, name and address of Contractor, name and address of subcontractor and/or supplier, name of manufacturer, Drawing number and detail reference.

1. Modify and customize mock-ups as required to show interface with adjacent work and attachment to structures or building.

3.03 PROTECTION OF MOCK-UPS

- A. Mock-ups shall be adequately protected from damage until they are no longer necessary.

3.04 REMOVAL AND DISPOSAL OF MOCK-UPS

- A. Demolish and remove mock-ups from site at completion of the Project. Legally dispose of demolished mock-up materials.

END OF SECTION

DOCUMENT 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies construction facilities and temporary controls, including, but not limiting to:

1. Temporary utilities include, but are not limited to, the following:

- a. Sewers and drainage.
- b. Water service and distribution.
- c. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
- d. Electric power service.
- e. Lighting.
- f. Telephone service.

2. Support facilities include, but are not limited to, the following:

- a. Temporary sidewalks and paving.
- b. Dewatering facilities and drains.
- c. Project identification and temporary signs.
- d. Waste disposal facilities.
- e. Field offices.
- f. Storage and fabrication sheds.
- g. Lifts and hoists.
- h. Construction aids and miscellaneous services and facilities.

3. Security and protection facilities include, but are not limited to, the following:

- a. Environmental protection.
- b. Stormwater control.
- c. Tree and plant protection.
- d. Pest control.
- e. Site enclosure fence.
- f. Security enclosure and lockup.
- g. Barricades, warning signs, and lights.
- h. Temporary enclosures.
- i. Fire protection.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect the Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
 - 1. Section 011000, SUMMARY.

2. Section 013529, HEALTH AND SAFETY PLAN.

1.03 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner, or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. Owner's construction forces.
 - 2. Architect.
 - 3. Testing agencies.
 - 4. Personnel of authorities having jurisdiction.

1.04 SUBMITTALS

- A. Temporary Utility Reports: If requested by the Architect or Owner, submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

1.05 QUALITY ASSURANCE

- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
 - 1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
 - 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.06 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.
- B. Pavement: Comply with Division 32 321312, BITUMINOUS CONCRETE PAVING.
- C. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- D. Plywood: Comply with the following: Signs and Directory Boards:
 - 1. Provide exterior grade, Medium Density Overlay (MDO) plywood, conforming to USDC PS1, of size and thickness indicated.
 - 2. Fences, Vision Barriers, and Safety Barriers: Provide exterior grade, C-D veneered plywood.
- E. Paint: Comply with industry standards.
- F. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- G. Water: Potable.

2.02 TEMPORARY UTILITIES

- A. Scope: Temporary utility work includes, but is not limited to:
 - 1. Water service and distribution.
 - 2. Electric power and light.
- B. Temporary Water Service and Distribution: Make arrangements with utility service company. Provide water for construction purposes, including water for drinking, hydroseeding, landscape maintenance, and fire protection. Pay costs for installation, maintenance, removal, and service charges for water used. Install branch piping with taps located so water is available through hoses throughout construction. Protect piping and fittings against freezing. Meter and pay all usage costs.
 - 1. Contractor shall be required to come to the Water Department and borrow a meter, and record the reading at the beginning and the end of the work. A backflow preventer will also be required.
- C. Temporary Electric Power and Light: Arrange with utility company to provide service required for power and lighting. Pay costs for service and for power used.
 - 1. Provide circuit and branch wiring, with area distribution boxes located so power and lighting is available throughout construction by use of construction-type power cords.
 - 2. Provide adequate artificial lighting where natural light is not adequate for work, and for areas accessible to public.
 - 3. Work shall meet applicable requirements of NFPA 70 and Division 26, ELECTRICAL.

2.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES

- A. Scope: Temporary construction and support facilities include, without limitation:
1. Field offices and storage sheds.
 2. Sanitary facilities.
 3. Temporary enclosures.
 4. Construction aids.
 5. Waste disposal services.
 6. Water control.
 7. Rodent and pest control.
 8. Pollution and dust control.
- B. Contractor's Option - Contractor's Field Offices and Sheds: Prior to installation of offices and sheds, consult with Architect and Owner on location, access, and related facilities. Provide field offices and sheds as follows:
1. At Contractor's option, portable or mobile buildings may be used. Mobile units, when used, shall be modified for office use.
 2. Temperature and Moisture Transmission Resistance: Compatible with occupancy and storage requirements.
 3. Contractor's Office and Facilities: Size units as required for general use and to provide space for project meetings.
 4. Furnishings in Meeting Area: Provide conference table and chairs for at least ten people. Provide racks and files for Project Record Documents in, or adjacent to, the meeting area.
 5. Other furnishings: Contractor's option.
 6. Miscellaneous Items: Provide one 10 in. outdoor type thermometer.
 7. Storage Sheds: Provide types and sizes required to meet requirements of various trades and to adequately store and handle products. Provide heating and ventilation necessary to comply with manufacturer's product data and with code requirements for products stored.
- C. Sanitary Facilities: Provide and maintain clean portable toilet facilities. Do not use permanent facilities within the building unless permitted by Owner in writing.
1. If use of permanent facilities is permitted, maintain washrooms in clean and sanitary condition and supply exhaustible materials such as soap, hand towels, and toilet tissue.
- D. Temporary Enclosures: Provide temporary weathertight enclosures of exterior walls as Work progresses. Design and construct temporary enclosures to provide acceptable working conditions, to provide weather protection for materials, to allow effective temporary heating, and to prevent entry of unauthorized persons.
- E. Construction Aids: Provide construction aids and equipment required by personnel to facilitate execution of the Work; ladders, stairs, ramps, runways, platforms, railings, h chutes, and other such facilities and equipment.
1. Refer to respective sections for particular requirements for each trade.
 2. When permanent stair framing is in place, provide temporary treads, platforms, and railings, for use by construction personnel.
- F. Hoisting Equipment and Machinery: The General Contractor shall furnish, install, operate, and maintain in safe condition all vertical, stationary hoisting equipment and machinery required for his own use and for the use of all Subcontractors on the project to properly carry out and complete the work, except as may otherwise be specifically provided for in any of the trade sections of the Specifications.
1. The trade contractors shall provide their own horizontal hoisting and moving equipment, such as fork lifts, Lulls, palette movers, etc.

2. All vertical hoisting thus provided by the General Contractor shall be without charge to the trades using same.
 3. All hoisting equipment and machinery, and operation shall comply in all respects to the governing laws and codes.
- G. Staging: The General Contractor shall furnish, erect, and maintain in safe condition all exterior staging and scaffolding required for his own use. Where staging and scaffolding over 8 ft. high is required by the sub-trades, the General Contractor shall provide the entire installation, including the first 8 ft., for the use of all Subcontractors on the project, as required to properly carry out and complete the work, except as may otherwise be specifically provided for in any of the trade sections of this Specification. This staging and scaffolding thus provided shall be without charge to the trades using same.
1. Each of the Subcontractors shall furnish, erect, and maintain in safe condition all exterior staging and scaffolding required to complete their own work which does not exceed 8 ft. height for their own use.
 2. Staging and Scaffolding shall comply in all respects to the governing laws and codes.
- H. Waste Disposal: Maintain all areas under Contractor's control free of extraneous debris. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
1. Provide containers for deposit of debris.
 2. Prohibit overloading of trucks to prevent spillage on access and haul routes.
 3. Provide periodic inspection of traffic areas to enforce requirements.
 4. Schedule periodic collection and disposal of debris.
 5. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.
- I. Water Control: Provide methods to control surface water to prevent damage to Project, site, and adjoining properties. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
1. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and water.
 2. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and properties.
- J. Rodent and Pest Control: Provide rodent control as necessary to prevent infestation of construction and storage areas. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties. Should rodenticides be considered necessary submit copies of proposed program to Owner and Architect. Use of rodenticide shall comply with manufacturer's published instructions and recommendations. Clearly indicate:
1. Area or areas to be treated.
 2. Rodenticides to be used.
 3. Manufacturer's printed instructions.
 4. Pollution preventive measures to be employed.
- K. Pollution Control: Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations. Provide equipment and personnel, perform emergency measures required to contain any spillage and to remove contaminated soils or liquids.
1. Excavate and legally dispose of any contaminated earth off-site, and replace with suitable compacted fill and topsoil.
 2. Take special measures to prevent harmful substances from entering public

- waters.
- 3. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
- 4. Provide systems for control of atmospheric pollutants.
- 5. Prevent toxic concentrations of chemicals.
- 6. Prevent harmful dispersal of pollutants to atmosphere.
- L. Dust Control: Provide positive methods and apply dust control materials to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into the atmosphere.

2.04 SECURITY AND PROTECTION FACILITIES

- A. Scope: Security and protection facilities includes, but is not limited to:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, lights.
 - 3. Temporary site enclosure fence.
 - 4. Security procedures.
- B. Temporary Fire Protection: Provide and maintain suitable fire protection equipment and services. Establish procedures for fire protection for welding and other potentially hazardous construction operations. Ascertain and comply with requirements of Project insurance carrier, Local Fire Department and the City of Salem Fire Marshal. Permanent fire protection system may be activated to meet these requirements. Replace fusible link heads and other expended or discharged components at time of Substantial Completion.
 - 1. Locate temporary portable fire extinguishers in convenient locations, not less than one extinguisher per floor.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes.
- C. Barricades, Warning Signs, and Lights: Provide and maintain barricades, warning signs, warning lights, railings, walkways, and the like. Paint signs and barricades with appropriate colors, graphics, and warnings to inform public and job-site personnel of hazards.
- D. Temporary Site Enclosure Fence: Prior to start of work at the Project site, install chain-link enclosure fence with suitably locked entrance gates. Locate fence to enclose substantially entire Project site, or that portion the Contractor establishes as required to encompass entire Project construction operation and as approved by Architect. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.
 - 1. Construct chain link fence in accordance with industry standards.
- E. Security Procedures: Secure project against unauthorized entry at all times. Provide secure, locked, temporary entrances to prevent vandalism, theft, and similar violations of security.
 - 1. Storage: Provide secure, locked facilities for areas where materials and equipment are stored.

PART 3 EXECUTION

3.01 MAINTENANCE, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit waste and

abuse.

- B. Maintenance: Maintain temporary facilities in operating condition; repair damages immediately upon discovery. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour per day basis.
- C. Termination and Removal: Unless otherwise requested by Architect, remove each temporary facilities when no longer useful, or when replaced by permanent facility. Clean and renovate permanent facilities that have been used during construction period, including:
 - 1. Replace worn parts.
 - 2. Replace lamps.

END OF SECTION

DOCUMENT 015500

VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 REQUIREMENTS INCLUDED

- A. Provide and maintain vehicular access to site and within site to provide uninterrupted access:
 - 1. To temporary construction facilities, storage, and work areas.
 - 2. For use by persons and equipment involved in construction of Project.
 - 3. For use by emergency vehicles.
- B. Single access will be available as directed by the Architect and Owner. Remove temporary construction road when no longer needed, and restore areas.
 - 1. Comply with City of Salem Transportation Dept. requirements.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 013100, PROJECT MANAGEMENT AND COORDINATION.
 - 2. Section 015000, TEMPORARY FACILITIES AND CONTROLS.
 - 3. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS, Clearing and grubbing.
 - 4. Section 312000, EARTHWORK, Establishment of subgrade elevations.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. Commonwealth of Massachusetts Highway Department (MHD):
Specifications Standard Specifications for Highways and Bridges

1.04 ON-SITE ROADS AND PARKING AREAS

- A. Single vehicle access shall be as directed by Owner and Architect.
- B. Maintain traffic areas free as possible of excavated materials, construction equipment, Products, snow, ice, and debris.

- C. Keep fire hydrants and water control valves free from obstruction and accessible for use.

PART 2 PRODUCTS

2.01 BASE AND TOPPING MATERIALS

- A. For temporary construction which will be removed when no longer needed for construction purposes: To Contractor's option.
- B. For earthwork and topping which will become a permanent part of the Work: Respective sections of Specifications.

2.01 DUST CONTROL

- A. Water and calcium chloride for roadway dust control shall conform to MHD Standard Specifications.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clear areas required for access roads and parking areas.
- B. Fill, compact, and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings.

3.02 CONSTRUCTION

- A. Construction methods for temporary facilities to be removed when no longer needed: To Contractor's option to provide the required results.
- B. For work which will become a part of permanent Work, comply with respective sections of Specifications for preparation and construction.

3.03 MAINTENANCE

- A. Maintain access drive in a sound, clean condition.
 - 1. Repair or replace any portions damaged during progress of construction work.

3.04 DUST CONTROL

- A. Contractor shall be responsible for dust control during all construction operations. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Architect decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread calcium chloride as directed. Methods and materials for dust control shall be as approved by the Architect.

3.05 REMOVAL

- A. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation.

1. Remove and dispose of compacted materials to depths required by various conditions to be met in completed Work.
- B. Restore areas to original or to specified conditions at completion of Work.

END OF SECTION

DOCUMENT 015526

TRAFFIC CONTROL

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 REQUIREMENTS INCLUDED

- A. Provide, operate, and maintain temporary equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, at on-site access roads, and parking areas during construction.
 - 1. Maintain unobstructed access to fire hydrants and other access routes.
 - 2. Provide open fire lane maintained throughout the construction period to provide uninterrupted access to Project site; include lighting of access lane. Lane shall be approved by local fire chief.
 - 3. Provide police detail and traffic control at designated project entrances and exits during any and all hauling and heavy traffic operations.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 013100, PROJECT MANAGEMENT AND COORDINATION.
 - 2. Section 015000, TEMPORARY FACILITIES AND CONTROLS.
 - 3. Section 015500, VEHICULAR ACCESS AND PARKING.

1.03 REFERENCED STANDARDS

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridges
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1.04 TRAFFIC CONTROL

- A. Provide traffic control required to direct and maintain an orderly flow of traffic in all areas under Contractor's control, or affected by Contractor's operations.
- B. Provide traffic control and directional signs, mounted on barricades or standard posts:
 - 1. At each change of direction of a roadway and at each crossroad.
 - 2. At detours.
 - 3. At parking areas.

1.05 POLICE DETAILS

A. Police Services:

1. The Contractor shall obtain police services as identified in the Traffic Management Plan or that the Architect or the City deems necessary to provide direction and control of traffic within and through the project area during construction operations. The police officers shall be obtained from the City of Salem Police Department.
2. Compensation for police services will be paid by Contractor on an hourly basis, at the prevailing wage rate in accordance with the City of Salem Police Department regulations for the time spent at the project. No additional payment will be made for training, equipment, travel time, transportation, or any administrative charges associated with the costs of providing police services.
3. Remove temporary equipment and facilities when no longer required, restore grounds to original, or specified conditions.

1.06 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations. Locate parking for construction vehicles at locations approved by the Owner and Architect.
- B. Monitor parking of construction personnel's private vehicles:
 1. Maintain free vehicular access to and through parking areas.
 2. Prohibit parking on or adjacent to access roads, or in non designated areas.

1.07 HAUL ROUTES

- A. Consult with governing authorities, establish public thoroughfares which will be used as haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to expedite traffic flow and to minimize interference with normal public traffic.
- D. The Contractor shall not close or obstruct any portion of any street, public or private, without obtaining permits therefore from the proper authorities. If any street or private way shall be rendered unsafe by the Contractor's operations, the Contractor shall make such repairs or provide such temporary ways or guards as shall be acceptable to the governing authority.
- E. The Contractor shall conduct the work at all times so that the abutters shall have access to their property. When public or private property is isolated by the temporary closure of a road, the Contractor shall be responsible for providing such safe means of access to a public way.

PART 2 PRODUCTS

2.01 SAFETY CONTROLS AND SAFETY SIGNING

- A. Safety controls and safety signing for construction operations shall conform to the relevant provisions of MHD Standard Specifications Section 850.

PART 3 EXECUTION

Not Used

END OF SECTION

DOCUMENT 015690

TREE AND PLANT PROTECTION

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. Protection of existing trees and plants from damage as a result of the Contractor's operations including, but not limited to:
 - 1. Tree protection fencing.
 - 2. Root pruning and construction pruning.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS.
 - 2. Section 311300, SELECTIVE TREE REMOVAL AND TRIMMING
 - 3. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING: Excavation and backfill.
 - 4. Section 329300, TREES, PLANTS, AND GROUND COVERS: New plant material.

1.03 REFERENCE STANDARDS

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American National Standards Institute (ANSI):
 - Z133.1 Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.
 - 2. International Society of Arboriculture (ISA):
 - Guide Guide for Establishing Values of Trees and Other Plants
 - 3. National Arborist Association (NAA):

Ref. 1 Pruning Standards for Shade Trees

1.04 SUBMITTALS

- A. Prepare and submit drawings indicating the extent of tree protection fencing required.
- B. Proposed methods, and schedule for effecting tree and plant protection shall be submitted for approval.
- C. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization by Certified Arborist shall be submitted for approval.

1.05 SUBMITTALS

- A. All tree work shall be performed by a professional Certified Arborist with a minimum five years experience, who has successfully completed a certification program equal to the Massachusetts Certified Arborist (MCA) program/examination sponsored by the Massachusetts Arborists Association, 8-D Pleasant Street, South Natick, MA 01760; (508) 653-3320; FAX: (508) 653-4112; E-mail: MaarbAssn@aol.com.

1.06 DAMAGE PENALTIES

- A. Certain specimen trees within the construction areas and in other key locations will be identified by the Owner and the Architect, and marked with red tags. Loss of any of these trees will result in fines assessed at \$10,000 per tree. Damage to all other trees on the property will be assessed at the rate of \$200 per inch caliper of the tree.
- B. A fine of \$1,000 will be levied against the Contractor for each incident of construction inside tree protection areas.
- C. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide.
- D. Trees or roots visibly damaged will cause the Owner to withhold from the Contractor an assessed amount conforming to the requirements stipulated above for a period of two years. After that period the impact of the damage to any tree will be assessed accordingly.
- E. If any trees or shrubs designated to be saved are damaged and replacement is required, a number and diameter of trees or shrubs of the same species and variety, as specified by the Owner and Architect, shall be furnished and planted by the Contractor. The total inch diameter of the replacement trees or shrubs shall equal the diameter of the tree or shrub to be replaced.

1.07 PRECONSTRUCTION TREE PREPARATION

- A. Trees to remain inside or within 20 ft. of Limit of Work, shall be inspected by Certified Arborist at contractors expense prior to commencement of work. Based on arborist's evaluation, pre-emptive measures shall be taken to reduce harm to trees.
- B. Pre-emptive measures shall include, but not be limited to, root pruning with airspade, feeding, structural pruning, spraying or other horticultural treatments to improve vigor of affected plants.

PART 2 PRODUCTS

2.01 TREE PROTECTION FENCING

- A. Tree protection fencing shall be the following:
 - 1. Galvanized chain link fencing, 4 ft. high.
 - 2. Fabric shall be a good commercial quality of steel wire of 2 in. mesh and 11 gauge.
 - 3. Fittings shall be malleable iron casting, wrought iron forgings, or pressed steel and provided with pin connections. Equipment shall be designed to carry 100% overload.
 - 4. Piping shall be steel conforming to ASTM A 120 except that pipe shall be unthreaded and untested for water pressure.
- B. Stakes for fencing shall be 7 ft. galvanized steel posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.
- C. For fencing within the drip line of trees, surface mounted post anchors may be acceptable. Review with Architect and arborist and obtain written approval prior to installing. Post installation shall not damage tree root systems.

2.01 ROOT PRUNING

- A. Peat moss, mulch and compost materials shall be as specified under Section 329300, TREES PLANTS, AND GROUND COVERS.
- B. Liquid fertilizer to be applied to root pruned and construction pruned trees shall be Peters M 77 Sequestered-Chelated Soluble Fertilizer manufactured by W.R. Grace and Co., Cambridge, MA 02140, Gold Start Liquid Fertilizer, manufactured by Nutra-Flo Company, 1919 Grand Ave, Sioux City, IA 51106-5708; Phone: 712-277-2011; 800-831-4815; Fax: 712-279-1946; Agro- Culture Liquid Fertilizer, manufactured by Agro-Culture Liquid Fertilizers, 3055 W. M-21, P.O. Box 150, St. Johns, Michigan 48879; 1-800-678-9029, or approved equal. Liquid fertilizer shall be approved by Certified Arborist.
- C. Dormant oil spray shall be a dormant miscible spray equal to Sunspray, Scalecide, or Volck Oil.
- D. Insecticide shall be Isotox manufactured by Ortho; QuickPRO, manufactured by Monsanto; LESCO Sevin Brand SL, #019106, manufactured by LESCO, or approved equal. Insecticide shall be approved by Certified Arborist.

PART 3 EXECUTION

3.01 INSTALLATION OF FENCING

- A. Prior to start of demolition work and clearing and grubbing operations, tree protection fencing shall be installed in accordance with the following:
 - 1. Fencing shall be installed at the tree protection areas indicated on the Drawings.

2. Fencing shall be installed at the drip line of trees to be protected, unless otherwise approved by the Architect.

- B. Posts shall be set in crushed stone footings.

3.02 ROOT PRUNING

- A. Where construction will be within drip line of existing trees designated to remain, roots shall be pruned with airspade.
- B. All root pruning shall be done by Certified Arborist only. Trenching, vibrating plow, and stump grinding are NOT suitable means for root pruning.
- C. Roots greater than 1 in. diameter shall be pruned by means of a hand saw, or other approved means.
- D. Install root protection measures as prescribed by Certified Arborist.

3.03 CONSTRUCTION PRUNING

- A. Construction pruning shall conform to NAA Ref.1 for Class IV - Crown Reduction Pruning. Work shall conform to the requirements of ANSI Z133.1, and shall be reviewed in the field with the Architect and Certified Arborist prior to start of work.

3.04 FERTILIZATION AND INSECT SPRAYING

- A. Root pruned and construction pruned tree shall be treated with liquid fertilizer, dormant oil spray, and insecticide as prescribed by Certified Arborist.
- B. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by NAA Ref. 2.
- C. Dormant oil spray shall be applied in early spring before buds begin to swell at a rate recommended by the manufacturer.
- D. Insecticide spray shall be applied twice to root pruned trees following application of dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.

3.05 REMOVAL OR PROTECTION

- A. All protection shall remain in place throughout the construction period. Remove protection devices only after written permission has been granted by the Architect.

END OF SECTION

DOCUMENT 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for materials and equipment used for the Project.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 011000, SUMMARY.
 - 2. Section 013000, SUBMITTAL PROCEDURES
 - 3. Section 016010, SUBSTITUTION REQUEST FORM
 - 4. Section 017700, CLOSEOUT PROCEDURES

1.03 MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK

- A. Conform to applicable specifications and standards.
- B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.
- C. Manufactured and Fabricated Products:
 - 1. Design, fabricate and assemble in accord with the best engineering and shop practices.
 - 2. Manufacture like parts of duplicate units to standard size and gages, to be interchangeable.
 - 3. Two or more items of the same kind shall be identical, by the same manufacturer.
 - 4. Products shall be suitable for service conditions.
 - 5. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
- D. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.04 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure Products in place with positive anchorage devices designed and sized to

withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

- A. When work is specified to comply with manufacturers' instructions, submit copies of said instructions, as specified in Section 013300, SUBMITTAL PROCEDURES, distribute copies to persons involved, and maintain one set in field office.
- B. Perform work in accordance with details of instructions and specified requirements. Should a conflict exist between Specifications and manufacturer's instructions, consult with Architect.

1.06 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.
- B. Transport Products by methods to avoid Product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling or damage.
- D. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and products are undamaged.

1.07 STORAGE AND PROTECTION

- A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated Products, place on sloped supports above ground. Cover Products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure Products are undamaged and are maintained under required conditions.
- E. After installation, provide coverings to protect Products from damage from traffic and construction operations, remove when no longer needed.

1.08 PRODUCT OPTIONS

- A. Within 7 days after date of Contract, submit complete list of major Products proposed, with name of manufacturer, trade name, and model.
- B. Options:
 - 1. Products specified only by reference standard: Any Product meeting that standard.
 - 2. Products specified by naming several manufacturers: Products of any named manufacturer meeting Specifications.
 - 3. Products specified by naming one or more manufacturers and "or equal": Submit a request for substitution for any manufacturer not specifically named.

1.09 MATERIAL SUBSTITUTIONS

- A. Where products or materials are specified by manufacturer's name, trade name or catalog reference, the words "or approved equal" shall be understood to follow unless there is a statement specifically indicating that no substitution will be allowed. An item shall be considered equal to the item so named or described if in the opinion of the Architect:
 - 1. It is at least equal in quality, durability, appearance, strength and design; including compliance with applicable specifications and compatibility with physical space allocations provided for the item;
 - 2. It performs at least equally the function imposed by the general design for the work;
 - 3. It conforms substantially, even with deviations to the detailed requirements for the item as indicated by the Contract Documents.
- B. Where two or more products or materials are specified, the choice of these shall be optional with the Contractor.
- C. Should the Contractor, after the award of the Contract, wish to use any products or materials other than those specified, he shall request written permission of the Architect, using SUBSTITUTION REQUEST FORM, Refer to Section 016010, SUBSTITUTION REQUEST FORM, immediately following this Section; Contractor shall submit this executed form with each proposed substitution. His request shall name and adequately describe (including shop drawings) the proposed substitutions, furnish any information requested by the Architect, and state what difference, if any, will be made in the Contract price, including the cost of changes in the Work, for such substitutions should they be accepted. Upon receipt of complete information from the Contractor, the Architect will consider all aspects of the proposed substitution and advise the Contractor in writing approving or disapproving the substitution. The principal reasons for approval or disapproval of the substitution will be enumerated by the Architect. Disapproval of the substitution shall not be cause for an increase in Contract price or a delay in schedule.
- D. Request constitutes a representation that Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds, in all respects, specified Product.
 - 2. Will provide the same warranty for substitution as for specified Product.
 - 3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.
 - 4. Waives claims for additional costs which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.
- F. Architect will determine acceptability of proposed substitution, and will notify Contractor of acceptance or rejection in writing within a reasonable time.

END OF SECTION



SUBSTITUTION REQUEST

(After the Bidding Phase)

Project: _____ Substitution Request Number: _____

From: _____
To: _____ Date: _____

A/E Project Number: _____
Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____
Installer: _____ Address: _____ Phone: _____
History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

**SUBSTITUTION
REQUEST**
(Continued)

- The Undersigned certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
 - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

DOCUMENT 017000

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies field engineering services required for the Project, including but not limited to:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Owner's Representative will identify existing control points and property line corner stakes indicated on the Drawings, as required.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 011000, SUMMARY; Project description.
 - 2. Section 017700, CLOSEOUT PROCEDURES; Record Documents

1.03 SUBMITTALS

- A. Only if requested by Architect or Owner:
 - 1. Qualification Data: For land surveyor and/or professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
 - 2. Certificates: Submit certificate signed by land surveyor and/or professional engineer certifying that location and elevation of improvements comply with requirements.
 - 3. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
 - 4. Certified Surveys: Submit two copies signed by land surveyor and/or professional engineer.

1.04 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land- surveying services of the kind indicated.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify **Architect and Owner** not less than **two** days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without **Owner's** written permission.
- D. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- E. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- F. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. **Submit requests on CSI Form 13.2A, "Request for Interpretation"**, a copy of which is attached at the end of this Section.

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to layout the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a **land surveyor or professional engineer** to layout the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Structure Lines and Levels: Locate and lay out control lines and levels for structures, including those required for electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial

Completion.

- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work. 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.07 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.08 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.09 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 017329, CUTTING AND PATCHING.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION



REQUEST FOR INTERPRETATION

Project: _____	R.F.I. Number: _____
_____	From: _____
To: _____	Date: _____
_____	A/E Project Number: _____
Re: _____	Contract For: _____

Specification Section: _____	Paragraph: _____	Drawing Reference: _____	Detail: _____
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Request:

Signed by: _____	Date: _____
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Response:

☐ Attachments

Response From: _____	To: _____	Date Rec'd: _____	Date Ret'd: _____
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Signed by: _____	Date: _____
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Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

DOCUMENT 017329

CUTTING AND PATCHING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting, fitting, and patching work, including attendant excavation and backfill, required to complete the Work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the Work to provide for installations of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 011100, SUMMARY; Description of Project.
 - 2. Section 016000, PRODUCT REQUIREMENTS; Substitutions and product options.

1.03 QUALITY ASSURANCE

- A. Permission to patch any items of work does not imply a waiver of the Architect's right to require complete removal and replacement in said areas and of said items if, in Architect's opinion, patching does not satisfactorily restore quality and appearance of work.
- B. Requirements for Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.
- C. Operational and Safety Limitations: Do not cut-and-patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance, or decreased safety.
- D. Visual Requirements: Do not cut-and-patch work that is exposed on exterior or in occupied spaces of building, in a manner resulting in reduction of visual qualities or resulting in substantial evidence of cut-and-patch work, both as judged solely by the Architect. Remove and replace work judged by the Architect to be visually unsatisfactory.

1.04 SUBMITTALS

- A. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
 - 1. Work of Owner or separate contractor.
 - 2. Structural value or integrity of any element of the Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of the Project.
 - 2. Description of affected work.
 - 3. The necessity for cutting, alteration, or excavation.
 - 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
 - 5. Description of proposed work:
 - a. Description of why cutting-and-patching cannot (reasonably) be avoided.
 - b. Scope of cutting, patching, alteration, or excavation.
 - c. How it will be performed.
 - d. How structural elements (if any) will be reinforced.
 - e. Trades who will execute the work.
 - f. Products proposed to be used.
 - g. Extent of refinishing to be done.
 - h. Approximate dates of the work, and anticipated results in terms of variations from the work as originally completed (structural, operational, visual, and other qualities of significance).
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of any separate contractor whose work will be affected.
- C. Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit request for substitution as specified in Section 016000, PRODUCT REQUIREMENTS.
- D. Submit written notice to Architect designating date and time the work will be uncovered.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Except as otherwise indicated or authorized by the Architect, provide materials for cutting- and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Comply with the requirements, and use materials identical with the original materials where feasible and where recognized that satisfactory results can be produced thereby.
- B. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
 - 1. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
 - 2. Comply with the requirements of applicable sections of Division 31 where cutting- and- patching requires excavating and backfilling.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
- C. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- E. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- F. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
- H. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
 - 1. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.
- I. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

END OF SECTION

DOCUMENT 017700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements during contract closeout, including, but not limited to:
 - 1. Substantial Completion.
 - 2. Final Acceptance.
 - 3. Record document submittal.
 - 4. Operating and maintenance data.
 - 5. Warranties and bonds.
 - 6. Final cleaning.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 011000, SUMMARY; Owner occupancy.
 - 2. Respective Sections of Specifications: Closeout Submittals for work of the Section.

1.03 SUBSTANTIAL COMPLETION

- A. Prior to requesting inspection for certification of Substantial Completion, complete the following:
 - 1. On Application for Payment, show 100% completion for portions of work claimed as substantially complete. Submit list of incomplete items, value of incomplete work, and reasons work is not complete.
 - 2. Submission of occupancy permits.
 - 3. Submission of warranties and bonds.
 - 4. Submission of test/adjust/balance records.
 - 5. Submission of maintenance instructions.
 - 6. Submission of meter readings.
 - 7. Final cleaning.
 - 8. Application for reduction of retainage.
 - 9. Consent of surety.
 - 10. Notification of shifting insurance coverages.
 - 11. Final progress photographs.
- B. Within reasonable time, Architect will inspect to determine status of completion.
- C. Should Architect determine Work is not substantially complete, he will promptly notify Contractor in writing, giving reasons therefor.
- D. Contractor shall remedy deficiencies, and send a second written notice of Substantial

Completion. Architect will re-inspect the Work.

- E. When Architect determines Work is Substantially Complete, he will prepare AIA Document G704, Certificate of Substantial Completion.

1.04 FINAL ACCEPTANCES

- A. Prior to requesting final inspection for certification of Final Acceptance and final payment, complete the following:
 - 1. Submission of final payment request with releases and supporting documentation.
 - 2. Completion of incomplete Work.
 - 3. Assurances that unsettled claims will be settled.
 - 4. Submission of updated final statement, including accounting for final additional changes to the Contract Sum. Show additional Contract Sum, additions and deductions, previous Change Orders, Total Adjusted Contract Sum, previous payments, and Contract Sum due.
 - 5. Submission of consent of surety.
 - 6. Submission of evidence of final, continuing insurance coverage complying with insurance requirements.
 - 7. Transmit final Project Record Documents to Owner.
 - 8. Transmit certified property survey.
 - 9. Prove that taxes, fees, and similar obligations have been paid.
 - 10. Remove temporary facilities and services.
 - 11. Remove surplus materials, rubbish and similar elements.
 - 12. Certify Work has been inspected for compliance with Contract Documents.
 - 13. Certify Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
 - 14. Certify equipment and systems have been tested in presence of Owner's representative, and are operational.
 - 15. Certify Work is complete and ready for final inspection.
- B. Architect will inspect to verify status of completion with reasonable promptness.
- C. Should Architect consider Work is incomplete or defective, he will promptly notify Contractor in writing, listing incomplete or defective work.
 - 1. Contractor shall take immediate steps to remedy deficiencies and send a second written certification that Work is complete, and Architect will re-inspect the work.
 - 2. When Architect finds Work is acceptable, he will consider closeout submittals.
 - 3. Re-inspection Fees: Should Architect perform re-inspections due to failure of Work to comply with claims made by the Contractor, Owner will compensate Architect for such additional services, and deduct the amount of such compensation from final payment to the Contractor.
- D. Application for Final Payment: Submit Application for Final Payment in accordance with procedures and requirements of Section 012900, PAYMENT PROCEDURES.
 - 1. Architect will issue final Change Order, reflecting approved adjustments to the Contract Sum not previously made by Change Orders.

1.05 RECORD DOCUMENTS

- A. General: Maintain a complete set of Record Documents at the site. Do not use Record Documents for construction purposes. Provide access to Record Documents for Architect and Owner's reference. Generally, without limitation, Record Documents shall include the following:

1. Record Drawings: Maintain a clean set of blue or black line prints of Contract Drawings and shop drawings, marked to show actual installation. Give particular attention to concealed items.
 2. Record Project Manual: Maintain a clean Project Manual, including Addenda, Change Orders, Architect Field Orders, and other modifications, marked to show changes in actual work performed. Give particular attention to substitutions, selection of options, and similar information.
 3. Record Product Data: Maintain one copy of each approved Product Data submittal, marked to show changes from products delivered, work performed, and from manufacturer's recommended installation instructions.
 4. Record Samples: Maintain one copy of each approved Sample submitted.
 5. Record Field Test Reports: Maintain one copy of each Field Test Report.
- B. Maintenance of Documents and Samples: Store documents and samples in Contractor's field office apart from documents used for construction. Provide files and racks for document storage. Provide locked cabinet or secure storage space for storage of samples. File documents and samples in accordance with CSI format. Maintain documents in clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes. Make documents and samples available at all times for inspection by Architect.
- C. Marking Devices: Provide felt tip marking pens for recording information in the color code designated by Architect.
- D. Recording: Label each document "PROJECT RECORD" in neat large printed letters. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
- E. Drawings: Legibly mark Drawings to record actual construction, including the following:
1. Depths of various elements of foundation in relation to finish first floor datum.
 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 4. Field changes of dimension and detail.
 5. Changes made by Field Order or Change Order.
 6. Details not in original Contract Documents.
- F. Specifications and Addenda: Legibly mark each Section to record:
1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 2. Changes made by Field Order or by Change Order.
- G. Submittal: At Contract Closeout, deliver Record Documents to Architect. Accompany submittal with transmittal letter in duplicate, indicating the date, Project title and number, Contractor's name and address, title and number of Record Document, and signature of Contractor or his authorized representative.
- 1.06 OPERATING AND MAINTENANCE DATA
- A. General: Prepare and submit Operating and Maintenance Data as specified in this Section and referenced in other pertinent Sections of Specifications. Organize Operating and Maintenance Data into suitable sets, bound and indexed. Mark

appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
 2. Spare parts list.
 3. Copies of warranties.
 4. Wiring diagrams.
 5. Inspection procedures.
- B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.
- C. Preparation of data shall be done by personnel trained and experienced in maintenance and operation of described products.
- D. Format of Data: Prepare data in form of instructional manual for use by Owner's personnel. Format shall be 8-1/2 in. x 11 in., 20 pound minimum, white, typed pages. Text shall be manufacturer's printed data, or neatly typewritten. Drawings shall be bound with text, with reinforced punched binder tabs. Fold larger drawings to size of text pages. Provide fly-leaf for each separate product or each piece of operating equipment. Provide typed description of product and major component parts of equipment. Provide indexed tabs.
1. Binders: Provide commercial quality three-ring binders with durable and cleanable plastic covers, with maximum ring size of 1 inch. When multiple binders are used, correlate the data into related consistent groupings.
 2. Binder Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List title of Project, identity of separate structure as applicable, and identity of general subject matter covered in the manual.
- E. Content of Manual: Neatly typewritten table of contents for each volume, arranged in systematic order, indicating Contractor name and address, and a list of each product, indexed to content of the volume. Provide a separate list with each product, name, address, and telephone number of subcontractor or installer, and local source of supply for parts and replacement. 1. Provide in each volume a copy of each warranty, bond, and service contract issued.
- F. Submittal of Maintenance and Operating Manual: Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of Work.
1. Architect will review draft and return one copy with comments.
 2. Submit one copy of complete data in final form 15 days prior to final inspection or acceptance. Copy will be returned after final inspection or acceptance, with comments.
 3. Submit three copies of approved data in final form ten days after final inspection or acceptance.

1.07 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
1. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.

1.08 WARRANTIES AND BONDS

- A. General: Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of Original Signed Copies Required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item including, product or work item, firm name, address, and telephone number.
- D. Information Required: Provide the date of beginning of warranty, bond, or service and maintenance contract, and duration of warranty, bond, or service and maintenance contract.
- E. Information for Owner's Personnel: Provide information on the proper procedures in case of failure. Indicate instances which might affect the validity of warranty or bond. Indicate Contractor, name of responsible principal, address, and telephone number.
- F. Form of Submittal: Prepare duplicate packets of 8-1/2 x 11 in., punched sheets for installation in standard three-ring binder. Fold larger sheets to fit into binders.
 - 1. Cover of Packet: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List the Project title and number, and name of Contractor.
 - 2. Binders: Bind into commercial quality, three-ring, with durable and cleanable plastic covers.
- G. Time of Submittals: For equipment or component parts of equipment put into service during progress of construction, submit documents within ten days after inspection and acceptance. Otherwise make submittals within ten days after Date of Substantial Completion, and prior to final request for payment.
 - 1. For items of work where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.09 FINAL CLEANING

- A. General: General cleaning during construction operations is specified as Work of Section 015000, TEMPORARY FACILITIES AND CONTROLS.
- B. Employ experienced workers or professional cleaners for Final Cleaning. Clean each surface to the condition expected in a normal building cleaning and maintenance program. Comply with manufacturer's instructions and recommendations.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

- A. General: Provide cleaning materials that will not create hazards to health nor property, and will not damage surfaces or finishes.
- B. Use cleaning materials and methods recommended by manufacturer of surface to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 FINAL CLEANING

- A. Employ skilled workers for final cleaning.
- B. Clean and restore adjoining surfaces and other work soiled or damaged during installation; replace work damaged beyond successful restoration. Where performance of subsequent work could result in damage to complete unit or element, provide protective covering and other provisions to minimize potential for damage.
- C. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- D. Complete the following cleaning operations prior to requesting inspection for Certification of Substantial Completion:
 - 1. Remove labels that are not permanent.
 - 2. Polish glossy surfaces to clear shine.
 - 3. Clean exterior finishes to a clean, dust-free condition. Remove stains, films, and similar foreign substances.
 - 4. Leave concrete pavements broom clean.
 - 5. Clean site areas of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; rake ground surfaces clean.
- E. Replace lamps in permanent light fixtures used during construction with lamps specified in Division 26, ELECTRICAL.
- F. Before final completion and Owner-occupancy, inspect sight-exposed exterior surfaces and work areas to verify that Work is clean.

END OF SECTION

DOCUMENT 018900

SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies the general requirements for the site work included in the Contract.
- B. These requirements supplement those contained in the Standard General Conditions of the Construction Contract and their Supplemental Conditions.
- C. References are included in this Section to Articles of the General Conditions to call the Contractor's attention to frequently needed requirements.

1.02 PERMITS

- A. Unless otherwise provided in the Supplementary Conditions, the Contractor shall obtain and pay for all construction permits and licenses. The Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. The City will waive all fees associated with permits.
- B. The Contractor is required to meet with Building Inspector to identify all required permits prior to starting work.

1.03 LAWS AND REGULATIONS

- A. Contractor shall give all notices and comply with all laws and regulations applicable to furnishing and performance of the Work.
- B. If the Contractor performs any work that is contrary to laws or regulations, the Contractor shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom.

1.04 UTILITIES

- A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing underground facilities (utilities) at or contiguous to the site is based on information and data furnished to Owner or Architect by the owners of such underground facilities (utilities) or by others.
 - 1. The Owner and Architect shall not be responsible for the accuracy or completeness of any such information or data; and
 - 2. The cost of all of the following will be included in the Contract and Contractor shall have full responsibility for: (i) reviewing and checking all such information and data; (ii) locating all underground facilities (utilities) shown or indicated in the Contract Documents; (iii) coordination of the Work with the owners of such underground facilities (utilities) during construction; and (iv) the safety and protection of all such underground facilities (utilities) and repairing any damage

thereto resulting from the Work.

- B. Not Shown or Indicated: If an underground facility (utility) is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, the Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency), identify the owner of such underground facility (utility) and give written notice to that facility (utility) owner and to Owner and Architect. Architect will promptly review the underground facility (utility) and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the underground facility (utility). If the Architect concludes that a change in the Contract Documents is required, revised plans and specifications will be issued to reflect and document such consequences. During such time, the Contractor shall be responsible for the safety and protection of such underground facility (utility).
- C. Contractor shall notify all municipal agencies and utility companies owning or operating utilities, of proposed work affecting the utilities, or agencies.
- D. Contractor shall give written notification within the time period required by the agency or company for advance notification. A copy of the notification shall be furnished to the Architect.
- E. Contractor shall notify "DIG SAFE" before commencing any work in the vicinity of existing subsurface utilities.
- F. Contractor shall secure in-place existing utilities whose support is affected by the work and cooperate and assist the agency or company operating the utility in maintaining the utility services. Contractor shall correct any damage to the utilities caused by construction operations by repair or replacement, as required by the utility owner. When the repair or replacement is made by the utility owner, Contractor shall pay all costs assessed by the utility owner for the work.
- G. If the existing utilities are found to conflict with the proposed work, the Contractor shall protect and maintain the utilities and take measurements to determine the location, type and dimensions of the utility. The information shall be furnished to the Architect who will determine the changes required in the proposed work or existing utilities to resolve the conflict as soon thereafter as is reasonable.
- H. Contractor shall verify the location, size, invert elevation and type of existing facilities at all points of connection prior to ordering new utility materials.

1.05 SOIL SUPPORT

- A. Contractor shall furnish and install excavation soil support devices or use soil strengthening techniques required to perform excavations in accordance with the current requirements of the U.S. Department of Labor, Occupational Health & Safety Administration and all federal, state, and municipal laws and regulations.

1.06 REFERENCE STANDARDS

- A. References are made to technical societies, organizations and groups using the following abbreviations. All work so referred shall conform to the current edition of the referenced standard.

AASHTO American Association of State Highway Transportation Officials

ACI American Concrete Institute

ACOE United States Army Corps of Architects

AGC Associated General Contractors of America
ANSI American National Standards Institute
AOAC Association of Official Agricultural Chemists
ASTM American Society for Testing and Materials
AWPA American Wood Preservers Association
AWWA American Water Works Association
NEMA National Electrical Manufacturers Association
NEWWA New England Water Works Association
OSHA Occupational Safety and Health Administration
UL Underwriters Laboratory

1.07 TRAFFIC MAINTENANCE

- A. Contractor shall maintain access to the site and through the work zones for personnel and vehicles of emergency services, utility agencies, inspection services, and others authorized to enter, move about and work on the site.
- B. When work is required on public roadways, Contractor shall furnish, install, maintain, and remove all signs, drums, barricades, steel plates, and other devices required by the federal or state government or municipality to maintain and protect pedestrians and vehicular traffic.
- C. Protective measures shall be installed at site access points to prevent mud and other debris from being deposited on the public roadways by construction traffic. The public roadways shall be swept as required to remove any deposits.

1.08 STATE AND LOCAL REFERENCE STANDARDS

- A. Building Code Massachusetts State Building Code
BWSC Boston Water and Sewer Commission
DEP Massachusetts Department of Environmental Protection
MHD Massachusetts Highway Department
MWRA Massachusetts Water Resources Authority

END OF SECTION

SECTION 024113

SELECTIVE SITE DEMOLITION AND REMOVALS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and do all work necessary to demolish, remove and salvage site structures, clean up debris and trash and prepare site in general, as indicated on the Drawings.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 01590, TREE AND PLANT PROTECTION.
 - 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill; establishment of subgrade elevations.
 - 3. Section 116816, PLAY STRUCTURES.
 - 4. Section 129300, SITE FURNISHINGS.

1.03 INFORMATION NOT GUARANTEED

- A. The Contractor's attention is directed to "Information Not Guaranteed" under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.

1.04 SUBMITTALS

- A. The following shall be submitted:
 - 1. Certificates of severance of utility services.
 - 2. Permit for transport and legal disposal off-site of demolition material and debris.
 - 3. Demolition procedures and operational sequence for review and acceptance by Architect.
 - 4. Location plan of staging areas and schedule for moving staging equipment into those areas shall be submitted for Architect's approval prior to mobilization and related site preparation operations.
- B. Pre-demolition photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

1.05 PROTECTION

- A. Prevent movement, settlement or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the Owner.

1.06 EXISTING CONDITIONS

- A. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Disconnect and stub off. Notify the affected utility company in advance and obtain approval before starting this work.
- B. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

1.07 TREE DAMAGE PENALTIES

- A. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide and Section 015690, TREE AND PLANT PROTECTION.

1.08 MAINTAINING TRAFFIC

- A. Do not close or obstruct roadways without permits.
- B. Conduct operations with minimum interference to public or private roadways.
- C. Provide Police Detail as needed for work in roadways.

1.09 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.01 TREE PROTECTION

- A. Refer to Section 015639, TEMPORARY TREE AND PLANT PROTECTION.

2.02 HERBICIDE

- A. Herbicide shall be QuickPro, Roundup Pro or Manage, manufactured by Monsanto Company, 800 North Lindbergh Boulevard, St. Louis, MO – 63167; Tel. (314) 694-1000, or other approved equal product capable of eradicating existing Japanese Knotweed.

PART 3 EXECUTION

3.01 DEMOLITION

- A. Structures indicated to be removed shall be completely removed including foundations, except when approved by the Architect, to a minimum of 4 ft. below

finished grade for graded areas.

- B. Remove from site, contaminated, vermin infested, or dangerous materials encountered and disposed of by safe means so as not endanger health of workers and public.
- C. Backfill areas excavated as a result of demolition. Use backfill material specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.
- D. Rough grade areas affected by demolition and leave areas level, maintaining grades and contours of site.
- E. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.02 ABANDONED PIPES - DRAINS AND SEWERS

- A. Drain and sewer pipes indicated to be abandoned shall be completely filled with an 8 in. thick mortar jointed masonry bulkhead. If a pipe indicated to be abandoned and plugged appears to be in active service, it shall not be plugged, and the Architect shall be notified.
- B. Other utility pipes shall be cut and capped outside the excavation and abandoned piping removed from the site.
- C. Frames, grates, covers, traps, and other castings shall be salvaged.

3.03 CLEARING AND GRUBBING

- A. Trees, shrubs, and other vegetation not indicated on the Drawings or designated in the field by the Architect to remain and required for execution of the Work shall be cleared and grubbed.
- B. See Section 31300 SELECTIVE TREE REMOVAL AND TRIMMING for tree pruning, removal and treatment of Norway Maple stumps.

3.04 JAPANESE KNOTWEED ERADICATION PLAN

- A. No clearing of invasive vegetation.
- B. Treat in place all Japanese Knotweed growth.
- C. Treat in place all invasive plant species using a State accepted systemic herbicide. Invasive species to be treated will be agreed upon and marked in the field. Herbicide may only be applied by an applicator licensed through the Massachusetts Department of Agriculture.

3.05 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Existing basketball court, fences, structures and utilities shall be suitably protected from damage.

3.06 LOAM AND TOPSOIL

- A. Loam and topsoil shall be stripped to their full depth from areas to be excavated, filled, re-graded, or resurfaced. Avoid mixing with fill/subbase/non-organic material below.
- B. Loam and topsoil shall be stockpiled on-site and protected. No loam and topsoil shall be removed from the site without the written permission of the Architect.
- C. Stockpiled loam and topsoil which conforms to the specifications may be used as Planting Soil for fill and finish grading within landscaped areas in accordance with Sections 329200, and 329300. Contractor shall submit soil test results of stockpiled material for Architect's approval. Contractor shall bear the cost of soil testing.

3.07 STOCKPILING ROCK

- A. Remove from construction area naturally formed rocks that measure more than 4" across in least dimension. Do not include excavated or crushed rock.
 - 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
 - 1. Limit height of rock stockpiles to 36 inches.
 - 2. Do not stockpile rock within protection zones.
 - 3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

3.08 PAVEMENT REMOVAL

- A. Where indicated on Drawing, and as directed by the Landscape Architect existing pavement and curb shall be removed and legally disposed of off-site. Where pavement and/or curb to be removed abuts pavement and curb to remain, a neat, straight saw cut shall be made with a concrete power saw.
 - 1. Pavement and/or curb removal shall include removal of subbase as required to accommodate proposed construction materials.

3.09 REMOVALS

- A. Materials and debris indicated on the Drawings or designated by the Architect in the field to be removed shall be dismantled, removed, and legally disposed of off-site or stockpiled as indicated on the Drawings.

3.10 SALVAGEABLE MATERIALS

- A. Materials indicated on the Drawings or designated by the Architect in the field to be salvaged shall be carefully removed, protected from damage, and put in temporary storage as directed by the Owner.

3.11 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or

new construction.

- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.12 PROTECTION OF PROPERTY TO REMAIN

- A. The Contractor's attention is directed to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING for protection of utilities to remain, and Section 015690, TREE AND PLANT PROTECTION for the protection of existing trees.

3.13 DISPOSAL OF MATERIALS

- A. Material resulting from demolition and not scheduled for salvaging shall become the property of the Contractor and shall be legally disposed of off-site at Contractor's expense.
- B. Debris, rubbish and other material shall be disposed of promptly and shall not be left until the final clean up of site.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to construct the cast-in-place concrete for foundations, slabs, bases and footings, including formwork, reinforcing, and concrete, complete as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 079200, EXTERIOR SEALANTS.
 - 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.
 - 3. Section 116816, PLAY STRUCTURES.
 - 4. Section 129300, SITE FURNISHINGS.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
 - 1. American Concrete Institute (ACI):
 - 301 Structural Concrete for Buildings
 - 303R Guide to Cast-In-Place Architectural Concrete Practice
 - 306.1 Cold Weather Concreting
 - 308 Standard Practice for Curing Concrete
 - 325.9R Guide for Construction of Concrete Pavements and Concrete Bases
 - 2. American Plywood Association (APA):
 - Ref. 1 APA Design/Construction Guide, Residential and Commercial
 - 3. American Society for Testing and Materials (ASTM):

A 36	Structural Steel
A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 185	Welded Steel Wire Fabric for Concrete Reinforcement
A 307	Carbon Steel Externally Threaded Standard Fasteners
A 386	Zinc Coating (Hot-Dip) on Assembled Steel Products
A510	General Requirements for Wire Rods and Course Round Wire, Carbon Steel
A 569	Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 33	Concrete Aggregates
C 143	Slump of Portland Cement Concrete
C 150	Portland Cement
C 171	Sheet Materials for Curing Concrete
C 309	Liquid Membrane-Forming Compounds for Curing Concrete
C 494	Chemical Admixtures for Concrete
D 1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.04 SUBMITTALS

- A. Shop drawings of reinforcing steel shall be submitted. Drawings shall indicate bar sizes, locations, spacings, quantity required, bending and cutting schedules, and supporting and spacing devices.
- B. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect exposed to view cast-in-place concrete.
- C. Samples of the following shall be submitted:

<u>Item</u>	<u>Sample Size</u>
Preformed joint filler	Two pieces, full depth and width, 4 in. length
- D. Prior to start of concrete work, Contractor shall submit to the Architect for review a schedule for execution of the work of this section and a location plan indicating sequence of concrete placement and location of proposed control joints and construction joints, if required.

1.05 DESIGN OF CONCRETE MIX

- A. Mix design shall be certified by independent testing laboratory. Statement of materials constituting design of mixes (as required by referenced standards) shall be submitted for Architect's approval within one week following award of Contract.
- B. Concrete mix design shall include the following information:
 - 1. Proportions of cement, fine and coarse aggregates, and water.
 - 2. Water-cement ratio, design strength, slump, and air content.
 - 3. Type of cement and aggregates.
 - 4. Type and dosage of all admixtures.
 - 5. Special requirements for pumping.
 - 6. Range of ambient temperature and humidity for which the design is valid.
 - 7. Any special characteristics of the mix which require precautions in the mixing, placing, finishing, or curing methods to achieve the finished product specified.
- C. No concrete shall be delivered to the job site until the Architect has approved the design mixes.

1.06 PRECONSTRUCTION MOCK-UPS

- A. General
 - 1. Schedule mock-up casting for acceptance 30 days prior to casting of concrete surfaces represented by the mockups.
 - 2. Locate mock-up panels in non-public areas accepted by the Architect.
 - 3. Continue to cast mock-ups until acceptable mock-ups area produced. Accepted mock-ups shall be the standard for color, texture, and workmanship for the work.
 - 4. Mock-up sequence of forming, placing, form removal, curing, and finishing shall be reviewed and accepted by the Architect.
 - 5. Demonstrate in the construction of the mock-up formwork the sealer material, form release agent, and curing materials and methods to be used.
 - 6. Mock-up formwork shall be inspected and accepted by the Architect before placing of concrete.
 - 7. Use the same concrete mixes and placement and timing procedures, accepted in mock-ups, in the final work, unless otherwise directed by the Architect.
 - 8. Protect accepted mock-ups from damage until completion and acceptance of the work represented by the mock-up.
 - 9. Remove mockups from site at completion of project, as directed by the Architect.
- B. Mockups: Cast mockups of full-size sections simulating actual design and execution conditions for concrete mix materials, reinforcement, formwork, placing sequence, form removal, curing, finishing, methods and materials of stain removal and correction of defective work, and overall standard of workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - a. Site Wall: 6 ft. long x 4 ft. ht. x full thickness.
 - b. Steps: 3 consecutive steps, 4 ft. wide x full tread and riser dimensions. Record time between final curing and performing sandblast finish.
 - 2. Notify Architect ten days in advance of dates and times when mockups will be constructed.
 - 3. Obtain Architect's approval of mockups before starting construction.
 - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 - 5. Demolish and remove approved mockups from the site when directed by Architect.
- C. Source of Materials. Utilize the same source, stock, or brand of concrete materials for

each class or mix of concrete which is to be exposed. Do not interchange materials or mixes until an additional mock-up shows that uniformity in finish texture and color, as compared to original mock-up will be maintained. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity.

1.07 QUALITY ASSURANCE

- A. Unless otherwise specified, cast-in-place concrete work shall conform to ACI 301. Construction of concrete subbases shall conform to ACI 325.9R
- B. Dimensions, locations, and details of equipment pads, anchors, supports, and similar features indicated on the Drawings are approximate. Manufacturer's approved shop drawings of equipment to be supported, anchored, or contained thereby shall be consulted for exact location, size, and details.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- D. Preinstallation Conference: Conduct conference at Project site.

1.08 TESTING

- A. Inspection and testing of the concrete mix will be performed by an independent testing laboratory approved by the Architect. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel.
- B. Concrete materials and operations will be tested and inspected as work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Architect to final acceptance.
- C. The following testing services may be provided by the Owner, at no cost to the Contractor:
 - 1. Review and test of the Contractor's proposed materials for compliance with the specifications.
 - 2. Review of the Contractor's proposed mix design.
 - 3. Sampling and testing of materials at plants or stockpiles during the course of the work for compliance with the specifications.
 - 4. Strength tests of concrete specimens.
 - 5. Inspection of concrete batching, mixing, and delivery.
- D. The following testing services shall be provided, at the Contractor's expenses:
 - 1. Additional testing and inspection required because of changes in materials or proportions, requested by the Contractor.
 - 2. Additional testing of materials or concrete occasioned by their failure by testing or inspection to meet specification requirements.
- E. At least four standard compression test cylinders shall be made and tested from each day's placement of concrete. Four concrete test cylinders will be taken for every 50 cubic yards of each type and design strength of concrete placed. Two cylinders shall be tested at seven days, and two at 28 days. One additional test cylinder will be taken during cold weather concreting, and will be cured at the job site under the same

conditions as the concrete it represents. 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.

- F. One slump test will be taken for each set of test cylinders taken.
- G. Submit to the testing laboratory, proposed concrete mix design for review, before beginning work. Forward testing laboratory's mix review to Architect for approval prior to beginning work.
- H. Provide free access to work and full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed for testing agency to take samples for required tests. Notify testing agency and Architect of intent to place concrete at least 24 hours before placement.

PART 2 PRODUCTS

2.01 FORMS

- A. Cylindrical Forms: Sonotube Fibre Forms, wax-impregnated strippable forms manufactured by Sonoco Products Company, General Products Division or approved equal, or ABS or PVC plastic reusable forms.
- B. Footing Form Materials: Bigfoot Footing Forms, manufactured by Bigfoot Systems; Bigfoot Systems Inc. 6750 Hwy. #3 Martin's Point Nova Scotia, Canada B0J 2E0 ; Tel. 1-800-934-0393, or approved equal.
- C. Forms for Unexposed Finish: Plywood, lumber or metal, with lumber dressed on at least two edges and one side.
- D. Form Ties: Provide prefabricated, adjustable length galvanized steel snap-off ties, with brackets, cones, cornerlocks and other accessories as necessary.
- E. Form Coatings: Commercial formulation compounds that will not bond with, stain or adversely affect concrete.
- F. Forms shall be true to line and free from warp, and shall be of sufficient strength, when staked, to resist the pressure of the concrete without springing. Formwork shall be designed so that sections may be fastened together to prevent vertical or horizontal movement of ends.

2.02 CONCRETE MIX

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and the following:
 - 1. Cement shall be Portland cement, conforming to ASTM C 150, Type I or II.
 - 2. Aggregates shall conform to ASTM C 33.
 - a. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch (19-mm)] nominal maximum coarse-aggregate size.
 - b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Minimum Compressive Strength:
 - a. Pavillion: 4500 psi, (20.7 MPa) at 28 days.
 - b. Pipe rail footings: 4000 psi (20.7 MPa) at 28 days.
 - c. Other site improvements, unless otherwise specified higher by manufacturers

instructions: minimum 3000 psi (20.7 MPa) at 28 days.

4. Maximum Water-Cementitious Materials Ratio:

- a. Pavillion: 0.45
 - b. Other site improvements: 0.50.
5. Concrete slump shall be no less than 2 in. nor greater than 4 in., determined in accordance with ASTM C 143.
6. Concrete shall be air-entrained type, conforming to ASTM C 94. Air-Entraining Admixture: ASTM C 260.
- a. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for [3/4-inch (19-mm) nominal maximum aggregate size.

- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.03 CONCRETE REINFORCING

- A. Steel reinforcing bars shall conform to ASTM A 615.
1. Bars employed as reinforcement shall be deformed type.
 2. Bars employed as dowels shall be hot-rolled plain rounds.
 3. Unless otherwise indicated on the Drawings, reinforcing bars shall be Grade 60.
- B. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.04 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.05 CURING MATERIALS

- A. Curing shall be by moist curing or by use of curing compound.
- B. Curing paper shall be a nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.
- C. Curing compound shall be a clear compound conforming to ASTM C 309, Type 1 or white pigmented compound conforming to ASTM C 309 Type 2, Class B.

2.06 EXPANSION JOINTS

- A. Unless otherwise indicated on the Drawings, expansion joints shall be located 30 ft. o.c., maximum.
- B. Unless otherwise indicated on the Drawings, expansion joints shall be 3/8 in. wide.

Expansion joint filler shall be preformed, nonbituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., or approved equal.

1. Premolded filler shall be one piece for the full depth and width of the joint.
2. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.
3. Except as otherwise noted on the Drawings, joint filler shall be 3/8 in. thick.

2.07 BOLTS

- A. Anchor bolts shall conform to ASTM A 307.
- B. Expansion bolts for anchoring into existing concrete shall conform to ASTM A 307, and shall have a self-drilling shell similar to Phillips Red Head Self-Drilling Shells, manufactured by Phillips Red Head Anchor Division of ITT, Michigan City, IN., or approved equal.

PART 3 EXECUTION

3.01 SUITABILITY OF SUBGRADE

- A. Aggregate subbase to receive concrete slab-on-grade shall be inspected by a professional geotechnical engineer to ensure that material is suitable to receive concrete, including compaction. Subgrade unacceptable shall be brought to the attention of the Architect.

3.02 ACCEPTABILITY OF CONCRETE SURFACES

- A. Concrete structures to receive concrete topping slab shall be inspected to ensure that surface is suitable to receive concrete. Waterproofed surfaces shall be thoroughly cured and suitably protected with protection board prior to start of concrete work of this section.

3.03 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.04 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.05 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
 1. Radial walls shall not be formed with tangent sections, but rather smooth, continuous curves as indicated on the Drawings.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Forms shall be sufficiently tight to prevent leakage.
- D. Clean forms and adjacent surfaces to receive concrete. Remove debris just before placing concrete.
- E. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.06 EARTH FORMED CONCRETE

- A. Earth formed concrete footings shall be excavated under work of Section 312000, EARTH MOVING to the depth and shape indicated on the Drawings. Earth formed footings shall be continuous.

3.07 REINFORCING

- A. Before being placed in position, reinforcing shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.
- B. Any bar showing cracks after bending shall be discarded.
- C. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.
- D. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel and anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.

3.08 PLACING CONCRETE

- A. Before placing concrete, forms and space to be occupied by concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint, and other material which might tend to reduce bond.
- B. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.
- C. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 2. If concrete can not be mechanically consolidated, concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.
- E. Cold-Weather Placement: Comply with ACI 306.1.

- F. Hot-Weather Placement: Comply with ACI 301.
- G. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.09 PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.
- C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
- E. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.
 - 1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.
 - 2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 sq. ft. per gallon, in two applications perpendicular to each other.
 - 3. Curing period shall be seven days minimum.

3.10 EXPANSION JOINTS

- A. Expansion joints shall be 3/8 in. wide and shall be as located on the Drawings. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab. Joint filler shall extend the full length of the expansion joint.
 - 1. Joint filler shall not extend above concrete slab. Depth of filler shall be as required to form a 1-1/4 in. deep sealant and backer rod recess below finished grade of paved surface.

2. Depth of joint filler shall be as required to form a 1-1/4 in. deep sealant and backer rod recess below finished concrete surface.

- B. Expansion joints of slab-on-grade shall be doweled. Dowel shall be centered over the joint prior to concrete placement. The end of the dowel at the side of joint which will be poured second shall be greased immediately before concrete placement.

3.11 PATCHING FORMED SURFACES OF EXPOSED CONCRETE

- A. After forms have been removed, inspect concrete surfaces and only at the direction of the Architect, patch pour joints, voids, stone pockets, other defective areas and before concrete is thoroughly dry. Chip away defective areas to depth of not less than 1 in. with edges perpendicular to surface. Wet areas to be patched and space at least 6 in. wide entirely surrounding it, to prevent absorption of water from patching mortar. Do not patch concrete in freezing weather.
- B. Apply chemical bonding agent to surface in accordance with manufacturer's printed instructions, followed immediately by patching mortar. Make patch of same proportions used for concrete except omit coarse aggregate. Add only enough water consistent with requirements for handling and placing.
- C. Thoroughly compact mortar into place and screed off; leave patch slightly higher than surrounding surface. Leave undisturbed for one to two hours to permit initial shrinkage before final finishing. Finish patch to match texture and color of adjoining surface.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. The work of this Section includes, but is not limited to the following:

1. Miscellaneous bearing and leveling plates.
2. Miscellaneous framing and supports for the following:
 - a. Trail Bridges
3. Custom brackets and supports.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 033000, CAST-IN-PLACE CONCRETE; Placing of inserts and anchors.
 2. Section 061053, EXTERIOR ROUGH CARPENTRY; Rough hardware for exterior rough carpentry work.
 4. Section 061053, EXTERIOR CARPENTRY; Wood Fencing, Trail Bridge.
 3. Section 099113, EXTERIOR PAINTING; Field painting.

1.03 REFERENCES

- A. Comply with applicable requirements of following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Institute of Steel Construction (AISC):

Code	Code of Standard Practice for Steel Buildings and Bridges
Specification	Specification for the Design, Fabrication and Erection of Structural Steel for Buildings

2. American Iron and Steel Institute (AISI):

Specifications	Specifications for the Design of Light Gage Cold-Formed Steel Structural Members
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3. American National Standards Institute (ANSI):

A14.3 Safety Requirements for Fixed Ladders

A202.1 Metal Bar Grating Manual

4. American Society for Testing and Materials (ASTM):

A 27	Steel Castings, Carbon, for General Application
A 36	Structural Steel
A 47	Ferritic Malleable Iron Castings
A 48	Gray Iron Castings
A 53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 307	Carbon Steel Externally Threaded Standard Fasteners
A 325	High Strength Bolts for Structural Steel Joints
A 366	Steel, Carbon, Cold-Rolled sheet, Commercial Quality
A 385	High-Quality Zinc Coatings (Hot-Dip)
A 386	Zinc Coating (Hot-Dip) on Assembled Steel Products
A 446	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
A 500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A 501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
A 510	General Requirements for Wire Rods and Course Round Wire, Carbon Steel
A 569	Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
A 570	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
A 588	High –Strength Low Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4 in. [100mm] Thick
A 606	Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
A 611	Steel, Cold-Rolled Sheet, Carbon, Structural
A 743	Castings, Iron-Chromium, Iron-Chromium Nickel, and Nickel-Base Corrosion-Resistant, General Application
A 780	Repair of Damaged Hot-Dip Galvanized Coatings

A 786	Rolled Steel Floor Plates
E 894	Anchorage of Permanent Metal Railing Systems and Rails for Buildings
E 935	Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
E 985	Specifications for Permanent Metal Railing Systems and Rails for Buildings

5. American Welding Society (AWS):

D1.1	Structural Welding Code - Steel
D1.3	Structural Welding Code - Sheet Steel

6. Corps of Engineers (CE):

CRD-C-621 Specification for Nonshrink Grout

7. Steel Structures Painting Council (SSPC):

PA 1	Paint Application Specification No. 1
SP 3	Power Tool Cleaning
SP 6	Commercial Blast Cleaning

1.04 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.05 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of work showing size and thickness of each member, type of material, method of connection and assembly. Show dimensions, clearances, anchorages, relationships to surrounding work, coatings, and other pertinent details of fabrication and installation.
1. Show profiles, reinforcing, fasteners, and any accessories.
 2. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
- B. Product Data: Provide manufacturer's product data, installation instructions, use limitations, and recommendations for each material used. Provide certifications that materials comply with requirements.
- C. Calculations: Where installed metal fabrication work is indicated to comply with certain

design loadings, provide professionally prepared calculations, material properties, certification, and other information required for structural analysis of performance of work.

- D. Welders Certification: Provide certifications, signed by Contractor, certifying that welders employed at project comply with requirements specified under AWS D1.1 and AWS D1.2.

1.06 GENERAL REQUIREMENTS

- A. The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.07 WORKMANSHIP

- A. Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.08 ANCHORAGE

- A. Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.09 QUALITY ASSURANCE

- A. Engineering: Provide services of a professional engineer, registered in Commonwealth of Massachusetts, to design and certify that work of this Section meets or exceeds performance requirements specified.
- B. Shop fabricate work to greatest extent possible. Label each piece in shop to facilitate field assembly.
- C. Welding: Perform welding in conformance with AWS D1.1 and D1.3. as applicable.

1.10 PRODUCT HANDLING AND STORAGE

- A. Store work off ground and under cover. Protect from damage. Repair and clean work before erection.

1.11 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

- 1. Provide allowance for trimming and fitting at site.

- B. Do not permit use of metal fabrication work until work is completely and fully installed and ready to assume intended design loads. Do not permit overloading of metal fabrication systems. Do not permit use of concrete filled metal pan stair systems until concrete is placed and cured.

1.12 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.01 STEEL

- A. General: Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Steel Tubing: ASTM A 500 or A 501, hot or cold rolled, as required for design loading.
- D. Steel Pipe: ASTM A 53, schedule 40, Type S (seamless), black except where galvanized is indicated, Grade A for cold-bending.
- E. Steel Sheet: ASTM A 366, A 570, or A 611, grade required for design loading.
 - 1. Stainless steel pipe, flat bar stock, and related components shall be AISI Type 304 with No. 4 satin finish.
- F. Rolled Steel Floor Plates: ASTM A 786.
- G. Steel Bars for Gratings: ASTM A 569 or ASTM A 36.

2.02 STAINLESS STEEL

- A. Stainless Steel: Comply with following standards and requirements for stainless steel components:
 - 1. Tubing: ASTM A 554, Type 316 stainless steel, as standard with manufacturer.
 - 2. Pipe: ASTM A 312, Type 316 stainless steel.
 - 3. Castings: ASTM A 743, Grade CF 8 or CF 20.
 - 4. Plate: ASTM A 167, Type 316 stainless steel.

2.03 NONFERROUS METALS

- A. General: Provide products and materials of new stock, free from defects, and of best

commercial quality for each intended purpose.

- B. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- D. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- E. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.04 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- J. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

- M. Inserts: Threaded or wedge type, galvanized ferrous castings; either ASTM A 47 malleable iron, or ASTM A 27 cast steel. Provide threaded inserts and wedge inserts manufactured by one of the following or Architect approved equal:

1. Hohmann and Barnard.
2. Gateway Erections, Inc.
3. Richmond Screw Anchor Co.

2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Grout for Exterior Applications: Provide Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating. Provide Super Por-Rok, Erosion-Resistant Anchoring Cement, manufactured by Minwax Construction Products Division, or equal as approved by Architect.

2.06 FABRICATION - GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate work of this Section to be straight, plumb, level and square, and to sizes, shapes and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metal work as required for proper assembly.
1. Fabricate miscellaneous supports, brackets, braces and the like required to fully complete the work.
 2. Obtain loading requirements from suppliers of work to be supported. Design and support systems with a safety factor of at least 6 unless otherwise indicated.
 3. Allow for thermal movement resulting from 100°F change in ambient temperature.
 4. Shear and punch metals accurately. Remove burrs.
 5. Ease exposed edges to a radius of approximately 1/32 in., unless indicated otherwise. Form bent corners to smallest radius possible without causing grain separation or impairing work.
 6. Remove sharp or rough areas on exposed traffic surfaces.
 7. Weld seams continuously. Spot welding is permitted for temporary welding only.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- F. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- J. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.
- K. Work Exposed to View: For work exposed to view, select materials with special care. Provide materials which are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform hairline joints. Form welded joints and seams continuously. Grind welds flush to be smooth after painting. For exposed fasteners, use hex head bolts or Phillips head machine screws.
- L. Galvanizing: Hot-dip galvanize exterior metal fabrications, items located in exterior wall assemblies, and other items indicated to be galvanized, in compliance with ASTM A 123, ASTM A 153, or ASTM A 386. Provide minimum 1.5 oz./ft.² zinc coating. Galvanize after fabrication.

2.07 FABRICATION

- A. Shelf and Relieving Angles: Fabricate shelf and relieving angles from steel angles and shapes of sizes indicated for attachment to building structure. Fabricate shapes with slotted holes to receive anchor bolts, of size and spacings indicated. If not indicated, holes not more than 6 in. from ends and not more than 24 in. on center. Align expansion joints in angles with building expansion joints, and with control joints in masonry cavity wall exterior wythe.
- B. Miscellaneous Bearing and Leveling Plate Fabrication: Provide miscellaneous loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Fabricate units flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts as required.
- C. Miscellaneous Framing and Supports: Fabricate miscellaneous framing and supports to adequately support live and dead loads with a safety factor of 5. Provide necessary anchors, inserts, and fasteners. Fabricate support system to carry entire load of work being supported to structure above. Do not transfer any loads to ceiling systems.
1. Cut, drill, and tap units to receive hardware, hangers and similar items.
 2. Coordinate loading and attachment requirements for miscellaneous framing and supports with manufacturers of items being supported.

2.08 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.09 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
- C. Shop Paint for assemblies shall be Tnemec "Series 27 F.C. Typoxy", polyamide epoxy, or approved equal. Dry film thickness of application shall be 4.5 to 6.0 mil. Color shall be black; surface texture shall be flat.
- D. Field Finish Paint shall be Tnemec Series 2 coat high performance system or approved equal. Color shall be black, with eggshell finish.
- E. Bituminous-based paint for electrolytic isolation shall be cold applied black asphaltic mastic conforming to SSPC Paint 12, with no asbestos fibers

2.10 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.11 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish – "Mill Finish": AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorage devices, setting drawings, diagrams, templates, instructions, and directions for installation of concrete inserts, sleeves, anchor bolts, and miscellaneous items to be embedded or attached to concrete work, masonry work, or structural steel work.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners necessary for securing work of this Section to in-place construction. Include threaded

fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors required.

- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Erect work square, plumb and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set in concrete or masonry shall be furnished loose by this trade to be built-into concrete and masonry by those trades. Avoid field cutting or drilling to greatest extent possible.
- D. Brace work rigid and secure to surrounding construction. Provide temporary bracing or anchors where required.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with AWS D1.1 and D1.2 for procedures of manual metal-arc welding, appearance and quality of welds, and correction methods for defective welds.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Where members other than expansion bolts or inserts are fastened into concrete, set such members in proprietary-type expanding grout manufactured specifically for such purpose. Use grouts strictly in accordance with manufacturer's directions. Form to receive members with galvanized metal sleeves, or other approved method to provide at least 1/2 in. clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 in. from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.
- H. Electrolytic Isolation: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or where dissimilar metals are to come into contact with one another, with an application of a heavy coating of bituminous paint on contact surfaces in addition to shop coat specified above. Do not permit the bituminous paint in any way to remain on surfaces to be exposed or to receive sealant.

3.03 INSTALLATION

- A. Miscellaneous Bearing and Leveling Plates: Clean concrete and masonry surfaces of bond reducing materials. Roughen surfaces if required to improve bond to surface. Clean bottom surface of leveling plates immediately prior to installation.
- B. Miscellaneous Items: Carefully review Drawings for miscellaneous metal items required by various trades but not specifically listed above, such as miscellaneous clip angles, miscellaneous steel bracketing, and other miscellaneous metal items as indicated on Drawings, reasonably implied therefrom, or reasonably necessary for thorough completion of work.

3.04 ADJUSTING, REPAIRING, CLEANING, AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Non-Galvanized Surfaces: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed surfaces with same material as used for shop painting. Comply with SSPC PA 1.

END OF SECTION

SECTION 061063

EXTERIOR ROUGH CARPENTRY

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all materials and equipment, and do all work required to construct wood fence as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
 - 1. Section 061533 WOOD PATIO DECKING
 - 2. Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

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

ASTM F 537	Standard Specification for Design, Fabrication, and Installation of Fences Constructed of Wood and Related Materials
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1.04 SUBMITTALS

- A. Samples: For metal framing anchors.
- B. Shop Drawings of wood fences shall be submitted.

1.05 QUALITY ASSURANCE

- A. Installation of wood fence and gate shall conform to ASTM F 537.

PART 2 PRODUCTS

2.01 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

- 1. Factory mark each item with grade stamp of grading agency.

2. For items that are exposed to view in the completed Work, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 15 percent.
2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness].
3. Timber: 19 percent

2.02 LUMBER

A. Fence Boards and Posts: lumber shall be:

1. Northern White Cedar, of sound stock.
2. Western red cedar, of sound stock, NLGA, WCLIB, or WWPA.

2.03 FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use fasteners with hot-dip zinc coating complying with ASTM A 153 unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless-steel fasteners.

2. Post installed Anchors: Stainless-steel anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E 488, conducted by a qualified independent testing and inspecting agency.

PART 3 EXECUTION

1.01 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. "Fastening Schedule" in ICC's International Building Code.

END OF SECTION 061063

SECTION 061533

WOOD DECKING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all materials and equipment, and do all work required to construct wood decking, stairs for elevated decks, railings for elevated decks, and support framing for elevated decks as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:

1. Section 033000 CAST IN PLACE CONCRETE
2. Section 055500 METAL FABRICATIONS
3. Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Lumber Standard Committee

DOC PS 20 American Softwood Lumber Standard

2. American Society for Testing and Materials (ASTM)

ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

ASTM F 593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs

ASTM F 594 Standard Specification for Stainless Steel Nuts

3. American Wood Council

AF&PA WCD1 Details for Conventional Wood Frame Construction

4. American Wood Protection Association

AWPA U1 Wood Protection with Preservative Systems

1.04 SUBMITTALS

- A. Product Data: For decking and metal framing anchors.
- B. Shop Drawings shall be submitted for Trail Bridges.

PART 2 PRODUCTS

2.01 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
 - 1. Factory mark each item with grade stamp of grading agency.
 - 2. For items that are exposed to view in the completed Work, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
 - 1. Boards: 15 percent.
 - 2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness].
 - 3. Timber: 19 percent

2.02 WOOD DECKING AND STAIR TREADS

- A. Dimension Lumber Decking and Stair Treads: No. 2 grade and the following species:
 - 1. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 - 2. Southern pine; SPIB.
 - 3. Redwood; RIS.
- B. Board Decking and Stair Treads: as dimensioned on the drawings, actual thickness radius-edged decking of any of the following species and grades:
 - 1. Douglas fir-larch or Douglas fir-south, Patio 1; WWPA.
 - 2. Douglas fir-larch, Commercial Dex; WCLIB.
 - 3. Douglas fir-larch (North), Commercial Patio; NLGA.
 - 4. Redwood, Heart B or Select Heart; RIS.
 - 5. Southern pine, Standard; SPIB.

2.03 WOOD RAILINGS

- A. Dimension Lumber Railing Members: No. 2 grade and[any of] the following species:
 - 1. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 - 2. Mixed southern pine; SPIB.
 - 3. Redwood; RIS.

- B. Dimension Lumber Railing Members: Heart B or Select Heart redwood; RIS.
- C. Railing Boards: Any of the following species and grades:

- 1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
- 2. Redwood, [Heart Clear] [Heart B or Select Heart]; RIS.
- 3. Southern pine, B & B finish; SPIB.

2.03 DIMENSION LUMBER FRAMING

- A. Deck **and Stair** Framing: **No. 2** grade and **any of** the following species:

- 1. Southern pine; SPIB.
- 2. Douglas fir-larch (North); NLGA.

2.04 POSTS

- A. Dimension Lumber Posts: No. 2]grade and any of the following species:

- 1. Douglas fir-larch, Douglas fir-larch (North); NLGA, WCLIB, or WWPA.
- 2. Mixed southern pine; SPIB.

- B. Timber Posts: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), eastern hemlock tamarack (North), hem-fir, southern pine, western hemlock, or western hemlock (North); No. 2; NeLMA, NLGA, SPIB, WCLIB, or WWPA.

- C. Timber Posts: Southern pine; No. 2; SPIB.

2.05 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWWPA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

- B. Pressure treat timber with waterborne preservative according to AWWPA U1; Use Category UC4a.

- C. Preservative Chemicals: Acceptable to authorities having jurisdiction.

- 1. Do not use chemicals containing arsenic or chromium, except for timber posts.

- D. Use process that includes water-repellent treatment.

- E. Use process that does not include water repellents or other substances that might interfere with application of indicated finishes.

- F. After treatment, redry boards, dimension lumber, and timber to 19 percent maximum moisture content.

- G. Under no circumstances shall creosote, copper sulfate, or mercuric chloride preservative be used.

2.06 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood

substrate.

1. Use stainless steel unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless-steel fasteners.

- B. Postinstalled Anchors: Stainless-steel anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2

2.07 METAL FRAMING ANCHORS

- A. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G185 (Z550) coating designation.
- C. Stainless-Steel Sheet: ASTM A 666, Type 316.

2.08 CONCEALED DECKING FASTENERS

- A. Deck Splines: Corrosion-resistant metal or plastic splines that fit in grooves routed into the sides of decking material and are fastened to deck framing with screws. Splines provide uniform spacing of decking material.
- B. Deck Clips: Black-oxide-coated, stainless-steel clips designed to be fastened to deck framing with screws, and to secure decking material with teeth that also provide uniform spacing of decking material.
- C. Deck Tracks: Formed metal strips designed to be fastened to deck framing and to secure decking material from underside with screws. Made from epoxy-powder-coated, hot-dip galvanized steel or stainless steel.

2.09 MESH

- A. Mesh: Shall be 1/16" welded galvanized wire 1" x 1" mesh.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install wood decking and stair treads with crown up (bark side down).

- D. Install plastic lumber to comply with manufacturer's written instructions.
- E. Secure decking to framing with screws.
- F. Install metal framing anchors to comply with manufacturer's written instructions.
- G. Do not splice structural members between supports unless otherwise indicated.
- H. Apply copper naphthenate field treatment to comply with AWPAC M4, to cut surfaces of preservative-treated lumber.
- I. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC708 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.
 - 3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.

3.02 ELEVATED DECK JOIST FRAMING INSTALLATION

- A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.
- B. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together.

3.03 STAIR INSTALLATION

- A. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
- B. Treads and Risers: Secure by gluing and screwing to carriages. Countersink fastener heads, fill flush, and sand filler. Extend treads over carriages and finish with bullnose edge.

3.04 RAILING INSTALLATION

- A. Posts: Secure to stringers and risers with countersunk-head wood screws and glue.
- B. Railings: Fasten freestanding railings to posts with countersunk-head wood screws or rail bolts.
- C. Mesh: Attach to top and bottom rails with galvanized steel tacks.

END OF SECTION 061533

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide painting and finishing work throughout exterior of Project as indicated and scheduled on the Drawings and as specified.
- B. Examine Contract Documents to determine full extent of painting and finishing work required. Materials provided under other Sections that need painting or finishing and are left unfinished under requirements of other Specification Sections, shall be painted and finished to completion under work of this Section, unless specifically scheduled herein to be left unfinished.
- C. Preparatory work of materials and surfaces to receive paint beyond that specified to be done as work of other Sections, shall be included as work of this Section.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
1. Section 055000, METAL FABRICATIONS; Prime coat on non-galvanized miscellaneous metal .
 2. Section 323113, CHAIN LINK FENCE..
 3. Section 321723, PAVEMENT MARKINGS.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. Federal Specifications (Fed. Spec.):

TT-D-65	Drier; Paint, Liquid
TT-T-801	Turpentine, Gum Spirits, Steam Distilled, Sulfate Wood, and De-structively Distilled
 2. Steel Structures Painting Council (SSPC):

SP 1	Solvent Cleaning
SP 2	Hand Tool Cleaning
SP 3	Power Tool Cleaning

SP 6 Commercial Blast Cleaning

SP 7 Brush Blast Cleaning

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's printed product data, specifications, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.
- B. Initial Color Selection Samples: Submit manufacturer's standard color charts or chips showing complete range of colors, textures, and finishes available for each paint system used.
- C. Verification Samples: After initial selection of colors, submit representative samples of each paint system color that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide texture to simulate actual conditions. Define each separate coat, including primers. Resubmit samples until required sheen, color, and texture have been approved.

1.05 QUALITY ASSURANCE

- A. Source: Provide primers and undercoat paint produced by same manufacturer of finish coats for each substrate.
- B. Coordination: Review other Specification Sections where primers are provided to ensure compatibility with with finish coatings provided under this Section.
- C. Mock-Ups: Prior to commencing work of this Section, provide mock-up of size requested by Architect, of each color, paint system, and substrate at locations acceptable to the Architect. Obtain Architect's acceptance of visual qualities. Refinish mock-ups until Architect's acceptance is obtained. Maintain acceptable mock-ups throughout the remainder of the work to serve as criteria for acceptance of the work. Acceptable mock-ups may be incorporated into the finish work.

1.06 TESTS

- A. The Owner may employ an independent testing agency to perform tests, evaluations, and certifications of products used. Cooperate and permit samples of materials to be taken as they are used.

1.07 PROJECT CONDITIONS

- A. Weather, Temperature, and Humidity: Perform work only when existing and forecasted weather conditions fall within limits established by manufacturers of materials used.
 - 1. Outdoor Temperature and Conditions: Air and surface temperature shall be between 50°F. and 90°F. Surfaces shall be dry within limits of finish system manufacturer.
 - 2. Do not paint exterior surfaces while surfaces are exposed to the hot sun.
- B. Substrates: Proceed with work only when substrate construction and penetration work is complete.
- C. Lighting: Since lighting conditions can alter appearances of finish painting work, perform work of this Section under lighting conditions simulating permanent lighting

system to the greatest extent possible.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in unopened original containers bearing manufacturer's labels.
- B. Store materials in fully sealed containers, outside the building, preferably in exterior storage shed, well ventilated, and with a minimum ambient temperature of 45°F. Oily rags and waste must be removed from the building every night, and under no circumstances will be allowed to accumulate. Each space containing stored paint materials shall be provided with UL labeled fire extinguisher of suitable type, class, and capacity.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. High Performance Paint Coatings: Provide products of one of the following manufacturers that meet or exceed specified requirements:
 - 1. DuPont.
 - 2. Tnemec Company, Inc. (Tnemec).
 - 3. Glidden.
 - 4. Sherwin Williams.
- B. Materials used shall be best grade products of their respective kinds. The Painting Schedule is based on products of the above named manufacturers. These are specified to establish a standard of quality and kind of material desired. Provide these products, or equals as approved by Architect.
- C. Note: If substitutes are proposed, submit complete schedule showing materials specified and equivalent materials proposed as substitutes. Provide complete manufacturer's product data on proposed materials. Substitutes must be approved by Architect before commitment for materials is made. Refer to Section 016200, SUBSTITUTION REQUEST FORM.
- D. Assume full responsibility for proper performance of materials, for method of application, and for compatibility of materials applied over shop coats or other coats previously applied, including but limited to primers, sealers, preservative treatments, etc. Notwithstanding specific schedules in this Section, select primers which have been verified to be appropriate for each of the substrates and finishes encountered.
- E. Provide miscellaneous painting materials such as linseed oil, shellac, turpentine, and thinner of the highest quality.

2.02 COLORS .

- A. Tint and match colors to the satisfaction of Architect. Provide facilities for comparison and adjustment of colors. No limit is placed on number of colors that may be required; however the following maximum number of colors may be used on any one surface:
 - 1. Two Colors.

2.03 FILLERS, SOLVENTS, AND MISCELLANEOUS MATERIALS

- A. Turpentine: Pure gum spirits of turpentine conforming to Fed Spec. TT-T-801.
- B. Drier: Conform to Fed. Spec. TT-D-65.
- C. Tinting Materials: Best quality, ground in pure boiled linseed oil, limeproof, and non-fading.

PART 3 EXECUTION

3.01 INSPECTION AND GENERAL PREPARATION

- A. Inspect surfaces to receive finishes to ensure they are in proper condition to receive work under this Section.
- B. If surfaces are not thoroughly dry, or if surfaces cannot be put in proper condition to receive paint or other finish by customary cleaning methods, sanding, or spackling, notify Architect in writing.
- C. Commencing work on any surface will be construed as acceptance of the surface as being satisfactory to properly receive the work of this Section.
- D. Furnish and lay drop cloths in all areas where painting and finishing is being done, to adequately protect other work from all damage during the painting work.
- E. Cleaning: Do not paint over dirt, dust, rust, grease, moisture, or other contaminants detrimental to the formation of a durable paint finish. Clean surfaces thoroughly prior to painting in any given area.
- F. Touch up bare or abraded spots on surfaces with shop or existing finishes scheduled to be painted under this Section. Use same material used for shop coat. Substrate shall be smooth, free from raised grain; putty sags, cracks, rust, grease, dirt, or other foreign matter or defect.
- G. Incompatible Shop Primers: Remove incompatible shop primers and reprime surfaces, or provide barrier coats in compliance with finish paint manufacturer's instructions.

3.02 SURFACE PREPARATION

- A. Prepare surfaces to receive work of this Section in strict accordance with manufacturer's instructions applicable to each material, condition, and finish.
- B. Field-Welded Ferrous Metal: After installation, field-welding, and grinding, and immediately before painting, remove rust, loose mill scale, dirt, weld flux, weld spatter, weld smoke stains, burnt primer, and other foreign material with wire brushes and/or steel scrapers. Power tool clean in accordance with SSPC SP 3. Remove grease and oil by use of solvent recommended by paint manufacturer. Sand exposed surfaces, and between coats, as required to produce smooth, even finishes.
 - 1. Sand smooth and spot prime welded areas, and areas where prime coat has been damaged or abraded, using rust inhibitive primer scheduled in this Section.
- C. Other Ferrous Metal: Remove rust, mill scale, and foreign materials. Wire brush or sand damaged or rusted area to bright metal. Remove grease or dirt with solvents recommended by paint manufacturer just prior to applying paint.

1. Spot prime all areas where shop coat has been damaged or abraded, using same type paint as used for shop coat.
- D. Field-Welded Galvanized Metal: After installation, field-welding, and grinding, and immediately before painting, brush blast clean to remove rust, loose mill scale, dirt, weld flux, weld spatter, weld smoke stains, and other foreign material in accordance with SSPC SP 7. Solvent clean in accordance with SSPC SP 1 to remove grease and oil with solvents recommended by paint manufacturer. Sand exposed surfaces, and between coats, as required to produce smooth, even finishes.
1. Sand smooth welded areas, and areas where galvanized coating has been damaged or abraded. Spot prime using zinc primer scheduled in this Section.
- E. Other Galvanized Metal: Prior to installation, brush blast clean in accordance with SSPC SP 7 and to remove corrosion and foreign materials. Solvent clean in accordance with SSPC SP 1 to remove grease or dirt with solvent recommended by paint manufacturer just prior to applying primer.
- F. Other Non-Ferrous Metal: Prepare shop primed non-ferrous metals similarly to ferrous metals, specified above.
1. Prepare unprimed non-ferrous metals by thoroughly cleaning of oil, grease, and temporary protective coatings using solvent recommended by primer manufacturer. Provide additional pretreatment recommended by primer manufacturer to assure permanent adhesion of paint coats.
- G. Materials Preparation: Mix and prepare paint materials in accordance with manufacturer's printed instructions. Use only thinners approved by paint manufacturer, and only within recommended limits.

3.03 APPLICATION

- A. Painting Schedule in this Section lists minimum number of coats required. If specified minimum number of coats does not completely cover or hide base materials, provide additional coats required for coverage and uniform finish appearance, without additional cost to Owner.
- B. Apply paint in strict accordance with manufacturer's instructions. Use applicators and techniques best suited for substrates and types of materials being applied. No material shall be thinned in any way except as directed by manufacturer.
- C. Apply paints and coatings at coverage rates and dry film thicknesses scheduled at the end of this Section. Each coat applied must be inspected and approved by Architect prior to application of succeeding coat, otherwise no credit for the coat applied will be given and work in question shall be recoated without additional expense to Owner. Notify Architect when each coat is ready for inspection.
- D. Additional Coats: Provide additional coats necessary to eliminate show through and bleed through conditions.
- E. Drying Time: Allow manufacturer's recommended drying time between successive coats. However, allow each coat to thoroughly dry prior to application of subsequent coat.
- F. Sanding: Lightly sand finishes between coats using #00 sandpaper.

- G. Tinting: Tint prime coat on gypsum wallboard and plaster to approximate color of final shade.
- H. Finished work shall be free from runs, sags, hairs, defective brushing, and clogging of lines and angles. Flaws visible in the completed work shall be removed and the area satisfactorily repaired.
- I. Completed Work: Provide finishes that match approved samples and mock-ups for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.04 COMPLETION

- A. Cleaning: At completion of work of this Section, remove paint and varnish spots, and oil, grease, and other stains caused by this work from exposed surfaces. Leave finishes in a satisfactory condition.
- B. At completion of work of this Section, remove masking materials and other debris. Reinstall or replace fixtures, plates, etc., removed to facilitate application of paint.
- C. Retouching: Touch-up and repair applied finishes which, for any reason have been damaged during construction work. All finished work applied under this Section shall have finished surfaces as approved by finish material manufacturer.
- D. Final Inspection: Protect painted surfaces against damage until date of Substantial Completion. Architect will conduct final inspection of painting work. Areas that do not comply with requirements of these Specifications shall be repainted or retouched to satisfaction of Architect at no additional cost to Owner.

3.05 SURFACES NOT TO BE FINISHED

- A. Finishes for the following items are either included under other appropriate Sections or require no painting, except as otherwise specifically scheduled with subsequent Exterior and Interior Schedules.
 - 1. Chrome or nickel plating, stainless steel, bronze, brass, and aluminum other than mill finished, unless otherwise specified.
 - 2. Factory finished materials, specialties, and accessories unless otherwise specified.
 - 3. Exterior concrete.
 - 4. Exterior masonry.

END OF SECTION

SECTION 101430

EXTERIOR SIGNAGE

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. The work of this Section includes, but is not limited to:
1. Cut vinyl graphics informational and identification signage.
 2. Steel cut letter identification signage.

1.02 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 033000, CAST-IN-PLACE CONCRETE; footings and bases.
2. Section 055000, METAL FABRICATIONS.
3. Section 099113 EXTERIOR PAINTING

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

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

A 36	Structural Steel
A 53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A 386	Zinc Coating (Hot-Dip) on Assembled Steel Products
A 446	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
A 500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A 501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
A 570	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
A 611	Steel, Cold-Rolled Sheet, Carbon, Structural

B 209	Aluminum and Aluminum Alloy Sheet and Plate
B 221	Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
B 308	Aluminum-Alloy 6061 T6 Standard Structural Shapes Rolled or Extruded
B 429	Aluminum-Alloy Extruded Structural Pipe and Tubing
D 256	Impact Resistance of Plastics and Electrical Insulating Materials
D 638	Tensile Properties of Plastics
D 648	Deflection Temperature of Plastics Under Flexural Load

2. American Welding Society (AWS):

D1.1	Structural Welding Code – Steel
D1.3	Structural Welding Code – Sheet Steel

1.04 SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings of work of this Section. Show all details of construction and installation of each sign and type.
- B. Product Data: Submit manufacturer's product data of work of this Section. Provide complete product description and specifications, catalog cuts, and other descriptive data.
- C. Schedule: Provide complete signage and graphic schedule, showing key plans and locations of each type of sign.
- D. Field Measurements: Take all necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of the job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.
- E. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.
- F. Verification Samples: Submit representative samples of the following materials for approval prior to construction. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.
 - 1. Vinyl samples, in specified type style, size and graphic, for each color and finish designated on Drawings.
 - 2. Paint color and finish sample on 1/8 in. thick aluminum, for each color and finish required.
 - 3. Paint color and finish sample on 1/8 in. thick structural steel, for each color and finish required.
 - 4. Full size representative plotted templates for designated lettering, for each style, size, color, and finish designated on the Drawings. Include character and word spacing.
- G. Welders Certification: Provide certifications signed by Contractor, certifying that welders employed on Project comply with requirements specified under AWS D.1 and AWS D1.3.

1.05 COORDINATION

- A. Coordinate all work of this Section with all other trades.

1.06 QUALITY ASSURANCE

- A. Source: For each material type required for the work of this Section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of primary materials.
- B. Installer: A firm with a minimum of three years experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.
 - 1. If installer is different company than sign manufacturer, notify Architect in advance providing installer's name, address, telephone number, and name of contact person.
- C. All work and material shall be in accordance with all applicable codes and standards and shall be acceptable to all authorities having jurisdiction. Work shall meet or exceed the requirements of the Commonwealth of Massachusetts State Building Code.
- D. Design Criteria: The Drawings indicate size, profiles, and dimensional requirements of signs and graphics, and are based on the specific type and model indicated. Signs by other manufacturers may be considered provided the deviations in dimensions and profiles are minor and do not, in the opinion of the Architect, change the design concept.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products unopened. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.
- B. Sequence deliveries to avoid delays, but minimize on-site storage. Coordinate work and storage requirements with the Building Contractor, subject to approval by the Owner and Architect.

PART 2 PRODUCTS

2.01 ALUMINUM MATERIALS

- A. General: Provide manufacturer's standard extrusions, sections, sheet, and plate, of alloy and temper recommended by aluminum manufacturer or finisher for type, use, and finish indicated, but not less than strength and durability properties specified below:
 - 1. Structural Aluminum Shapes: ASTM B 308, 6061 alloy.
 - 2. Extruded Aluminum Bars, Rods, Shapes, and Tubes: ASTM B 221, 6063 alloy.
 - 3. Aluminum Sheet and Plate: ASTM B 209, alloy 1100, 3003, or 5052.

2.02 STEEL MATERIALS

- A. General: Provide manufacturer's standard extrusions, sections, sheet, and plate, of alloy and temper recommended by steel manufacturer or finisher for type, use, and finish indicated, but not less than strength and durability properties specified below:

- B. Steel Shapes: ASTM A 36.
- C. Steel Tubing: ASTM A500 or A 501, hot or cold rolled.
- D. Steel Sheet: ASTM A 366, A 570 or A 611, of grade required for design loading.
- E. Steel Pipe: ASTM A 53, black Schedule 40, unless indicated otherwise. Type and grade as required for design loading.
- F. No stainless steel shall be used in sign fabrication except for fasteners where necessary, and approved by Architect.

2.03 VINYL MATERIALS

- A. Applied Vinyl Graphics: Pressure sensitive vinyl graphics shall be Scotchlite Reflective Sheeting, enclosed lens reflective sheeting; Scotchcal, 0.4 mil applied pressure sensitive vinyl; Scotchlite Series 3200, Engineer Grade permanent pressure sensitive adhesive sheeting, or approved equal. Color(s) will be selected by Architect.

2.04 MISCELLANEOUS MATERIALS

- A. Fasteners: Unless otherwise indicated, use concealed fasteners in all work of this Section. Fabricate fasteners from metals that are non-corrosive (aluminum or non-magnetic stainless steel) to sign surface materials and mounting substrates.
 - 1. Exposed fasteners shall be roundhead and vandal-resistant.
- B. Anchors and Inserts: Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations. Provide toothed steel or lead expansion bolt devices for drilled-in place anchors. Furnish inserts to other trades when required to be cast into concrete.
- C. Permanent Bond Adhesive: Provide structural adhesive suitable for bonding a variety of dissimilar industrial surfaces over a wide temperature range, similar to "PR-943", manufactured by Products Research and Chemical Corporation, Gloucester City, NJ 08030, or approved equal.

2.05 FABRICATION

- A. General: Fabricate work of this Section in conformance with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, and sizes.
- B. Fabricate panel signs using metals and shapes of sufficient thickness, with reinforcing when necessary, to produce sufficient flatness, free of "oil canning", and to impart sufficient strength for size, design, and application indicated.
 - 1. Fabricate informational signs as indicated on the Drawings.
 - 2. Fabricate posts, brackets, and fittings from extruded aluminum to suit sign panel construction and mounting conditions indicated; all seams welded and ground smooth prior to painting.
 - 3. Colors: Where applied graphics require color selection, provide colors as indicated and as approved by Architect.
 - 4. Graphic Content and Style: Provide graphics in letter style, size, spacing, and arrangement indicated.
- C. Custom Aluminum Sign Posts and Caps: Custom aluminum sign posts and caps shall

be fabricated to size, shape and dimension indicated on the Drawings.

- D. Welded Connections: Comply with AWS for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of the exposed side. Clean exposed welded surfaces of welding flux and dress on all exposed and contact surfaces.
- E. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.

2.06 FINISHES

- A. Acrylic Polyurethane Finish: For surfaces indicated to be painted with acrylic polyurethane, provide Matthews Acrylic Polyurethane, satin finish paint system consisting of a pigmented component, a catalyst and a flattening agent, manufactured by Matthews Paint Company, Wheeling, IL 60090, or approved equal. Paint shall contain three ultraviolet inhibitors to prevent fading.
- B. Silkscreen Inks: shall be compatible with the finishes it will be applied to. Colors will be selected by Architect.
- C. High Performance Fluoropolymer Finish: For surfaces indicated to be painted with a high performance finish, provide Matthews "de Signar" high performance finish based on a fluoropolymer resin system manufactured by Matthews Paint Company, Wheeling, IL 60090, in strict compliance with coating system manufacturer's instructions and recommendations for surface preparation, mil thickness, curing and other requirements.
- D. Exterior Color: Exterior aluminum sign, post, and support surfaces indicated to receive high performance finish shall be in colors and finishes indicated on the Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. Locate sign units, letters and accessories where shown and scheduled. Use mounting methods indicated.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of work of this Section.
- C. Erect work square, plumb and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set in concrete shall be furnished loose by this trade to be built-into concrete by that trade. Avoid field cutting or drilling to greatest extent possible.
- D. Fit exposed connections accurately together to form hairline joints, except where invisible joints are indicated. Shop weld connections, except when work cannot be shop welded due to shipping size or galvanizing limitations.
- E. Fastening to In-Place Construction: Provide anchorage devices and fasteners necessary for securing work of this Section to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors required.

- F. Field Welding: Comply with AWS Code for procedures of manual welding, appearance and quality of welds, and correction methods for defective welds.
- G. Where members other than expansion bolts or inserts are fastened into concrete, set such members in proprietary-type expanding grout manufactured specifically for such purpose. Use grouts strictly in accordance with manufacturer's directions. Form to receive members with galvanized metal sleeves, or other approved method to provide at least 1/2 in. clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 in. from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.
- H. Electrolytic Isolation: Where dissimilar metals are to come into contact with one another, or in contact with concrete, isolate by application of a heavy coating of bituminous paint on contact surfaces in addition to shop coat specified above. Do not permit the bituminous paint in any way to remain on surfaces to be exposed or to receive sealant.

3.02 FINISH

- A. Paint finish shall be applied in strict compliance with coating system manufacturer's instructions and recommendations for surface preparation, mil thickness, curing and other requirements.

3.03 INSPECTION

- A. The Installer shall examine substrates, supports, and conditions detrimental to the proper completion of work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of installation will be construed as installer accepting substrates and conditions.

3.04 SIGN INSTALLATION

- A. General Installation Requirements: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section.
- B. Exterior signs shall be installed in various stages in response to the overall Project construction schedule. Install signage in strict accordance with approved phasing plan.
- C. Installation: Install units plumb, level, in alignment and plane without warp or rack. Anchor securely in place.

3.05 ADJUSTING, CLEANING, TOUCH-UP, AND PROTECTION

- A. Clean exposed surfaces using manufacturer's printed instructions recommending materials and methods to be used. Remove and replace work which cannot be successfully cleaned.
- B. Touch-up damaged coatings and finishes. Eliminate visible evidence of repair.
- C. Provide temporary protection during the course of work, and immediately after completion to ensure work is not damaged or deteriorated in any way at time of final acceptance. Remove temporary protections and reclean as necessary immediately prior to final acceptance.

END OF SECTION

SECTION 116816
PLAY STRUCTURES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all labor, materials, and equipment necessary to furnish and install the play equipment, swingset, and basketball backboards and goals, as indicated on the Drawings, and as specified herein.

1.02 RELATED SECTIONS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill; establishment of subgrade elevations, and gravel base material; sand material.
 2. Section 321216, BITUMINOUS CONCRETE PAVEMENT.
 3. Section 321816, RUBBER CUSHIONED SAFETY SURFACING.
 4. Section 321817, WOOD FIBER SAFETY SURFACING.
 5. Section 033000, CAST-IN-PLACE CONCRETE; Concrete footings and bases.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

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

C 90	Hollow Load-Bearing Concrete Masonry Units
A 36	Structural Steel
A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 325	High-Strength Bolts for Structural Steel Joints
C 136	Sieve Analysis of Fine and Coarse Aggregates

F 355	Test Method for Shock Absorbing Properties of Playing Surface Systems and Materials
F1292	Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment
F 1487	Standard Consumer Safety Performance Specifications for Playground Equipment for Public Use

2. Americans with Disabilities Act (ADA)

Accessibility Guidelines for Buildings and Facilities; Play Areas, amended November 20, 2000.

3. U.S. Consumer Product Safety Commission (CPSC):

Technical Guidelines for Play Equipment

1.04 SUBMITTALS

- A. Submit to the Architect manufacturer's literature on all equipment to be provided.
- B. Shop drawings of play structures, including all panels and fastening hardware shall be submitted. Show assembly and installation details.
- C. Manufacturer's written guarantee for minimum period of one year from date of installation. Guarantee shall cover replacement of any damaged components, not including vandalism or improper use.
- D. Product Data: Include physical characteristics such as materials, dimensions and finish.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications - An experienced installer familiar with local building codes and with the latest safety guidelines, who has completed installation of playground structures similar in material, design, and extent to that indicated for this project, and whose work has resulted in construction with a record of successful in-service performance.
- B. Product - Play equipment shall conform to all current U.S. and Canadian standards and guidelines for public playgrounds:
 - 1. ASTM F1487-07: Standard Consumer Safety Performance Specification for Playground Equipment for Public Use
 - 2. CPSC: U.S. Consumer Product Safety Commission, Handbook for Public Playground Safety
 - 3. ADA: American Disability Act
 - 4. ASTM F1292: Standard Guide for ASTM Standards on Playground Surfacing
 - 5. CAN CSA – Z614-07, A National Standard of Canada

1.06 DELIVERY, STORAGE AND HANDLING

- A. Inspect all components on delivery to ensure that no damage occurred during shipping or handling. Materials shall be stored in original undamaged packaging in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft until ready for installation. Inspect components prior to installation.

PART 2 PRODUCTS

2.01 TIMBERFORM PLAY STRUCTURES

- A. Ages 2-5 Play Structure shall be design #P-17039-D from Columbia Cascade Company, 1300 SW Sixth Ave. Ste 310, Portland, OR 97201, <http://www.columbia-cascade.com/>, contact John LaRue, (800)986-3716, john@jplarue.com, or approved equal. Play structure shall include the following components:
1. Wood Wall with Two Ship's Wheels- 1604-102-TF-M By Timberform
 2. Plastic-Coated Perforated Steel Transfer Platform with Stair – 1697-16-81-TF2 By Timberform
 3. (3) Stepping Pads, 1602-01-00 By Timberform
 4. Plastic Slide Chute, Straight, 1650-32-51-TF by Timberform
 5. Stepping Column Cluster 1500-M by Timberform
 6. 24"/32" Wood Deck with Powder-Coated Steel Frames
 7. Wood posts and columns
- B. Ages 5-12 Play Structure shall be design #P-17039-D from Columbia Cascade Company, 1300 SW Sixth Ave. Ste 310, Portland, OR 97201, <http://www.columbia-cascade.com/>, contact John LaRue, (800)986-3716, john@jplarue.com, or approved equal. Play structure shall include the following components:
1. Log Scramble – 4500-001-M by Timberform
 2. Column Climber - 1500-MB by Timberform
 3. Corner Handle – CH-02 by Timberform
 4. Moving Bridgeway - 1655-TF-M by Timberform
 5. Column Climber – 1500-MA by Timberform
 6. Plastic Spiral Slide Chute – 1647-6-91-TF by Timberform
 7. (2) Wood Wall – 1613-02-38-PP2 by Timberform
 8. 72" Wood Deck with Powder-Coated Steel Frames
 9. Climbing Tree - 1679-6-41-TF by Timberform
 10. Wood Wall with Ship's Wheel – 1604-101-TF by Timberform
 11. 72" Plastic-Coated Perforated Steel Deck
 12. Rope Net Climber - 1656-8-TF-M by Timberform
 13. 48" Wood Deck with Powder-Coated Steel Frames
 14. Plastic Wide Chute - 1638-4-51-TF by Timberform
 15. Chain Cargo Net, Galvanized – 1648-4-90-TF by Timberform
 16. Grade Ramp Climber – 1683-4-91-TF by Timberform
 17. Wood posts and columns
- C. Provide all components from a single manufacturer.
- D. Wood components shall be playground equipment grade, free-of-heart-center Douglas Fir wood. Metal components shall be powder-coated steel.

- E. Colors will be selected by Architect from manufacturer's standard offerings.
- 2.02 KOMPAN PLAY STRUCTURES (ACCEPTABLE ALTERNATE TO TIMBERFORM PLAY STRUCTURES)
- A. Ages 2-5 Play Structure shall be Play Tower with Slide & Deck, product #NRO1020-XX01, customized without roof, from Kompan, 821 Grand Avenue Parkway, Pflugerville, TX, 78660, <http://www.kompan.us/>, contact Erik Walsh, (978)569-3797, EriWal@Kompan.com, or approved equal.
 - B. Ages 5-12 Play Structures shall be from Kompan, 821 Grand Avenue Parkway, Pflugerville, TX, 78660, <http://www.kompan.us/>, contact Erik Walsh, (978)569-3797, EriWal@Kompan.com, or approved equal. Play structure shall include the following components:
 - 1. Double Tower with Valley Bridge – NRO3001, customized without roofs and with two added slides, by Kompan
 - 2. Triple Balance Beam – NRO804 by Kompan
 - 3. Stilts – NRO806 by Kompan
 - C. Provide all components from a single manufacturer.
 - D. Wood components shall be FSC-certified, debarked and sap-free Robinia pseudoacacia wood (Black locust).
 - E. Wood finish to be manufacturer's standard natural wood. Colors of other components will be selected by Architect from manufacturer's standard offerings.
- 2.03 PARKOUR PLAY STRUCTURE (PURCHASED BY OWNER)
- A. Parkour Play Structure shall be Parkour 004, product #NRO854 from Kompan, 821 Grand Avenue Parkway, Pflugerville, TX, 78660, <http://www.kompan.us/>, contact Erik Walsh, (978)569-3797, EriWal@Kompan.com, or approved equal.
 - B. Contractor to provide footings and install Parkour Structure purchased by the City.
- 2.04 SWINGSET
- A. Swingset shall be Standard Swing Set with 4 seats, product #1505-PL from BYO Recreation, 405 Golfway West Drive, Suite #02, Saint Augustine, FL 32095, (800)853-5316, <http://www.byoplayground.com>, or approved equal.
 - 1. Provide (2) Commercial Belt Swing Seats, (1) Adaptive Swing, and (1) High Back Bucket Swing Seat
 - B. Provide all components from a single manufacturer.
 - C. Colors will be selected by Architect from manufacturer's standard offerings.
- 2.05 BASKETBALL GOAL AND BACKBOARD
- A. Basketball goal and backboard shall be MegaSlam 72 Basketball Hoop, manufactured by MegaSlam Hoops LLC, 1141 N. Loop 1604 E., Ste. 105-117, San Antonio, TX 78232; (877)321-6342, <http://www.megaslamhoops.com>, or approved equal.
 - 1. Backboard : 72 in. x 42 in. rectangular clear, 1/2 in. thick tempered glass with 2 in.

- perimeter steel frame
- 2. 8" x 6" 5 Gage Structural Steel Pole
- 3. Stainless steel hardware
- 4. Lifetime limited warranty

PART 3 EXECUTION

3.01 INSTALLATION INSTRUCTIONS AND AIDS

- A. To guide installation, each structure shall be accompanied by bills of materials, written instructions, an erection plan view drawing, and a footing plan location drawing to be furnished prior to or with the delivery of the play structure. To facilitate assembly, each part shall be indelibly stenciled with an easily-read identification number keyed to the bills of materials and erection drawings. All components shall be shipped unitized, protectively wrapped, banded for mechanical handling and ready for assembly.

3.02 INSTALLATION

- A. Playground equipment shall be assembled and installed in strict accordance with manufacturer's printed instructions, true to the dimensions, layout, and details shown on the Drawings.
 - 1. Install play structure in compliance with manufacturer's written instructions.
 - 2. Install components in sequence as recommended by manufacturer.
 - 3. Install play structure as indicated on the drawings provided. Contractor to verify fall-zone dimensions in relationship to safety surfacing.
 - 4. Variations from the installation indicated must be approved.
 - 5. Variations from the installation indicated and all costs for removal and replacement will be the responsibility of the Contractor.
 - 6. Installation Contractor will warranty the replacement of any warranty item for the entire manufacturer's warranty period at no cost to the Owner.
- B. Locate positions of all play equipment support posts with proper clearances as dimensioned on the Drawings, and as called for on manufacturer's shop drawings.
- C. Concrete footings shall be to depth and dimension proposed by Contractor based on manufacturer's instructions.
- D. Install all members at proper heights, levels, in plumb or horizontal relationships as required. Assemble all structures in conformance with approved shop drawings. Final installations shall be stable, secure and free from any hazardous projections.
- E. Touch up finishes damaged during installation with finish kits provided by manufacturer.

3.03 MANUFACTURER'S CERTIFICATION

- A. Manufacturer's representative shall provide written certification that all play equipment has been installed in strict accordance with manufacturer's guidelines and standards.

3.04 SWINGSET

- A. Assemble swingset per manufacturer's instructions and install at location indicated on the Drawings.

3.05 BASKETBALL GOAL AND BACKBOARD

- A. Basketball Goal and Backboard shall be located as indicated on the Drawings, and installed in strict accordance with manufacturer's printed instructions. Basketball Goal and Backboard shall be positioned in the required location and firmly secured to the base.

3.06 CLEANING

- A. Contractor shall clean the jobsite of excess materials, including post hole excavations.

3.07 DEMONSTRATION

- A. Instruct the Owner's personnel on proper operation and maintenance of playground components.

END OF SECTION

SECTION 129300

SITE FURNISHINGS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all materials and equipment, and all work necessary to furnish and install the site furnishings, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 012300, ALTERNATES; Description of alternates.
 - 2. Section 024113, SITE DEMOLITION AND REMOVALS; Remove and store existing bleachers for installation under work of this Section.
 - 3. Section 033000, CAST-IN-PLACE CONCRETE; Concrete footings, bases and pads.
 - 4. Section 0321543, STONE DUST SURFACING

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Society for Testing and Materials (ASTM):

A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
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1.04 SUBMITTALS

- A. Complete shop drawings of each item specified shall be submitted.
- B. Where appropriate, and when approved by the Architect, manufacturer's catalogue cuts may be substituted for shop drawings.
- C. Certificate of wood treatment shall be submitted upon delivery of treated wood items.

- D. Submit assembly instruction drawings showing layout(s), connections, bolting and anchoring details as per manufacturer's standards.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory usage for at least 2 years.

2.02 FASTENERS AND HARDWARE

- A. Provide manufacturer's standard materials and accessories as required for assembly of units and as indicated on the assembly drawings. Provide unexposed aluminum, stainless steel or steel plates, angles and supports as required for complete assembly. Separate dissimilar materials to prevent electrolytic action.

1. Fasteners and metal components shall be cadmium-plated steel or steel hot-dipped galvanized in accordance with ASTM A 153.

2.03 BENCHES

- A. Benches shall be "Avondale Backless Bench", 72 in. length with Ipe Wood Slat seats, in-ground pedestal mount and center arm, product #AV1-1131, manufactured by Sitescapes, P.O. Box 22326 Lincoln, NE 68542; Phone (402) 421-9464. Fax (402) 421-9479. Website www.sitescapesonline.com. E-mail: info@sitescapesonline.com, Local Rep.: Hannah Jacobs, Tel. (402) 202-4269; email: hannah@sitescapesonline.com, or approved equal.

1. Colors: To be selected by Architect from manufacturer's standard color line.

- B. Team Benches shall be "PD' Permanent Bench w/o Back", 15'-0" length, in-ground mount, product #BE-PD15, manufactured by National Recreation Systems, Inc., P.O. Box 11487, Fort Wayne, IN 46856; Phone (888) 568-9064, Website www.bleachers.net, or approved equal.

1. Colors: To be selected by Architect from manufacturer's standard color line.

2.04 TRASH RECEPTACLE

- A. Trash Receptacles shall be CityView Vertical Strap Receptacle, product #CV2-3011, 40 Gallon Side-door-opening litter receptacle with dome lid, embedded pedestal mount, vertical solid steel bars with standard lockable latch manufactured by Sitescapes, P.O. Box 22326 Lincoln, NE 68542; Phone (402) 421-9464. Fax (402) 421-9479. Website www.sitescapesonline.com. E-mail: info@sitescapesonline.com, Local Rep.: Hannah Jacobs, Tel. (402) 202-4269; email: hannah@sitescapesonline.com, or approved equal.

1. Colors: To be selected by Architect from manufacturer's standard color line.

2.05 BIKE RACK

- A. Bike rack shall be Dero Hoop Rack, in ground mount, powder coated, black, by Dero

504 Malcolm Ave SE, Suite 100 Minneapolis, MN 55414; Phone (617) 869-5408;
Website www.dero.com; or approved equal.

2.06 REMOVABLE BOLLARD

- A. Removable Bollard shall be Salem 2 CAST ALUMINUM Removable Bollard 9023-2ARM with special base and lock tab for removable installation, powdercoated black by Ironsmith, 41701 Corporate Way #3, palm Desert, CA 92260 Phone 800-338-4766 Website www.ironsmith.biz or approved equal.
 - 1. Bollard material shall be cast aluminum from 100% recycled materials. All castings shall be manufactured true to pattern and component parts, and shall fit together in a satisfactory manner. The castings shall be of uniform pattern and quality, free from blowholes, hard spots, shrinkage, distortion, or other defects.
 - 2. Finish: Bollards shall be supplied factory applied Polyester powder coat over degassing primer low gloss texture black
- B. Removable Bollard Receiver shall be Salem 2 Removable Bollard Receiver 9023-2R by Ironsmith, 41701 Corporate Way #3, palm Desert, CA 92260 Phone 800-338-4766 Website www.ironsmith.biz or approved equal.

2.07 BLEACHERS

- A. Bleachers shall be existing bleachers, removed under work of Section 024113, SITE DEMOLITION AND REMOVALS. Reassemble on site.

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true, at locations indicated, in accordance with the approved manufacturer's instructions.

3.02 ASSEMBLY AND ERECTION OF COMPONENTS

- A. Items shall be shipped knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.03 ANCHORAGE, FASTENINGS AND CONNECTIONS

- A. Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place. Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do

not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied. Conceal fastenings where practicable.

3.04 TESTING

- A. Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

3.05 BENCHES

A. Examination

1. Do not begin installation until substrates are properly prepared.
2. Verify that substrates are stable and capable of supporting the weight of the product.

B. Installation

1. Install tables and benches in accordance with manufacturer's installation instructions.
2. Bolt and anchor tables and benches securely in place.

C. Adjusting

1. Any loose or missing hardware should be tightened or replaced immediately.
2. If any part is found to be cracked or broken it is recommended that the product be taken out of service until the appropriate repairs can be made.

D. Cleaning

1. Metal Components

- a. Should dirt from the environment build-up on this surface a wipe with a soft cloth and mild detergent will do the trick.
- b. Abrasive cleaners, brushes and steel wool should be avoided.
- c. If the finish is marred by a sharp object and the steel is exposed take a fine abrasive material to the area to improve the adhesion of the primer and touch-up paint. A quality grade exterior metal primer and top coat of matching color enamel should then be applied over the prepared surface.

E. Protection

1. Protect installed tables and benches until completion of project.

3.06 TRASH RECEPTACLE

- A. Trash receptacle shall be located as indicated on the Drawings. Each receptacle shall be fastened to the base with a minimum of four bolts, unless otherwise indicated in the manufacturer's printed instructions.
- B. Receptacle shall be positioned in the required location and firmly secured to the base.

3.07 BIKE RACK

- A. Work shall be executed only by workmen experienced in the trade.
- B. Install bicycle racks level and plumb at the locations indicated on the Drawings and in accordance with manufacturer's printed instructions. Coordinate bicycle racks installation with installation of the surrounding surface at grade beneath the bicycle racks.
- C. Protect bicycle racks from paint spatter, splashed concrete, and other construction damage by wrapping and taping in place plastic sheeting or heavy kraft paper around the bicycle racks until adjacent work is completed. Repair any damage to the finish in a manner consistent with manufacturer's recommendations.

3.08 REMOVABLE BOLLARD

A. EXAMINATION

- 1. Do not begin installation until site is properly prepared.
- 2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. PREPARATION

- 1. Clean surfaces thoroughly prior to installation
- 2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. INSTALLATION

- 1. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

D. BOLLARDS

- 1. Install Bollards where indicated on plans. Install bollards such that they are vertically aligned and plumb so they do not appear to lean from any direction.
- 2. Install bollard receivers for removable bollards where located on plans. Provide adequate concrete footings for site conditions. Provide gravel sump below footing for drainage.
- 3. For bollards mounted over pipe. Install Schedule 40 or 80 pipe sized as specified in 2.1 B above per details on plans. Insure all pipes are vertically plumb. After concrete footings have set, fill pipes with concrete and install bollards over pipes per manufacturer's instructions.

4. For Surface mount Bollards: Install per details on plans and manufacturer's instructions.

E. CLEAN-UP and PROTECTION

1. Protect all installed products until completion of project.

2. Touch up, repair or replace damaged products.

3.09 BLEACHERS

A. Install salvaged bleachers at location indicated on the Drawings.

END OF SECTION

SECTION 224713

DRINKING FOUNTAIN

PART 1 GENERAL

1.00 RELATED DOCUMENTS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.01 WORK INCLUDED

- A. Provide all work and materials, and do all work necessary to furnish and install the drinking fountain, as indicated on the Drawings and as specified herein. Work shall include, but not be limited to: furnishing and installing drinking fountain complete including: water supply from the valve box at the fountain; waste piping, drywell, cleanouts, and connections to sanitary sewer; drainage material and slab beneath fountain and all other incidental work and connections required for a complete installation.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 033000, CAST-IN-PLACE CONCRETE; Concrete.
 - 2. Section 321816, RUBBER CUSHIONED SAFETY SURFACING.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
 - 1. American Society for Testing and Materials (ASTM):

D 2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
D 2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
 - 2. Federal Specification (Fed. Spec.):

WW-T-799	Tube, Copper, Seamless, Water (For Use with Solder-Flared-On Compression-Type Fittings)
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1.04 SUBMITTALS

- A. Submit shop drawings of drinking fountain indicating all piping, valves, fittings, adapters, receptors, granite, finishes, and accessories.

1.05 PERMITS AND FEES

- A. Contractor shall obtain all permits and pay all fees required for the fountain installation. A plumbing permit will be required.

1.06 LAYOUT

- A. The location of fountains indicated on the Drawings is approximate. Final exact locations of each fountain will be determined in the field.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. Copper tubing shall be Type "K" with wrought copper fittings and soldered joints, conforming to Fed. Spec. WW-T-799.
- B. PVC drain pipe shall be Schedule 40, conforming to ASTM D 2665, with solvent cement jointing.
 - 1. Marking and Identification: PVC pipe shall be continuously and permanently marked with following information: Manufacturer's name, pipe, size, type of pipe and material, SDR number, Product Standard number, the NSF (National Sanitation Foundation) Seal or the DWV (Drainage, Waste and Vent) Seal.
 - 2. PVC pipe fittings to be of same material and Schedule as the PVC pipe specified and compatible with PVC pipe furnished.

2.02 GATE VALVE

- A. Gate valve shall be 125 lb. brass, non-rising stem, wedge disc, threaded valves, equal to Crane No. 438.
- B. Globe valves, three (3) inches and smaller, shall be 125 lb. screwed, brass globe valve with brass disc, equal to Crane No. 1.
- C. Check valves, three (3) inches and smaller, shall be 125 lb. brass swing check valves, screwed, Crane No. 34, or equal.

2.03 DRINKING FOUNTAIN

- A. Drinking fountain valves, bubblers, and other items specified below are manufactured by Murdock, Inc., Cincinnati, OH 45204- or equal. Alternate manufacturer's equipment shall be submitted to the Architect for his approval prior to purchase by the Contractor.
 - 1. Drinking fountain shall be Model No. GYM74-FRU2, Barrier free drinking fountain with bottle filler. Construction shall be 12 gage, all stainless steel with 18 gage stainless

steel fountain bowl. Pedestal base shall have four mounting hiles. Access covers shall be secured with vandal resistant stainless steel screws. Bottle filler shall be activated by 9 volt sensor or a pushbutton as standard. Unit shall contain a 100 mesh inlet strainer, lead and cyst vilter, 6-AA battery pack laminar flow spout. Self-closing pushbutton, needing less than 5 pounds force, shall activate internally mounted vlave with adjustable stream regulator. Bubbler shall be stainless steel with non-squirt feature and operate on water pressure range of 20-105 psig. Fountian is certified to ANSI A117.1, Public Law 111-380 (NO LEAD), CHSC 11687 AND NSF/ANSI 61, SECTION 9. Fixture meets ADA, ADA Standing Person and ADA Child requirements when mounted appropriately. Freeze Resistant model- requiring no winterization.

2. Base shall receive manufacturer's painted finish. Color shall be selected by Architect from manufacturer's standard colors.

PART 3 EXECUTION

3.01 TRENCH EXCAVATION AND BACKFILL

- A. Trench excavation and backfill shall conform to Section 02315, SITE EXCAVATING, BACKFILLING AND COMPACTING.

3.02 PIPE INSTALLATION

- A. Piping shall be installed as indicated on the Drawings.
- B. Waste pipe installation shall conform to ASTM D 2321.
- C. Copper tubing and fittings shall be assembled as follows:
 1. Clean pipe and fittings thoroughly and lightly sand pipe connections to remove residue from pipe.
 2. Attach fittings to tubing in an approved manner using 50-50 soft solid core solder.

3.03 DRINKING FOUNTAIN

- A. Drinking fountain shall be installed on concrete footing within rubber cushioned saftey surfacing as indicated on the Drawings.

END OF SECTION

SECTION 311300

SELECTIVE TREE REMOVAL AND TRIMMING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. Provide all work necessary to perform selective clearing within the limits indicated on the Drawings and as specified herein. Selective clearing work shall include, but not be limited to, the following:
1. Tree pruning.
 2. Flush cutting shrubs and trees, and grinding of stumps and backfilling of holes with clean fill and topdress with 6 in. loam.
 3. Removal of deadwood and brush.
 4. Removal of all rubbish, debris, and other materials to be disposed of as a result of the work of this section.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS; Clearing and grubbing and removal and disposal of felled trees and stumps outside of the work limits of this section.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. American National Standards Institute (ANSI):

A300	Best management practices Tree Support Systems: Cabling, Bracing, and Guying
Z133.1	Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush
Z133A	Best Management Practices Tree and Shrub Fertilization
 2. Tree Care Industry Association, 3537 Stratford Rd., Wantagh, NY 11793 (TCIA):

Ref. 1	Pruning Standards for Shade Trees
Ref. 2	Standard for Fertilizing Shade and Ornamental Trees

Ref. 3 Bracing, Cabling and Guying Standard for Shade Trees.

1.04 SUBMITTALS

- A. The Contractor shall submit to the Architect for review, proposed methods and materials for selective clearing, including a schedule indicating specific dates for implementing specific work items in each major work area.

1.05 QUALITY ASSURANCE

- A. Selective clearing methods shall conform to the applicable requirements of ANSI Z133.1
- B. Selective pruning methods shall conform to the applicable requirements of ANSI Z133.1.
- C. Work of this section shall be completed by a professional Certified Arborist with a minimum five years experience, who has successfully completed a certification program equal to the Massachusetts Certified Arborist (MCA) program/examination sponsored by the Massachusetts Arborists Association, 8-D Pleasant Street, South Natick, MA 01760; (508) 653-3320; FAX: (508) 653-4112; E-mail: MaarbAssn@aol.com.

PART 2 PRODUCTS

2.01 HERBICIDE

- A. Herbicide shall be QuickPro, Roundup Pro or Manage, manufactured by Monsanto Company, 800 North Lindbergh Boulevard, St. Louis, MO – 63167; Tel. (314) 694-1000, or other approved equal product capable of eradicating existing Norway Maples.

PART 3 EXECUTION

3.01 TREE PRUNING

- A. Tree pruning shall be "Class II Medium Pruning" conforming to NAA Ref. 1.
- B. Schedule of trees to be pruned and extent of pruning shall be as indicated on the Drawings. Tree pruning shall be as directed and approved by the Architect.

3.02 TREE REMOVAL

- A. Trees indicated on the Drawings as "Remove" or trees tagged in the field by the Landscape Architect to be removed shall be felled. Stumps shall be routed out to a minimum depth of 12 in. below finished grade. Holes shall be backfilled with clean fill and toppedressed with 6 in. loam. Stumps shall be legally disposed of off-site.
- B. Trees indicated to be removed from rock ledge shall be felled and stumps ground..
- C. Treat in place all Norway Maple tree stumps using a State accepted systemic herbicide to prevent re-sprouting. Herbicide may only be applied by an applicator licensed through the Massachusetts Department of Agriculture. Treat stumps in mid-October to early November before leaves turn color.

3.03 DEADWOOD AND BRUSH REMOVAL

- A. Deadwood and brush within the limits of work indicated on the Drawings shall be

disposed of as follows:

1. Brush, limbs, and other material less than 6 in. in diameter shall be chipped and stockpiled on-site in an area designated by the Architect.
 2. All deadwood shall be chipped and stockpiled as specified above.
 3. Limbs 6 in. and larger shall become the property of the Contractor and be disposed of off-site.
- B. All debris material not otherwise indicated shall be legally disposed of off-site, at Contractor's expense.

END OF SECTION

SECTION 312300

SITE EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary for site excavating, backfilling, and compacting, as indicated on the Drawings and as specified.
- B. The work of this section shall include, but is not necessarily limited to the following:

1. Site excavation, filling, and grading.
2. Excavation and backfill for site structures, irrigation, and utilities.
3. Preparation of subgrade for slabs and pavements.
4. Grading for landscape and pavement areas.
5. Sheet piling, bracing, and support of excavations as necessary.
6. Drainage and dewatering as necessary to perform work in the dry.
7. Placement and compaction of fills.
8. Placement and compaction of aggregate base other than beneath pavements.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 1. Section 013529, HEALTH AND SAFETY PLAN; BMP for soil exposure.
 2. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS; Clearing and grubbing and stripping of topsoil.
 3. Section 329119, LANDSCAPE GRADING.
 4. Furnishing and installing utility bedding and embedment materials is included under the appropriate utility specification section.
 5. Aggregate base courses beneath paving is included under the applicable paving specification section.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

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

C 33	Concrete Aggregates
C 136	Sieve Analysis of Fine and Coarse Aggregates
D 422	Particle - Size Analysis of Soils
D 698	Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft. (6000kN-m/m.))
D 1556	Density of Soil In-Place by the Sand Cone Method
D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (457-mm) Drop
D 2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D 3017	Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3740	Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
E 329	Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
E 548	General Criteria Used for Evaluating Laboratory Competence

2. Associated General Contractors of America, Inc.(AGC):

Manual of Accident Prevention in Construction

1.04 EXISTING CONDITIONS

- A. A series of subsurface soil investigation has been prepared by Tighe & Bond, 53 Southampton Road, Westfield, MA 01085 for use by the Owner and Architect in the design of the Project. A cover letter, figure showing locations of soil testing, test boring logs, laboratory reports, and data summary table are included as Appendix O, A, C, D and E.

1. The soil sampling identified historic urban fill with elevated levels of lead and PAHs in the

park. Contractor to establish BMP for worker protection in event soils are encountered.

2. Contractor to assume even cut and fill for the project as documented. No excavated soils are to be removed from the site.

- B. The Contractor shall become thoroughly familiar with the site, consult records and drawings of adjacent structures and of existing utilities and their connections, and note all conditions which may influence the work of this Section.
- C. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section including work which has been let for construction under previous bid packages. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.
- D. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information.

1. No excavation or testing shall be performed outside the Limit of Work as shown on the Drawings.

1.05 INFORMATION NOT GUARANTEED

- A. Information on the Drawings and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period, as no additional compensation will be made for errors and inaccuracies that may be found therein.

1.06 QUALITY CONTROL

- A. The Owner reserves the right to retain a Testing Laboratory, to perform on-site observation and testing in accordance with Section 014000, QUALITY REQUIREMENTS during the following phases of the construction operations. The services of the Testing Laboratory may include, but not be limited to the following:
 - 1. Observation during placement and compaction of fills.
 - 2. Laboratory testing and analysis of fill and bedding materials specified, as required.
 - 3. Observe construction and perform water content, gradation, and compaction tests at a frequency and at locations determined by the Testing Laboratory. The results of these tests will be submitted to the Architect, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the Testing Laboratory will advise the Architect in writing with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.
 - 4. Observation of fills following interruptions by rains or other inclement weather.

- B. Perform field density tests in accordance with ASTM D 1556 or D 3017.
1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
 2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved areas, but in no case less than three tests.
- C. The Testing Laboratory's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Testing Laboratory, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
- D. The Owner reserves the right to modify or waive Testing Laboratory services.
- E. Testing of soils shall be in accordance with the following:

Property	ASTM Test Method
Particle-Size Analysis	D 422
Liquid Limit	D 4318
Plasticity Index	D 4318

1.07 SUBMITTALS

- A. A 10 lb. sample of each off-site material proposed for use, and of any on-site material when so requested by the Architect or Testing Laboratory, shall be submitted for approval.
1. Samples shall be delivered to office of the Architect or Testing Laboratory, as directed.
 2. Samples required in connection with compaction tests will be taken and transported by the Testing Laboratory.

1.08 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property. Protect existing structures and foundations from damage caused by settlement, lateral movement, 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 his 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 their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing bench marks, monuments, and other reference points which are disturbed or destroyed.

- C. Buried structures, utility lines, etc., including those which project less than 18 in. 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.

1.09 DRAINAGE AND DEWATERING

- A. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep excavated areas sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures or cause excessive disturbance of underlying natural ground or excavation bottom.
- B. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations and subgrade surfaces. Positive drainage (minimum 2.0% slope) shall be maintained at all times.
- C. Water handled as part of the Contractor's dewatering operations shall be discharged on-site to the ground surface in a location to be coordinated with the Architect and Geotechnical Consultant.
- D. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health nor to public or private property, nor to existing work, nor to the work completed or in progress, nor to the surface of roads, walks, and streets, nor cause any interference with the use of the same by the public. Methods of disposal of pumped effluent shall not cause erosion or siltation.
- E. Under no circumstances place fills, pour concrete, or install piping and appurtenances in excavations containing free water.
- F. There shall be sufficient pumping equipment, in good working order, available at all times to remove water.
- G. Where, in the opinion of the Testing Laboratory pumping of excavations is not effective in maintaining a dry firm subgrade, other dewatering methods acceptable to the Testing Laboratory, shall be employed. This may include the use of well points or deep well dewatering.

1.10 FROST PROTECTION

- A. Do not excavate to full indicated depth when freezing temperatures may be expected, unless footings or slabs can be poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed.
- B. Completed footings which have not been backfilled shall be protected from freezing by temporary additional earth cover, insulating blankets, heaters, or other methods acceptable to the Architect.
- C. Frozen material shall not be placed as fill or backfill.

1.121 SHORING AND SHEETING

- A. Provide shoring, sheeting and/or bracing at excavations, as required, to prevent collapse of earth at side of excavations.
- B. Comply with federal, state, and local regulations, or in the absence of such

regulations, comply with the requirements contained in the AGC Manual.

- C. Remove sheeting and shoring and the like, as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides.

1.12 ROCK

- A. Rock shall be defined as sound and solid mass, layer, or ledge of mineral matter in place of such hardness and texture that it:
 - 1. Mechanical Definition of Rock: Cannot be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler type tractor rated between 210-and 240-net flywheel horsepower, operating in low gear, or
 - 2. Manual Definition of Rock: In areas where the use of the ripper described above is impracticable, rock defined as sound material of such hardness and texture that it cannot be loosened or broken by a 6-lb. drifting pick. The drifting pick shall have a handle not less than 34 in. in length.

1.13 COORDINATION

- A. Prior to start of earthwork the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.
- B. As construction proceeds, the Contractor shall be responsible for notifying the Architect prior to start of earthwork operations requiring inspection and/or testing.
- C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.
- D. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.

1.14 PROTECTION OF EXISTING LANDSCAPE

- A. The Contractor shall exercise care to preserve the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the Work.
 - 1. Except where clearing is required for permanent works, for approved construction roads, and for excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage which may be caused by the Contractor's construction operations and equipment. Existing trees to remain shall be suitably protected

from damage with fencing or other means acceptable to the Architect.

2. Movement of crews and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage to property. Where unnecessary destruction, scarring, damage, or defacing may occur as a result of the Contractor's operations the same shall be repaired, replanted, reseeded, or otherwise corrected at the Contractor's expense.

- B. Where indicated on the Drawings and as directed by the Architect, disturbed areas shall be temporary seeded.

1.15 PROTECTION OF EXISTING WATER SYSTEMS

- A. The Contractor shall comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution.
- B. The Contractor's construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, water courses, lakes, and underground water sources.

PART 2 PRODUCTS

2.01 SOURCE OF MATERIALS

- A. Material shall be obtained from required on-site excavation, to the extent that suitable material is available, and from off-site sources, to the extent that suitable material is not available from on-site excavation. The Contractor shall maximize the reuse of excavated materials on-site to ensure there is no surplus soil material requiring off-site disposal.
- B. Reuse of excavated materials shall be conducted as directed by the Geotechnical Consultant.
- C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- D. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 1. Unsuitable material is defined as surficial organics, surficial and buried topsoil and subsoil, old foundations and pavement, and compressible and deleterious materials.
 2. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2.02 EMBANKMENT MATERIALS

- A. Embankment material shall be a granular material conforming to the following:
 1. Liquid Limit shall not exceed 35%.
 2. Plasticity Index shall be in the range of 2 to 10.

3. Gradation shall conform to the following:

Sieve Size %	Passing by Weight
2 in.	100
3/4 in.	80-100
No. 4	60-85
No. 40	35-60
No. 100	15-40
No. 200	0-12

2.03 BACKFILL MATERIALS

- A. On-site material for use in compacted backfill shall be natural, inorganic, granular soil, taken from areas of excavation after stripping of topsoil and removal of unsuitable material.
- B. Material containing organic matter, topsoil, organic silt, peat, or soft or frost-susceptible soil is unsuitable for any of the following uses:
- Backfill beneath site structures and pavilion
 - Backfill beneath pavement and within 5 ft. of subgrade
 - Bearing strata material
 - Bedding
- C. Backfill materials shall be free from rocks greater than 8 in. in diameter or length, having largest dimension greater than 3/4 lift thickness, or greater than 1/2 ft.³ in volume, and foreign matter, such as construction debris, trash, wood, roots, leaves, sod, organic matter, or soft clay and silt. Backfill shall be clean, non-organic material, of non-swelling character, capable of being readily compacted to form a solid, stable embankment. Materials containing ice or frozen lumps shall not be employed.
- D. Backfill material shall be compacted clean washed sand with less than 10% passing the No. 200 sieve. Maximum diameter shall be 1-1/2 in. Testing laboratory shall examine and approve material before backfilling.
- E. Structural Fill: Backfill below and around foundations and other structural elements and above the select fill in trenches should consist of clean, well-graded sand and gravel free of organic material, trash, ice, frozen soil, and other deleterious materials. The recommended gradation for structural fill should satisfy the following limits.

	Percent Finer by	Weight
U.S. Sieve Size and Number	Minimum	Maximum
4 inch	100	---

2 inch	65	100
No. 4	30	80
No. 20	10	65
No. 40	5	40
No. 100	0	20
No. 200	0	8

1. The moisture content of the structural fill material should be adjusted before placement so that it is within 2 percent of the optimum moisture content.

- F. Select Fill: should be used as backfill around and above underground piping. Select fill shall consist of hard, durable sand and gravel, free from trash, organic matter, surface coatings and other deleterious materials. The recommended gradation for select fill should satisfy the following limits.

U.S. Sieve Size and Number	Percent Finer by	Weight
	Minimum	Maximum
4 inch	100	---
No. 10	30	100
No. 40	0	70
No. 200	0	15

1. The moisture content of the select fill material should be adjusted before placement so that it is within 2 percent of the optimum moisture content.

- G. Common Fill (in landscaped areas) shall be bankrun sand, gravel, or mixture thereof, graded within the following limits:

Sieve Size %	Passing by Weight
6 in.	100
No. 4	30-95
No. 200	0-15

- H. Aggregate Base shall be Dense-graded Crushed Stone, conforming to MHD Specifications Section M2.01.7.
- I. Drainage Fill: shall be graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- J. Planting Soils: Refer to Section 329200, LAWNS AND GRASSES and Section 329300, TREES, PLANTS AND GROUND COVERS.

PART 3 EXECUTION

3.01 PROTECTIVE EQUIPMENT

- A. Provide all employees and subcontractor(s) with personal protective equipment and protective clothing consistent with the levels of protection for this work as indicated in the Contractor's Health and Safety Plan.

3.02 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. When excavations have reached required subgrade, Contractor shall have subgrades surveyed to determine if subgrade elevations will allow for the indicated depth of proposed materials to be placed on them.
 - 1. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material to achieve required subgrade elevation, as directed.
 - 2. If survey indicates that subgrade elevations are too high, continue excavation and reconstruct subgrades to required elevation as directed, without additional compensation.
 - 3. If survey indicates that subgrade elevations are too low, add compacted backfill or fill material to achieve required subgrade elevation as directed, without additional compensation.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.03 EXCAVATION

- A. Sheet piling, shoring, bracing, pumping, bailing, and other incidental work necessary to make and maintain excavations and keep them free from water at all times during placing of concrete, utility lines, and fill and backfill materials, shall be performed or supplied as required. Fill and backfill shall be placed in dry or dewatered areas only.
- B. Sheet piling shall be installed where required to maintain safe and workable conditions in excavations. Sheet piling, including necessary walers and struts, shall be selected and designed by the Contractor. Use of sheet piling shall equal or exceed minimum required

for safety and/or conformance to law.

- C. Structures, pipes, pavement, earth, and other property liable to damage from excavation operations shall be braced, underpinned, and supported as required to prevent damage and movement.
- D. As excavation approaches underground utilities and structures, excavation shall be done by hand tools. Such manual excavation is incidental to normal excavation and no special payment will be made.
- E. Excavation shall include satisfactory disposal of excavated material not employed as backfill or fill materials.
 - 1. Excavation material, other than topsoil, which is not required for or is unsuitable for backfill or fill materials, shall be legally disposed of off-site.
- F. Excavation for pipe and other items shall be carried far enough below underside of item to accommodate bedding material.
- G. Excavations which extend below indicated or specified levels ("over-excavation"), shall be filled to those levels with compacted Granular Fill Material.
- H. If bearing surface of subgrade which is to receive fill, structure, concrete, or other construction becomes softened, disturbed, or unstable, unsuitable material shall be removed down to a firm bearing surface and replaced with suitable material. Subgrade shall then be protected from further disturbance until construction item is placed.
- I. Excavations shall not be wider than required to set, brace, and remove forms for concrete, install structures, piping, or perform other necessary work. Width of trench at 12 in. above top of pipe or conduit shall not be greater than the sum of outside diameter of the pipe or the conduit plus 2 ft. (pipe O.D. + 2 ft.). Sides of trench above this level shall be sloping, at an angle 30 degrees or less from vertical, from this level to grade. In materials where sloping walls are not stable, trench walls shall be sheeted.
- J. Explosives: Do not use explosives.
- K. Below-ground Demolition
 - 1. Underground items, not indicated on the Drawings, which impede construction of new work indicated, shall be abandoned, demolished, and/or removed only with the approval of the Architect.
- L. Proof roll areas to support foundations, pavements with a 35 ton rubber tired roller in four passes in two perpendicular directions. Undercut to level of stable soils in unstable areas. Perform work in presence of Testing Laboratory.
- M. The excavation and handling of lead-impacted soil shall be conducted implementing Best Management Practices (BMPs) as recommended by the Geotechnical Consultant to help reduce potential exposure to elevated lead.

3.04 FILLING

- A. Filling shall be done in any area only after the Testing Laboratory has reviewed subgrade.

- B. Benching: Fills placed on existing slopes which exceed 6 ft. horizontal to 1 ft. vertical shall be keyed or benched into the existing slope not less than 5 ft. to prevent the formation of slippage planes.
- C. Compaction at End of Day: Areas undergoing filling shall be smooth-rolled before the end of the work day to seal and protect these areas from rainfall infiltration during the night.

3.05 FILL, BACKFILL, AND COMPACTION

- A. Excavation below finished grades shall be backfilled. Temporary planking, timbering, forms, debris, and refuse shall be removed before backfill is placed.
- B. Backfilling shall be done in any area only after the Architect or Testing Laboratory has inspected and approved subgrade, or other work in excavations. Notice that the work is ready for inspection shall be given promptly, and sufficient time shall be allowed for making necessary examinations.
- C. General Site Fill: General Site Fill for use in areas beyond the building limits and beyond structures shall be placed in lifts not exceeding 12 in. in loose thickness and compacted to 90% of maximum density, determined by ASTM D 1557.
- D. Where pumping of excavations is not effective and where permitted by the Architect or Testing Laboratory, Stone Fill may be placed below water without compaction in lieu of General Site Fill or Structural Backfill. There will be no adjustment in Contract price.
- E. In order to prevent lateral movement, care shall be exercised in placing backfill adjacent to foundation wall, footing, utility line and other structures. Backfill on opposite sides of such items shall be kept at approximately the same elevation as backfilling progresses to prevent unbalanced earth pressure. During backfilling the difference in elevation of backfill on opposite sides of the structure shall not exceed 12 in.
 - 1. Shoring shall be employed as necessary to protect such items.
 - 2. Foundation walls and footings have been designed to act with other portions of the structure to withstand the loads they will bear in completed project; they have not been designed to withstand construction loads or unbalanced earth or equipment loadings.
- F. Except as otherwise noted, tolerance of top surface of completed backfill shall be +2 in. from true grade indicated, and variations from indicated tolerance shall approximately compensate within each 100 ft.² area.
- G. Subgrade and backfill of indicated areas or structures shall be compacted in accordance with requirements of ASTM D 1557, and as specified in the following table:

Area or Structure	COMPACTION TABLE		
	Subgrade Compaction Minimum %	Max. Compacted Thickness Per Lift - in.	Compaction of Each Lift Minimum %
Above pipe cover to subgrade	85	12	90
Area or structure not otherwise noted	85	12	90

Concrete equipment pad	90	8	95
Footing, foundation, manhole, or similar structure, and within 2 ft. horizontally	90	8	95
Pavilion Footing And within 2 ft. horizontally	95	8	95
Pavement, including 1 ft. beyond edge	90	8	95
Pipe cover	--	6	95
Granular Fill	95	6	95

- H. Compaction requirements shall apply to material directly below the indicated supported item (base course, footing, or structure), and to all material above the undisturbed earth beneath fill, and enclosed by the following planes:
1. Horizontal plane at the elevation of the bottom of the supported item (base course, footing, or structure), within a perimeter line located 2 ft. beyond the exterior face or edge of item.
 2. Flat planes extending from the perimeter line downward and outward at 45o angle with the horizontal, to where the planes intersect undisturbed earth. Where zones of higher and lower percentages of compaction overlap, that of the higher percentage shall apply.
- I. Compaction of backfill in excavation shall be to a density not less than that required of the surrounding area fill.
- J. Equipment and methods employed to achieve specified compaction shall be subject to the approval of the Architect and Testing Laboratory and equipment shall be replaced and methods revised as directed until specified compaction is obtained.
- K. Compaction of each lift shall be completed before compaction of the next lift is started.
- L. Backfill adjacent to wall, conduit, pipe, and similar item, and in other areas where wheeled equipment cannot safely be employed, shall be placed in 4 in. thick layers, to the specified compaction, using mechanical tampers.
- M. Contractor shall coordinate the reuse of excavated materials on-site with the recommendations of the Geotechnical Consultant.

3.06 MOISTURE CONTROL

- A. Variation of moisture content in fill and backfill materials shall be limited to Optimum Moisture (-1% to +2%). Moisture content shall be as uniformly distributed as practicable within each lift, and shall be adjusted as necessary to obtain the specified compaction.
- B. Material which does not contain sufficient moisture to be compacted to the specified

densities shall be moisture conditioned by sprinkling, disking, windrowing, or other method approved by the Testing Laboratory.

1. Material conditioned by sprinkling shall have water added before compaction. Uniformly apply water to surface of subgrade or layer of soil material to obtain sufficient moisture content. The Contractor shall maintain sufficient hoses and/or water distributing equipment at the site for this purpose.
- C. Material containing excess moisture shall be dried to required Optimum Moisture Content before it is placed and compacted. Excessively moist soils shall be removed and replaced or shall be scarified by use of plows, discs, or other approved methods, and air-dried to meet the above requirements.
- D. Materials which are within the moisture requirements specified above, but which display pronounced elasticity or deformation under the action of earthmoving and compaction equipment, shall be reduced to Optimum Moisture Content, or below, to secure stability.
- E. In the event of sudden downpours or other inclement weather, exposed subgrades and fills which, in the opinion of the Testing Laboratory, become inundated or excessively moistened shall have excess water removed and soil dried as specified above.

3.07 DUST CONTROL

- A. Contractor shall be responsible for dust control during all construction operations. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Architect decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread calcium chloride as directed. Methods and materials for dust control shall be as approved by the Architect.

3.08 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.09 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Surplus satisfactory soil imported from off-site sources shall be transported off-site by the Contractor or relocated to designated storage areas on Owner's property and

stockpiled or spread as directed by Architect.

- B. The transportation and off-site disposal of excavated materials generated during the course of the work under this Contract is prohibited without prior approval by the Architect. Contractor shall coordinate the reuse of excavated materials on-site with the recommendations of the Geotechnical Consultant.
- C. Remove waste material, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 312500

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 SUMMARY

- A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions detailed on the Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to effect the erosion and siltation control principles specified herein.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not necessarily limited to the following:
 - 1. Section 015000, TEMPORARY FACILITIES AND CONTROLS; Fencing, except silt fence.
 - 2. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS ; Clearing and grubbing.
 - 3. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill.
 - 4. Section 329200, LAWNS AND GRASSES; Permanent seeding for lawns.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

- 1. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridge
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1.04 SUBMITTALS

- A. Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:

1. Proposed methods for effecting erosion and siltation control including 1" = 40' scale plans indicating location of erosion control devices and siltation basins.
 2. List of proposed materials including manufacturer's product data.
 3. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.
- B. The following samples shall be submitted:

<u>Sample</u>	<u>Size</u>
Filter Fabric	12 x 12 in.

1.06 EROSION CONTROL PRINCIPLES

- A. The following erosion control principles shall apply to the land grading and construction phases:
1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.
 2. Whenever feasible, natural vegetation shall be retained and protected.
 3. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.
 4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance.
 5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
 6. Sediment shall be retained on-site.
 7. Erosion control devices shall be installed as early as possible in the construction sequence prior to start of clearing and grubbing operations and excavation work.
- B. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to six months, and temporary erosion protection when erosion exposure period is expected to be less than six months.
1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.
 2. Temporary erosion protection shall be accomplished by covering an erosion protection materials, as appropriate for prevailing conditions.
 3. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 2:1 (horizontal: vertical) cut slopes shall be limited to a grade of 1.5:1.

1.07 QUALITY ASSURANCE

- A. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.
- B. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.
- C. Surface water runoff originating upgrade of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.
- D. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream bed, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.
- E. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.
- F. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half.
- G. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- H. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

PART 2 PRODUCTS

2.01 SILT FENCE

- A. Silt fence shall be a wire-bound woodroll snow fence covered with filter fabric. Fence shall be 4 ft. high minimum, and shall have 3/8 in. by 1-1/2 in. wide pickets, approximately 2 in. apart, bound together with at least 13 gage minimum, galvanized steel wire.

- 1. Filter fabric shall be one of the following, or approved equal:

<u>Product</u>	<u>Manufacturer</u>
Trevira Spunbond	Hoechst Fibers Industries
Fabric Type 1120	Spartanburg, SC 29304
Supac N 5NP(UV)	Phillips Fibers Corporation
	Greenville, SC 29602
Envirofence Mirafi, Inc.,	Charlotte, NC 2822

2. Silt fence shall be supported by steel posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.

PART 3 EXECUTION

3.01 SILT FENCE

- A. Silt fence shall be constructed and installed as indicated on the Drawings, prior to start of clearing and grubbing operations.

3.02 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

- A. Wetland areas, water courses, and drainage swales adjacent to construction activities shall be monitored twice each month for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.
- B. Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.
- C. Erosion Control Devices
 1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.
 2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.
 3. Sediment deposits shall be disposed of off-site, in a location and manner which will not cause sediment nuisance elsewhere.
- D. Removal of Erosion Control Devices
 1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
 2. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

END OF SECTION

SECTION 313613

GABION BOXES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 DESCRIPTION OF WORK

- A. Provide all materials and equipment, and do all work required to furnish, assemble, and install rock filled wire mesh gabion baskets, as indicated on the drawings and as specified.

1.03 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
 - 1. Section 14339, MOCK-UPS.
 - 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill and establishing subgrade elevations.

1.04 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Society for Testing and Materials (ASTM):
 - ASTM A 90/A 90 M Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coating
 - ASTM A 641 Specification for Zinc Coated (Galvanized) Carbon Steel Wire
 - ASTM A 974 Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses
 - ASTM D 6711 Standard Practice for Specifying Rock to Fill Gabions, Revet Mattresses, and Gabion Mattresses
 - 2. Massachusetts Department of Transportation
 - M2.01.7 Aggregates and Related Materials

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's printed product data, specifications, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

1.06 QUALITY ASSURANCE

- A. Installer shall be a firm which has successfully installed gabion walls for comparable project for a period of not less than five (5) years.
- B. Supplier must be able to adequately demonstrate to the Landscape Architect that it can supply the quantities and types of materials which are required for the project.
 - 1. The right is reserved, at the source or job site, to reject materials deemed by the Landscape Architect to be unsuitable. Such material shall be removed from the job site at the Contractor's expense.

1.07 TESTS

- A. The Owner may employ an independent testing agency to perform tests, evaluations, and certifications of products used. Cooperate and permit samples of materials to be taken as they are used.

PART 2 PRODUCTS

2.01 GABION BASKETS

- A. Factory fabricated so that sides, ends, lid and internal diaphragms readily assemble at site into rectangular baskets of sizes as indicated.
- B. Single unit construction or with joints having strength and flexibility equal to that of mesh.
- C. When length exceeds horizontal width, provide diaphragms of same mesh as gabion walls to divide basket into equal cells of length not in excess of horizontal width.
- D. Wire for fabrication and assembly shall be hot-dipped galvanized. The wire shall have a minimum tensile strength of 60,000 pounds per square inch. Galvanized steel wire shall conform to ASTM A 641, class 3, soft temper.
- E. Spiral binders, lacing wire and stiffeners shall be made of wire having a tensile strength in accordance with the requirements of specification ASTM A 641, having the same coating material as the welded wire fabric.
- F. Gabions shall be welded wire mesh with a mesh opening of 3 in. X 3 in. Mesh openings shall be considered to be center-to-center distance between two consecutive longitudinal or transverse wires. The permissible tolerance is +/- 1/8 in. maximum.
- H. Spiral binders shall have the maximum inside diameter of 2 1/2" and a maximum pitch of 3".
- I. The width, height and length of the gabion as assembled shall not differ more than +/- 5% from the ordered size prior to filling.

2.02 STONE FILL

- A. Stone fill shall be hard, durable, and dense such that it will not disintegrate from action of wetting and drying, freezing and thawing cycles.
- B. Stone fill for gabion units shall be clean, rough quarry stone or pit or river cobbles, or a mixture of any of these materials, and shall be essentially free from dust, clay,

vegetative matter and other deleterious materials.

- C. Individual pieces of stone shall have least dimensions not less than $\frac{3}{4}$ " larger than the gabion mesh openings and greatest dimensions not more than $\frac{2}{3}$ of the thickness of the gabion.
- C. On- site stone excavated during site construction can be used as stone fill if it meets this specification.

2.03 AGGREGATE BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.

- 1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.04 DRAINAGE FILL

- A. Comply with requirements in Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING for drainage fill.

2.05 FILTER FABRIC

- A. Filter fabric shall be a non-woven polypropylene fabric made specifically for use in subsurface drainage structures equal to Mirafi 140N, manufactured by Tencate, 365 South Holland Drive, Pendergrass, GA 30567; Tel 800 685 9990; Tel 706 693 2226; Fax 706 693 4400; www.mirafi.com, or approved equal.

PART 3 EXECUTION

3.01 ESTABLISHING WALL LINE

- A. Establish location and line of all gabion walls prior to construction by staking in the field with stake spacing not exceeding 15 ft. o.c., showing length and height of wall. Location and line shall be inspected and approved by the Landscape Architect before construction.

3.02 PREPARATION OF SUBGRADE

- A. Subgrade to receive stone wall shall be smoothed and compacted prior to placing aggregate base. Excavation and backfill shall meet requirements of Section 312000, SITE EXCAVATING, BACKFILLING AND COMPACTING.

3.03 AGGREGATE BASE

- A. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2 in. shall be excluded from course.
- B. Width of base course shall be greater than or equal to the width of wall surface, if

continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

- C. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density.
- D. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with aggregate base. Materials spilled outside pavement lines shall be removed and area repaired.
- E. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.04 GABION WALL CONSTRUCTION

- A. Install gabions to lines and grades as indicated. Follow manufacturer's instructions in assembling baskets.
- B. Prior to placing gabions, the surface on and against which they are to be constructed shall have been prepared and finished in accordance with the relevant provisions of the appropriate sections of this Specification.
- C. Each gabion basket shall be put in place in its turn, completely fabricated except for the fastening down of the lid, stretched to the correct shape and dimensions, and interconnect the adjacent gabions along the top, bottom, and vertical edges using spiral binders and lacing wire.
- D. The basket shall be tightly packed with approved stone by hand in such a manner that voids are kept to a practicable minimum and are uniformly distributed in the stone mass.
- E. The lid of the basket shall be securely fastened down with lacing wire along all hitherto unfastened edges.

3.05 BACKFILL

- A. Where back of wall is below grade, back of wall shall be backfilled with stone aggregate material. Aggregate shall be not less than 6 in. thick from back of wall, and shall extend for full depth of wall, except for the top 6 in.

END OF SECTION

SECTION 321216

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. The work includes furnishing all labor, materials, equipment, and supervision to construct the bituminous concrete paving for splash pad and pedestrian walks, including aggregate base course, in accordance with the Drawings and Specifications.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
 - 1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation; grading; geotextile, and subbase.
 - 2. Section 321723, PAVEMENT MARKINGS.
 - 3. Section 329200, LAWNS AND GRASSES; Planted embankment with loam and sod.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Association of State Highway and Transportation Officials (AASHTO):

M 20	Penetration Graded Asphalt Cement
M 81	Cut-Back Asphalt (Rapid Curing Type)
M 140	Emulsified Asphalt
 - 2. American Society for Testing and Materials (ASTM):

D 979	Sampling Bituminous Paving Mixtures
D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop

D 3549	Thickness or Height of Compacted Bituminous Paving Mixture Specimens
D 1188	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D 2041	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
D 2726	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
D 2950	Density of Bituminous Concrete in Place by Nuclear Methods

3. Federal Specifications (Fed. Spec.):

SS-S-1401	Sealing Compound, Hot Applied, for Concrete and Asphalt Pavements
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4. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridges
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1.04 QUALITY ASSURANCE

- A. Unless otherwise specified, work and materials for construction of the asphaltic concrete paving shall conform to the applicable portions of the following:
 - 1. MHD Specifications Section 460 for bituminous pavement for roadways and parking areas, Section 701 for bituminous sidewalks, and Section 405 for aggregate base course.
 - a. MHD Specifications Section 472 for repairs to existing pavements after installation of new curb.
- B. Paving work, base course etc., shall be done only after excavation and construction work which might damage them has been completed. Damage caused during construction shall be repaired before acceptance.
- C. Repair and/or replace existing paved areas damaged during this Project. Workmanship and materials for such repair and replacement shall match those employed in existing work, except as otherwise noted.
- D. Pavement subbase shall not be placed on a muddy or frozen subgrade.
- E. Existing pavement under state or local jurisdiction shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification in conformance with applicable codes, standards, and practices.
- F. Qualifications:
 - 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

2. Contractor shall have a minimum 5 years experience installing bituminous concrete pavements and shall have successfully completed at least three projects of comparable scale within the past 3 years.

- G. Contractor shall provide and pay for testing procedures specified herein. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, and in accordance with Section 014000, QUALITY REQUIREMENTS.
- H. The Owner reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated work in accordance with Section 014000, QUALITY REQUIREMENTS.
- I. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Shop Drawings: Indicate pavement markings, cross walks, lane separations, and defined parking spaces. Indicate, with international graphics symbol, spaces dedicated to people with disabilities.
- D. Qualification Data: For manufacturer.
- E. Material Certificates: For each paving material, signed by manufacturers.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
 4. Asphalt Surface Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.

PART 2 - PRODUCTS

2.01 AGGREGATE BASE COURSE

- A. Material for gravel base course shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious

materials, and which can be readily compacted to form a stable foundation.

1. Material shall conform to MHD Specifications Section M1.03.0 Type b, with less than 8% by weight passing No. 200 sieve.

2.02 ASPHALTIC CONCRETE

- A. Asphaltic shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, crushed rock aggregate, mineral filler, and asphalt equal to Class I, Type-1, in accordance with MHD Specifications Section M3.11.03, except as modified herein. The master range composition tolerances for bituminous concrete materials shall be as follows:

Table A (As modified)
Percent by Weight Passing Square Opening Sieves

<u>Standard Sieve Size</u>	<u>Base Course</u>	<u>Binder Course</u>	<u>Top Course (Dense Mix)</u>
2 in.	100		
1 in.	55-80	100	
3/4 in.	80-100		
5/8 in.			
1/2 in.	40-65	55-80	100
3/8 in.			80-100*
No. 4	20-45	28-50	55-80
No. 8	15-33	20-38	48-63
No. 16	36-49		
No. 30	8-17	8-22	24-38
No. 50	4-12	5-15	14-27
No. 100			6-18
No. 200	0-4	0-5	4-8
Bitumen	4.0-5.0	4.5-5.5	7-8

* For dense mix the maximum aggregate size allowable shall be 3/8 in. AASHTO M20.

1. Base or bottom course paving shall have maximum aggregate size passing 2 in. sieve, and bitumen content of 4.5% + 1/2% by weight.
 2. Binder course paving shall have maximum aggregate size passing 1 in. sieve, and bitumen content of 5% + 1/2% by weight.
 3. Top course paving for sidewalks shall conform to composition for "Dense Mix".
- B. Complete job mix formula, listing quantities and pertinent ingredient properties, shall be submitted to and approved by Architect at least two weeks before work is scheduled to begin.

2.03 BITUMINOUS MATERIALS

- A. Bituminous material for prime coat shall be one of the following:
 1. Cut-back asphalt (rapid-curing type) conforming to AASHTO M 81, Grade RC-70 or RC-250.
 2. Emulsified asphalt rapid-setting type conforming to AASHTO M 140, Grade RS-

1.

- B. Bituminous material for tack coat shall be emulsified asphalt rapid-setting type conforming to AASHTO M 140, Grade RS-1.
- C. Bitumen shall be a rapid-setting type emulsified asphalt conforming to AASHTO M 140, Grade RS-1.
- D. Bituminous crack sealer shall be a hot-applied bituminous sealer conforming to Fed. Spec. SS-S-1401.

PART 3 - EXECUTION

3.01 GRADING

- A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.
- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.
- C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:
 - 1. Material shall be legally disposed of off-site.
- H. Prepared subgrade will be inspected and tested by an independent testing agency, provided and paid for by the Contractor, prior to installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

1. Contractor shall submit a minimum of six (6) Proctor compaction test results indicating conformance to compaction density requirements specified herein.

3.02 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
 1. MHD Specifications Section 405, "Gravel Base Course".
- B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.
- C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.
 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.03 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.04 SURFACE PREPARATION

- A. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 2. Protect primed substrate from damage until ready to receive paving.
- B. Existing paved surfaces to be resurfaced shall be cleaned of foreign and objectionable matter with blowers, power brooms, or hand brooms immediately before applying bituminous pavement.
- C. Seal cracks between 3mm (1/8") and 6 mm (1/4") with an acceptable crack sealer. Repair wider cracks using a method that provides a level surface. All holes shall be filled with hot asphalt and compacted level with adjacent surfaces. Remove all dirt, weeds, foreign matter, and debris from cracks and apply crack sealer to fully seal pavement.
- D. Surface of pavement to be resurfaced shall receive a bituminous tack coat before laying asphaltic wearing course. Tack coat shall be applied at rate which will leave asphaltic residue of 0.05 to 0.15 gal./sq. yd. after evaporation of vehicle. Base surface shall be dry and clean when tack coat is applied.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.05 ASPHALTIC PAVING

- A. Asphaltic paving mixture, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base, etc., shall conform to MHD Specifications Section 460 Class I Bituminous Concrete Pavement for roadway and parking areas and Section 701 Sidewalks, Wheelchair Ramps, and Driveways for sidewalks.
- B. Complete job mix formula, listing quantities and pertinent ingredient properties, shall be submitted to and approved by Architect at least two weeks before work is scheduled to begin.
- C. Asphaltic binder and wearing courses for new full depth pavement shall each be applied individually, in single lifts of full thickness indicated on the Drawings.

1. Bituminous Wearing Surface Course (Overlay): bituminous wearing surface course (overlay) shall be applied in a single lift of full thickness over tack coat on existing pavement, as indicated on the Drawings.
- D. Work shall not be performed during rainy weather or when temperature is less than 40° F. or 60° F. as indicated in Paragraph 1.06.
- E. Adjacent concrete work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original condition.
- F. Deliveries shall be timed to permit spreading and rolling all material during daylight hours, unless artificial light, satisfactory to Architect, is provided. Loads which have been wet by rain or otherwise will not be accepted. Hauling over freshly laid or rolled material will not be permitted.
- G. Placing and rolling of mixture shall be as nearly continuous as possible. Rolling shall begin as soon after placing as mixture will bear the operation without undue displacement. Delays in rolling freshly spread mixture will not be permitted. Rolling shall proceed longitudinally, starting at edge of newly placed material and proceeding toward previously rolled areas. Rolling overlap on successive strips shall be greater than or equal to 1/2 width of roller rear wheel. Alternate trips of roller shall be of slightly different lengths. Corrections required in surface shall be made by removing or adding materials before rolling is completed. Skin patching of areas where rolling has been completed will not be permitted. Course shall be subjected to diagonal rolling, crossing lines of the first rolling while mixture is hot and in compactable condition. Displacement of mixture or other fault shall be corrected at once by use of rakes and application of fresh mixture or removal of mixture, as required. Rolling of each course shall be continued until roller marks are eliminated. Roller shall pass over unprotected edge of course only when paving is to be discontinued for sufficient time to permit mixture to become cold.
- H. In places not accessible to roller, mixture shall be compacted with hand tampers. Hand tampers shall weigh at least 50 lb. and shall have a tamping face less than or equal to 100 sq. in. Mechanical tampers capable of equal compaction will be acceptable in areas in which they can be employed effectively.
- I. Portions of pavement courses which become mixed with foreign material or are in any way defective shall be removed, replaced with fresh mixture, and compacted to density of surrounding areas. Asphaltic material spilled outside lines of finished pavement shall be immediately and completely removed. Such material shall not be employed in the work.
- J. Joints shall present same texture, density, and smoothness as other sections of the course. Continuous bond shall be obtained between portions of existing and new pavements and between successive placements of new pavement. New material at joints shall be thick enough to allow for compaction when rolling. Compaction of pavement, base, and subgrade at joints shall be such that there is no yielding of new pavement relative to existing pavement when subjected to traffic.
- K. Contact surfaces of previously constructed pavement (if greater than or equal to seven days since binder placed), manholes, and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate which will leave asphaltic residue of 5 to 7 gal./100 yd.² after evaporation of vehicle. Base surface shall be dry and clean when tack coat is applied. Asphaltic paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be

placed before tack coat has dried or dusted over.

- L. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 1 ft. of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface. Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.
 - 1. After final rolling, vehicular traffic shall not be permitted on pavement until it has cooled and hardened, and in no case less than six hours.
- M. Variations in smoothness of finished surface shall be less than or equal to the following tolerances when tested with a 10 ft. straightedge, applied both parallel to and at right angles to centerline of paved area.
 - 1. For sidewalk pavement surface course - 1/4 in. in 10 ft.
 - 2. At joint with existing pavement, and at other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed 0.01 ft.
 - 3. At other areas pavement elevation tolerance shall not exceed + 0.05 ft.
 - 4. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this Section.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be

determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.07 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

- 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION

SECTION 321543

STONE DUST SURFACING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to construct the stone dust surfacing (decomposed granite) with stabilizer as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 012300, ALTERNATES.
 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation; grading.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

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

D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop
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2. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridges
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1.04 SUBMITTALS

- A. Samples: The following samples shall be submitted:

<u>Material Sample</u>	<u>Size or Quantity</u>
Decomposed granite	1 lb. (for color approval)

- B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Stabilizer

- C. Test results for stabilized stone dust surfacing indicating compliance with ADA Requirements for accessibility and slip resistance.

1.05 QUALITY ASSURANCE

- A. Installer shall provide evidence to indicate successful experience in providing decomposed granite surfacing containing stabilizer binder/additive or ability to follow installation instructions.
- B. Installer shall provide documentation of at least three (3) installations similar in scale (all reference projects to be equal or greater than 75% of the total square footage of the project being bid on) using specified stabilizer solution material, completed over the past five (5) years. If Contractor is not able to meet experience qualifications, Contractor shall be required to have a representative from manufacturer of stabilizer material be present on site for pre-construction training, installation of mockup, and at least 25% of the project installation. Contractor shall be responsible for any and all costs associated with this requirement. If contractor is unable to meet these requirements a qualified replacement contractor will be located subject to all qualifications listed above and Owner approval.

1.06 PERFORMANCE REQUIREMENTS

- A. Perform gradation of decomposed granite material or 3/8" or 1/4" minus crushed aggregate in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Course.

1.07 MOCK-UP

- A. General
1. Schedule mock-up for acceptance 30 days prior to constructing decomposed granite surfaces represented by the mockups.
 2. Locate mock-up panels in non-public areas accepted by the Architect.
 3. Continue to construct mock-ups until acceptable mock-up is produced. Accepted mock-up shall be the standard for color, texture, mix ratio, and workmanship for the work.
 4. Use the same decomposed granite /stabilizer mix and placement procedure, accepted in mock-ups, in the final work, unless otherwise directed by the Architect.
 5. Protect accepted mock-ups from damage until completion and acceptance of the work represented by the mock-up.
 6. Remove mock-up panels from site at completion of project, as directed by the Architect.
- B. Sample panel shall be 5 ft. x 5 ft. minimum.
- C. Source of Materials. Utilize the same source, stock, or brand of stabilizer material for all decomposed granite surfacing. Do not interchange materials or mixes until an additional mock-up shows that uniformity in finish texture and color, as compared to original mock-up will be maintained. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity.

1.08 PROJECT/SITE CONDITIONS

- A. Field Measurements: Each bidder is required to visit the site of the Work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.
 - 1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.
- B. Environmental Limitations: Do not install decomposed granite or crushed 3/8" or 1/4" minus aggregate paving during rainy conditions or below 40 degrees Fahrenheit and falling.

1.09 TESTING AND INSPECTION

- A. The Owner reserves the right to inspect and test paving and associated work in accordance with Section 014000, QUALITY REQUIREMENTS.

1.10 WARRANTY

- A. Provide written warranty signed by stabilizer manufacturer, installer, and Contractor, agreeing to repair or replace all work of this section which exhibits defects in materials or workmanship. Warranty shall cover stabilizer, decomposed granite and aggregate base work. "Defects" is defined to include, but not limited to, differential settlement, ponding of water, abnormal aging or deterioration of stabilized paving system, and failure to perform as required.
 - 1. Warranty Period: 90 days from date of Substantial Completion.
 - 2. Contractor shall provide unconditional maintenance and repairs as required through the warranty period.

PART 2 - PRODUCTS

2.01 DENSE GRADED BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
 - 1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.02 STONE DUST

- A. Stone Dust: shall be decomposed granite of 3/8 in. or 1/4 in. crushed aggregate screenings.
 - 1. Surfacing material shall be sand and crushed stone consisting of inert materials that are hard and durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:
 - 2. Crushed Stone Sieve Analysis Percentage of weight Passing a Square Mesh AASHTO T11-82 and T2782.

<u>Sieve Size</u>	<u>%Passing by Weight</u>
3/8 in.	100
No. 4	90 - 100
No. 8	75 - 80
No. 16	55 - 65
No. 30	40 - 50
No. 50	25 - 35
No. 100	15 - 20
No. 200	10 - 15

- B. Decomposed granite color will be selected by Architect.

2.03 STABILIZER

- A. Stabilizer additive shall be a non-toxic, colorless, odorless, concentrated powder organic binder capable of binding crushed aggregate screenings.
1. Material shall be provided by supplier pre-mixed with decomposed granite material specified herein.

2.04 EDGING

- A. Steel edging shall be shop fabricated, 3/16 in. thick x 4 in. deep, steel, primed and painted black. Edging shall be furnished in 16 ft. lengths.
1. Steel edging shall accommodate staking steel edging every 30 in. o.c.
 2. Steel stakes shall be 16 in. long, tapered.

PART 3 - EXECUTION

3.01 GRADING

- A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.
- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be aggregate base material conforming to this Section.
- C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 1 in. deep in subgrade, shall be graded out,

reshaped as required, and recompact before placing pavement.

- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall be legally disposed of off-site.
- H. Submit Proctor Test to Architect confirming that subgrade meets compaction specifications.

3.02 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
 - 1. MHD Specifications Section 405, "Gravel Base Course".
- B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.
- C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.
 - 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.03 EDGING

- A. Steel edging shall be installed at locations indicated on the Drawings. Where required, edging shall be cut square and accurately to required length.
 - 1. Steel edging shall be securely staked in required position. Stakes shall be driven every 30 in. o.c. along length of edging.

2. Adjacent lengths of edging shall overlap 8 in.
3. Edging shall be set plumb and vertical at required line and grade. Straight sections shall not be wavy; curved sections shall be smooth and shall have no kinks or sharp bends.

3.04 STONE DUST SURFACING .

- A. Stabilizer shall be provided thoroughly and uniformly pre-blended with decomposed granite by local supplier, at rate, and by method in strict accordance with manufacturer's printed instructions.
 1. Bucket blending is not acceptable. Blending with a rake and or shovel is not acceptable.
 2. Blend material dry.
- B. Stone dust surfacing shall be done only after excavation and construction work which might injure it has been completed. Damage caused during construction shall be repaired before acceptance.
- C. Stone dust surfacing shall be constructed on a compacted aggregate base as indicated on the Drawings.
- D. Pre-blended stabilized stone dust screenings shall be spread evenly over the base in 2 in. maximum lifts, rolled and compacted to 85% of maximum density as determined by ASTM D 1557.
 1. Contractor shall wait a minimum of 24 hours after placing stabilized stone dust surfacing material prior to compaction. Longer periods may be required for material to adequately dry. Consult manufacturer to make determination.
- E. Water shall be added to decomposed granite for full-depth moisture penetration prior to compacting.
- F. Upon thorough moisture penetration, compact stabilized decomposed granite to 85% relative compaction with 2 to 4 ton durable drum roller or 1000 lb. single drum roller as required to achieve a dense, hard packed surface conforming to the finish grades indicated.
 1. Do not use vibratory rollers or compactors.
 2. Do not begin compaction for 12 hours after placement and up to 72 hours.
 3. Contractor shall hand tamp areas adjacent to irrigation or plantings with 8 in. or 10 in. hand tamper.
 4. If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction operations.
- G. Variations in smoothness of finished stone dust surface shall be less than or equal to 1/4 in. when tested with a 10 ft. straightedge, applied both parallel to and at right angles to centerline of stone dust surface areas. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this specification.
- H. Stone dust surfacing shall comply with ADA Requirements for slip resistance and accessibility, with a minimum static coefficient of friction of 0.6 for accessible routes and 0.8 for ramps, when tested in accordance with ASTM C1028.
- I. Allow finished surface to dry completely before permitting use.

3.06 INSPECTION

- A. Finished stone dust surfacing shall be smooth, uniform and solid. Cured and compacted aggregate shall be firm throughout profile with no spongy areas. Loose material shall not be present on the surface after installation, but may appear after use and according to environmental conditions. Surfacing shall appear "natural" yet stable throughout. Any significant irregularities in surfacing shall be repaired to the uniformity of the entire installation.

3.07 MAINTENANCE

- A. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4" off the paving surface.
- B. During the first year, a minor amount of loose aggregate will appear on the paving surface (1/16" to 1/4"). If this material exceeds a 1/4", redistribute the material over the entire surface. Water thoroughly to the depth of 1". Compact with power roller of no less than 1000 lbs. This process should be repeated as needed.
- C. If cracking occurs, simply sweep fines into the cracks, water thoroughly and hand tamp with an 8" – 10" hand tamp plate.

3.08 REPAIRS

- A. Excavate damaged area to the depth of the stabilized aggregate and square off sidewalls.
- B. If area is dry, moisten damaged portion lightly.
- C. Pre-blend the dry required quantity of stabilizer powder with the proper quantity of aggregate in a concrete batch mixer.
- D. Add water to the pre-blended aggregate and stabilizer in accordance with stabilizer manufacturer's printed instructions.
- E. Apply moistened, pre-blended aggregate to excavated area to finish grade.
- F. Compact with an 8 in. to 10 in. hand tamper or 250 lb to 300 lb. roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.

END OF SECTION

SECTION 321545

SKINNED INFIELD SURFACING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS; Clearing and grubbing.
 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill.

1.02 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
1. American Society for Testing and Materials (ASTM):

D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop
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1.03 SUBMITTALS

- A. A 2 lb. sample of skinned infield mix shall be submitted for the Architect's approval of material gradation and color.

PART 2 PRODUCTS

2.01 SKINNED INFIELD MIX

- A. Provide infield mix comprised of sand, silt and clay, as manufactured by Nardone Sand and Gravel Company, Westford, MA.
1. Mix Ratio: 60% Sand, 20% Silt, 20% Clay.
 2. Field Conditioner: shall be Surface Athletics Proleague Soil Conditioner
 - a. Color: Heritage Red

2.02 SAND BASE

- A. Sand shall graded within the following limits:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
No. 4	100
No. 200	0-8

PART 3 EXECUTION

3.01 GRADING

- A. Areas to receive skinned infield surfacing will be compacted and brought to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING before work of this section is performed. Skinned infield surface and compaction as required to form a firm, uniform surface at required elevations and to required lines, shall be done under this Section.
- B. Subgrade of areas to receive skinned infield surfacing shall be recompactd as required to bring top 4 in. of material to a compaction of at least 90% of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 1 ft. beyond proposed edge of skinned infield surface.
- C. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- D. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 1 in. deep in subgrade, shall be graded out, reshaped as required, and recompactd before placing skinned infield surfacing.
- E. Materials shall not be stored or stockpiled on subgrade.
- F. Disposal of debris and other material excavated and/or stripped under this Section, and material unsuitable for or in excess of requirements for completing work of this Section shall be disposed of off-site.

3.02 SAND BASE

- A. Compaction of sand base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D.
- B. Material shall be applied in lifts less than or equal to 2 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a minimum of four coverages of tires of a ten wheel truck having a gross weight of 70,000 lb. or using an approved equivalent.
 - 1. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas.
 - 2. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- C. Base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines

shall be removed and area repaired.

- D. Portions of subgrade or of construction above which become contaminated, softened, or dislodged, or otherwise damaged, shall be replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.03 SKINNED INFIELD SURFACING

- A. Skinned infield mix shall be spread evenly over the sand base to depth indicated on the Drawings, and rolled with a 3 to 5 ton steel-wheeled roller, as required to achieve a dense, hard packed surface conforming to the finish grades indicated, and in accordance with supplier's recommendations.
- B. Clay field conditioner shall be applied in accordance with the manufacturer's printed instructions.

END OF SECTION

SECTION 321723

PAVEMENT MARKINGS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.02 WORK INCLUDED

- A. Without limiting the generality thereof, the scope of work under this Section shall include all labor, materials, accessories, service, and equipment necessary to furnish and apply all pavement striping, parking stalls, basketball court lines, and traffic markings as indicated on the Drawings and as specified herein.

1.03 RELATED WORK

- A. The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated:

- 1. Division 1 General Requirements
- 2. Section 321216, BITUMINOUS CONCRETE PAVING.

1.04 REFERENCES

- A. General Requirements Division 1 apply to this Section.
- B. Refer to other Divisions of these Specifications, other Sections in this Division, and Drawings for related work which may affect the work of this Section.
- C. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work.
- D. "The Standard Specification" shall refer to The Massachusetts Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

1.05 SUBMITTALS

- A. Submit paint manufacturer and application instructions for review and approval prior to ordering material.

1.06 QUALITY ASSURANCE

- A. Contractor is to furnish the Owner with a 1-year unconditional guarantee against fading, chipping, peeling, wearing, etc., for said 1-year period. The Contractor is to provide said guarantee in writing, in a form acceptable to the Owner's representative, with the bid.

PART 2 PRODUCTS

2.01 PAINT

- A. All paint for parking stall and traffic markings shall be fast-drying white traffic paint complying with the applicable paragraphs of Section 627, Pavement Markings, of the Standard Specifications.
- B. The name of the manufacturer shall be submitted to the Owner's representative together with an affidavit stating material does comply with the above-noted specification. Material shall be used in accordance with the Standard Specifications, but shall not be installed until the top course of pavement has cured at least a week. No reflective glass beads will be required.
- C. The material shall not lift from the pavement in freezing weather, and shall not smear or spread under normal traffic conditions or at temperature below 120 degrees F.
- D. The paint shall not deteriorate by contact with sand, sodium, chloride, calcium chloride, or other chemicals used against the formation of ice on the pavement, because of the oil content of pavement materials, or from gasoline, grease, and oil drippings from vehicles.

PART 3 EXECUTION

3.01 APPLICATION

- A. Pavement striping and marking shall be applied in accordance with this Specification and the Drawings. See Drawings for layout and additional notes. No paint shall be applied until the top pavement course has cured at least one week minimum.
- B. Stripe all parking stalls as shown on the Drawings accurately and paint all parking stall striping in white 4-inch-wide single stripes. Striping, symbols, and arrows shall be painted to the size, length, and spacing as specified and indicated on the Drawings.
- C. Stripe all basketball court markings as shown on the Drawings accurately and paint all basketball court markings in white, 2-inch wide single stripes.
- D. All stripes shall be applied one coat with brush, spray, or marking machine over dry, clean pavement only.
- E. All paint shall be installed at a rate of not more than 300 linear feet of 4-inch-wide lines per gallon of paint (approximately 0.016-inch dry film thickness).
- F. Furnish only skilled workmen who are experienced and normally employed in the work of installing traffic lines. Supply all the necessary equipment and materials for the installation of the traffic lines.
- G. If material is applied to the pavement by an extrusion method, one side of the shaping die shall be the pavement and the other three sides are contained by, or are part of, suitable equipment for controlling the flow of paint.
- H. All stalls shown on the plan are to be spaced equally, each stall being separated from the next as indicated on the Drawings. The line indicated on the Drawings is on the center line of the stall striping. The line between rows of stalls shall be a single line.

- I. Where entire areas are to be cross-hatched as directed by the Drawings, the 4-inch-wide straight white parallel stripes 36 inches o.c. shall be laid out and painted in solid lines.
- J. After application and proper drying time, the material shall show no appreciable deformation or discoloration under traffic conditions and in air and/or road temperature ranging from 0 degrees F to 120 degrees F.
- K. The stripe shall maintain its original dimensions and placement. The exposed surface shall be free from tack. Cold ductility of the material shall be such as to permit normal movement with the pavement surface without chipping or cracking.
- L. Contractor shall clean and sweep all areas to be striped or restriped of all sand, dirt, grease, oil, etc., as required so as to produce a first-class job. By proceeding, the striping Contractor agrees surface is satisfactory to produce the required first-class job and 1-year guarantee described.
- M. The Contractor shall protect the building, walks, pavement, curbing, trees, shrubs, mulch, etc. from over-spray of paint and damage by his operations.
- N. Traffic shall not be permitted on the pavement until the paint is thoroughly dry.

END OF SECTION

SECTION 321816

RUBBER CUSHIONED SAFETY SURFACING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to furnish and install the poured-in-place rubber cushioned playground safety surfacing over a compacted aggregate base, complete, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING;

Establishment of subgrade, aggregate base.

2. Section 116816, PLAY STRUCTURES.

3. Section 321216, BITUMINOUS CONCRETE PAVING.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

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

C 33	Concrete Aggregates
C 67	Sampling and Testing Brick and Structural Clay Tile
C 94	Ready-Mixed Concrete
C 150	Portland Cement
D 573	Rubber Deterioration in an Air Oven
D 1557	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³))
E 648	Critical Radiant Flux of Floor Covering Systems Using Radiant Heat Energy

Source

F 1292

Impact Attenuation of Safety Surface
Systems Under and Around Playground
Equipment

2. American Concrete Institute (ACI):

301

Structural Concrete for Buildings

306.1

Cold Weather Concreting

3. Commonwealth of Massachusetts Highway Department (MHD):

Specifications

Standard Specifications for Highways and Bridges

1.04 SUBMITTALS

- A. Certified test data indicating that safety surface meets or exceeds the following:
1. Current Consumer Product Safety Commission (CPSC) guidelines issued in "A Handbook for Public Playground Safety" (latest edition) for a minimum fall height of 6 feet.
 2. Current Americans with Disabilities Act Guidelines (ADAG).
 3. Current ASTM F-1292 requirements.
- B. Shop drawings of playground safety surfacing indicating colors, dimensions, and layout of surfacing shall be submitted.
- C. Manufacturer's product data, and catalogue cuts, shall be submitted for playground safety surfacing system including certifications and other data as may be required to show compliance with Contract Documents.
- D. Verification Samples: Submit 12 in. x 12 in. color samples of safety surfacing on 1/4 in. plywood backing as many times as necessary to obtain Landscape Architect's approval.
- E. Manufacturer's Review: Submit written statement, signed by safety surfacing installer stating that Drawings and Specifications have been reviewed by qualified representatives of materials manufacturer, and that they are in agreement that materials and system to be used for safety surfacing are proper and adequate for applications shown.
- F. Substrate Acceptability: Submit a certified statement issued by manufacturer of safety surfacing materials and countersigned by applicator, attesting that areas and surfaces designated to receive safety surfacing have been inspected and found satisfactory for reception of Work covered under this Section; and are not in conflict with "Warranty" requirements. Application of materials will be construed as acceptance of surfaces.
- G. Statement of Supervision: Upon completion of Work, submit a written statement signed by manufacturer stating that field supervision of manufacturer's representative was sufficient to insure proper application of materials, that Work was installed in accordance with Contract Documents, and that installation is acceptable to manufacturer.

- H. Certification: Furnish certificate accompanying delivery of safety surface material indicating compliance with the Contract Documents.

1.05 QUALITY ASSURANCE

- A. Safety surfacing work shall be performed by a firm with ten years experience in installation of materials specified on comparable projects. The firm shall have the approval of the safety surface materials manufacturer.
- B. The safety surface manufacturer shall provide evidence indicating that the specified materials have been successfully utilized on work of similar scope to that shown and specified for this Project. The safety surface system examples cited shall have been completed and in use for five years without any evidence of failure.
- C. The Owner reserves the right to retain an independent testing laboratory to test and inspect the work specified herein. The presence of the testing laboratory, nor any observations and testing performed by the laboratory shall relieve the Contractor of his responsibilities for the Work.
- D. Contractor shall engage the manufacturer's representative to inspect the surface after preparation and monitor the application of the safety surface system upon the prepared surfaces of all pavement to receive safety surface system.
- E. Installed safety surface shall meet or exceed CPSC performance guidelines with respect to the Critical Heights of the proposed in-place play equipment.
- F. Material used in construction of the safety surface system shall be tested for conformance with requirements of ASTM F 1292.
- G. Material shall have a Class B fire rating.
- H. Material shall be vandal resistant, firmly secured so that it cannot be pulled away from the playground surface.

1.06 MATERIAL TESTING

- A. Shock Absorbency: When tested in accordance with ASTM F 1292, Test Method F355, Procedure C (Metal Headform), the surface shall not impart to the headform upon impact, a peak deceleration exceeding 200 times the acceleration due to gravity (200G's). Drop heights used in this test shall be the heights relevant to the proposed play structures used in conjunction with the safety surfacing areas indicated on the Drawings.
- B. Weathering: After being subjected to a freeze-thaw cycle in accordance with ASTM C 67 and after being subject to 200o F. for seven days in accordance with ASTM D 573, the sample shall be retested in compliance with ASTM F 1292 at 72o F. only. A peak deceleration reading not exceeding 200G's shall be maintained.
- C. Slip Resistance: Wet dynamic reading shall not be less than 40 when tested in accordance with ASTM E 303, using the British Portable Skid Resistance Tester.
- D. Flammability: Minimum critical radiant flux of 0.22 Watts/CM2 when tested in accordance with ASTM E 648.

1.07 WARRANTY

- A. Provide a written warranty stating that work executed under this Section will be free from defects of materials and workmanship for a period of two years from date of Substantial Completion, and that material breakdown and unraveling will be remedied on written notice at no additional cost to Owner. The warranty shall be in writing and shall be signed by the Contractor and safety surface materials manufacturer. Warranty shall include removal and replacement of materials as required to repair safety surfacing, at no cost to Owner.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles fully identified with brand, type, grade, date of manufacture, class, lot number, and other qualifying information.
- B. Store materials in original tightly sealed containers or unopened packages. Materials shall be stored out of weather, off the ground, in dry area, in compliance with manufacturer's maximum storage temperature range.

1.09 JOB CONDITIONS

- A. Maintain manufacturer's current installation instructions at the job site at all times for safety surface material to be used on the Project.
- B. Maintain material storage area at minimum 60oF., but not above 90oF. for 48 hours prior to application.
- C. Proceed with work of this section only after substrate construction and penetrating work have been completed.
- D. Do not proceed with work during inclement weather. Comply with manufacturer's recommendations for application and curing under specific climatic conditions.
- E. Coordinate application of safety surfacing with work of other trades.

1.10 PROTECTION

- A. Protect the safety surface from damage, resulting from spillage, dripping, and dropping of materials. Prevent materials from entering and clogging drains. Repair, restore or replace work which is soiled or damaged in connection with the performance of the work.
- B. Erect temporary barriers to protect coatings during drying and curing.
- C. Contractor to provide, at his expense, constant security detail to prevent damage during the required drying and curing period. Security detail shall be a representative of the Contractor or a City Police Detail.
- D. Compensation for police services will be paid by Contractor on an hourly basis, at the prevailing wage rate in accordance with the City of Salem Police Department regulations for the time spent at the project. No additional payment will be made for training, equipment, travel time, transportation, or any administrative charges associated with the costs of providing police services.

PART 2 - PRODUCTS

2.01 AGGREGATE BASE COURSE

- A. Material for dense graded base course shall consist of hard durable particles of fragments of stone. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used. Coarse aggregates shall have a percentage of wear, by the Los Angeles test, of not more than 45. Fine aggregates shall consist of natural or crushed sand.

1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.01 SAFETY SURFACE SYSTEM

- A. Playground safety surfacing shall be "Dura Turf Poured in Place" rubber safety surface, manufactured by Sports Surface Specialties, East Aurora, NY 14052; Tel. 1-877-438-3872, or approved equal.

1. Wear/top course shall be minimum ½ in. thick, peroxide cured EPDM.
2. Approved manufacturers for EPDM shall be as follows:
 - Midwest Elastomers
 - BRG International
 - Sparton Enterprises, Inc.
 - Melos
3. Base: shall be minimum 2 ½" thick, 100% recycled material, 100% buffings or mix of buffings and recycled feed stock.
4. Binder: shall be one part polyurethane comprised of 100% solids Approved binders are Rosehill 1102/1118; Conica 315/316; and APT.

- B. Color Mix:

1. Color Mix 1: 50% Black : 50% TBD (manufacturers standard color).
2. Color Mix 2: 50% Black : 50% TBD (manufacturers standard color).

- C. Material shall be delivered to the construction site in its original unopened containers clearly labeled with trade name and name of manufacturer, container weight, and safety precautions.

PART 3 - EXECUTION

3.01 GENERAL

- A. The entire safety surfacing system shall be applied under the observation of the material manufacturer's representative.

3.01 GRADING

- A. Areas to receive safety surfacing will be compacted and brought approximately to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND

COMPACTING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive safety surfacing, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.
- C. Subgrade of areas to receive safety surfacing shall be recompact as required to bring top 8 in. of material immediately below aggregate base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond safety surfacing edge.
- D. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompact before placing safety surfacing.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:
 - 1. Material shall be legally disposed of off-site.
- H. Prepared subgrade will be inspected and tested by an independent testing agency, provided and paid for by the Contractor, prior to installation of aggregate base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.
 - 1. Contractor shall submit a minimum of six (6) Proctor compaction test results indicating conformance to compaction density requirements specified herein.

3.02 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
 - 1. MHD Specifications Section 405, "Gravel Base Course".
- B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.

- C. Width of base course shall be greater than or equal to the width of safety surfacing, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.
 - 1. Material shall be placed adjacent to structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with aggregate. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.02 SURFACE PREPARATION

- A. Where safety surface system is being applied over new concrete, a minimum of two weeks shall be allowed between the installation of paving, patches, and safety surface system to ensure full curing of the asphaltic concrete paving and the escape of all oils and gases from new paving. If manufacturer's recommendations differ from that specified above, manufacturer's recommendations shall govern.
- B. Final Surface Inspection: Prior to application of safety surface system, the compacted aggregate base surface shall be inspected by representative of safety surfacing manufacturer. Start of playground safety surfacing application shall constitute acceptance of the aggregate base surface to receive safety surfacing.

3.03 CONCRETE CURB

- A. Placing Concrete - General
 - 1. Before placing concrete, forms and space to be occupied by concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint, and other material which might tend to reduce bond.
 - 2. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.
 - 3. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.

4. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - a. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - b. If concrete can not be mechanically consolidated, concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.
 - B. Cold-Weather Placement: Comply with ACI 306.1.
 - C. Hot-Weather Placement: Comply with ACI 301.
 - D. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.
 - E. Concrete Curb
 1. Curb shall be cast true to line, plane, and dimensions indicated on the Drawings. Maximum length of poured-in place curb shall be 30 ft.
 2. Concrete curb shall be formed to size, shape and dimensions indicated on the Drawings.
 3. Expansion joints (EJ) shall be 1/2 in. thick, and shall be located 20 ft. o.c. maximum.
 - F. Curb shall be moist cured by covering with burlap, waterproof curing paper, or other approved method. Curing period shall be 7 days, minimum.
 - G. Allow 14 days after concrete curb has cured before proceeding with abutting safety surface installation.
 - H. Backfill material on each side of curb shall be as specified for adjacent surface and shall be thoroughly compacted by means of power tampers. Extreme care shall be taken not to destroy alignment. Curb sections disturbed during backfilling or otherwise shall be reset to line and properly backfilled.
- 3.04 SAFETY SURFACING
- A. Prior to applying playground safety surfacing system, adjacent work shall be completed and approved by the Architect.
 - B. Application of the playground safety surfacing shall occur only after the compacted aggregate base has been thoroughly prepared and leveled in accordance with manufacturer's recommendations. The safety surface material shall be applied in strict accordance with manufacturer's printed instructions.
 - C. In all cases, manufacturer's directions for achieving maximum wearability and

resilience shall be strictly adhered to.

3.05 CLEAN UP

- A. Contractor shall remove all containers and surplus materials leaving the site in a clean and orderly condition acceptable to the Architect.

END OF SECTION

SECTION 321817

WOOD FIBER SAFETY SURFACING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to furnish and install the wood fiber playground safety surfacing over a compacted aggregate base, complete, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
1. Section 116816, PLAY STRUCTURES.
 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade, aggregate base.
 3. Section 321543, STONEDUST SURFACING.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. American Society for Testing and Materials (ASTM):

F1292	Impact Attenuation of Surface Systems Under and Around Playground Equipment.
F1951	Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
 2. Americans with Disabilities Act (ADA):

Appendix to Part 1191	Accessibility Guidelines for Buildings and Facilities
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 3. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridges
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4. International Playground Equipment Manufacturer's Association (IPEMA)

1.04 SUBMITTALS

- A. Certified test data indicating that safety surface meets or exceeds the following:
 - 1. Current Consumer Product Safety Commission (CPSC) guidelines issued in "A Handbook for Public Playground Safety" (latest edition) for a minimum fall height of 6 feet.
 - 2. Current Americans with Disabilities Act Guidelines (ADAG).
 - 3. Current ASTM F-1292 requirements.
- B. Shop drawings of playground safety surfacing indicating colors, dimensions, and layout of surfacing shall be submitted.
- C. Manufacturer's product data, and catalogue cuts, shall be submitted for playground safety surfacing system including certifications and other data as may be required to show compliance with Contract Documents..
- D. Verification Samples:
 - 1. 5 lb. sample of wood carpet material
 - 2. 12 in. x 12 in fabric liner sample.
- E. Manufacturer's Review: Submit written statement, signed by safety surfacing installer stating that Drawings and Specifications have been reviewed by qualified representatives of materials manufacturer, and that they are in agreement that materials and system to be used for safety surfacing are proper and adequate for applications shown.
- F. Substrate Acceptability: Submit a certified statement issued by manufacturer of safety surfacing materials and countersigned by applicator, attesting that areas and surfaces designated to receive safety surfacing have been inspected and found satisfactory for reception of Work covered under this Section; and are not in conflict with "Warranty" requirements. Application of materials will be construed as acceptance of surfaces.
- G. Statement of Supervision: Upon completion of Work, submit a written statement signed by manufacturer stating that field supervision of manufacturer's representative was sufficient to insure proper application of materials, that Work was installed in accordance with Contract Documents, and that installation is acceptable to manufacturer.
- H. Certification: Furnish certificate accompanying delivery of safety surface material indicating compliance with the Contract Documents.

1.05 QUALITY ASSURANCE

- A. Qualifications: Utilize an installer approved, trained and certified by the manufacturer of the playground surfacing system, and must have completed at least 50 installations of areas of greater than 1,000 sf over the past 3 years.
 - 1. Safety surfacing work shall be performed by a firm with ten years experience in installation of materials specified on comparable projects. The firm shall have the approval of the

safety surface materials manufacturer.

2. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

3. International Play Equipment Manufacturers Association (IPEMA) certified.

- B. The safety surface manufacturer shall provide evidence indicating that the specified materials have been successfully utilized on work of similar scope to that shown and specified for this Project. The safety surface system examples cited shall have been completed and in use for five years without any evidence of failure.
- C. The Owner reserves the right to retain an independent testing laboratory to test and inspect the work specified herein. The presence of the testing laboratory, nor any observations and testing performed by the laboratory shall relieve the Contractor of his responsibilities for the Work.
- D. Installed safety surface shall meet or exceed CPSC performance guidelines with respect to the Critical Heights of the proposed in-place play equipment.
- E. Material used in construction of the safety surface system shall be tested for conformance with requirements of ASTM F 1292, and shall be IPEMA Certified.
- F. Material shall have a Class A fire rating.

1.06 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.
1. Proper drainage is critical to the longevity of the surfacing system. Inadequate drainage will cause premature breakdown of the system in affected areas; and void the warranty.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials fully identified with qualifying information.
- B. Store materials in compliance with manufacturer's recommendations.

1.08 JOB CONDITIONS

- A. Maintain manufacturer's current installation instructions at the job site at all times for safety surface material to be used on the Project.
- B. Proceed with work of this section only after substrate construction and penetrating work have been completed.
- C. Do not proceed with work during inclement weather. Comply with manufacturer's recommendations for application under specific climatic conditions.
- D. Coordinate application of safety surfacing with work of other trades.

1.09 PROTECTION

- A. Protect the safety surface from damage, resulting from spillage, dripping, and dropping of materials. Prevent materials from entering and clogging drains. Repair, restore or replace work which is soiled or damaged in connection with the performance of the work.

PART 2 PRODUCTS

2.01 DENSE GRADED BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, freedraining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation. Material shall conform to following gradation:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1 in.	90-100
5/8 in.	50-80
1/4 in.	30-50
No. 4	15-35
No. 8	10-30
No. 30	3-5
No. 200	0-3

- B. Aggregate base material shall be approved by the safety surface manufacturer.

2.02 SAFETY SURFACE SYSTEM

- A. Playground safety surfacing shall be "WoodCarpet System 1", an engineered wood fiber material place over aggregate drainbase, sandwiched between a top and bottom layer of "Duraliner" fabric liner, manufactured by Zeager, PA Office: 1-800-346-8524 · fax 717-944-7681 · sales@zeager.com, or approved equal.

2.03 EDGING

- A. Steel edging shall be shop fabricated, 3/16 in. thick x 4 in. deep, steel, primed and painted black. Edging shall be furnished in 16 ft. lengths.

1. Steel edging shall accommodate staking steel edging every 30 in. o.c.
2. Steel stakes shall be 16 in. long, tapered.

PART 3 EXECUTION

3.01 GRADING

- A. Areas to receive safety surfacing system will be compacted and brought approximately to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form

a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.
- C. Subgrade of areas to receive safety surfacing system shall be recompacted as required to bring top 8 in. of material immediately below aggregate base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond safety surfacing system edge.
- D. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:
 - 1. Material shall be legally disposed of off-site.
- H. Prepared subgrade will be inspected and tested by an independent testing agency, provided and paid for by the Contractor, prior to installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.
 - 1. Contractor shall submit a minimum of six (6) Proctor compaction test results indicating conformance to compaction density requirements specified herein.

3.02 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
 - 1. MHD Specifications Section 405, "Gravel Base Course".
- B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.
- C. Width of base course shall be greater than or equal to the width of safety surfacing

system surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

- D. Fabric liner shall be laid over compacted subgrade. Aggregate material shall be applied over fabric liner in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, in accordance with manufacturer's printed instructions.
- E. Fabric liner shall be applied over compacted aggregate base prior to installing engineered wood fiber material.

3.03 SAFETY SURFACING INSTALLATION

- A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, storm drainage system, fencing, playground equipment installation and other relevant work, has been completed.
- B. Application of the playground safety surfacing shall occur only after the aggregate surface has been thoroughly prepared, leveled, and compacted in accordance with manufacturer's recommendations. The safety surface material shall be applied to depth and by method in strict accordance with manufacturer's printed instructions.

3.04 EDGING

- A. Steel edging shall be installed at locations indicated on the Drawings. Where required, edging shall be cut square and accurately to required length.
 - 1. Steel edging shall be securely staked in required position. Stakes shall be driven every 30 in. o.c. along length of edging.
 - 2. Adjacent lengths of edging shall overlap 8 in.
 - 3. Edging shall be set plumb and vertical at required line and grade. Straight sections shall not be wavy; curved sections shall be smooth and shall have no kinks or sharp bends.

3.05 PROTECTION AND CLEAN UP

- A. Protect the installed playground surface from damage resulting from subsequent construction activity on the site.
- B. Contractor shall remove all containers and surplus materials leaving the site in a clean and orderly condition acceptable to the Architect.

END OF SECTION

SECTION 323113

CHAIN LINK FENCE AND BACKSTOP

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 DESCRIPTION OF WORK

- A. Provide all equipment and materials, and do all work necessary to construct the chain link fence, including replacing rails and fence fabric on existing posts, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other specification sections which directly relate to the work of this section include, but are not limited to the following:
1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill and establishing subgrade elevations.
 2. Section 033000, CAST-IN-PLACE CONCRETE; Concrete.
 3. Section 099113, EXTERIOR PAINTING.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

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

A 53	Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
A 90	Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 153	Zinc-Coating (Hot-Dip) on Iron and Steel Hardware
A 385	High-Quality Zinc Coatings (Hot-Dip)
A 392	Zinc-Coated Steel Chain-Link Fence Fabric

A 569	Steel, Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality
B 6	Zinc (Slab Zinc)
D 412	Tests for Rubber Properties in Tension
D 638	Tensile Properties of Plastics
D 746	Brittleness Temperature of Plastics and Elastomers by Impact
D 792	Specific Gravity and Density of Plastics by Displacement
D 2240	Rubber Property - Durometer Hardness
F 567	Installation of Chain-Link Fence
F 668	Poly (Vinyl Chloride)(PVC)-Coated Steel Chain-Link Fence Fabric

2. Chain Link Fence Manufacturers Institute (CLFMI):

Manual

Product Manual

1.04 QUALITY ASSURANCE

- A. Vinyl-coated chain link fencing shall be manufactured in accordance with the requirements of the CLFMI Manual. Fence manufacturer shall be a CLFMI member.
- B. Fence manufacturer shall have at least ten years of experience in the manufacture of vinyl-coated galvanized steel chain link fencing.

1.05 SUBMITTALS

- A. Submit sample of fence fabric for Architect's review prior to installation.
- B. Shop Drawings shall be submitted for all fence materials, including, gate assembly and related hardware, for Architect's review.
- C. Submit manufacturer's certification that all fence materials conform to specification requirements.

PART 2 PRODUCTS

2.01 PVC COATED FENCE AND BACKSTOP FABRIC

- A. Fabric shall be PVC coated thermally fused and bonded to a primer which is thermally cured onto galvanized steel core wire conforming to ASTM F 668, Class 2b. Color of vinyl coating shall be black. Minimum coating thickness shall be 0.006 in. Color sample shall be submitted to the Architect for approval.
- B. Fabric shall be woven into a 2 in. mesh of 6 finished gauge (0.148 in.) galvanized wire with a minimum breaking strength of 1290 lb. in accordance with ASTM F 668, Class

2b.

- C. Zinc for galvanized coating shall conform to ASTM B 6, galvanized by hot dipped method AISI Type I, before vinyl coating; coating shall be smooth. Minimum weight of zinc coating shall be 0.30 oz. per sq. ft.
- D. Polyvinyl chloride coating shall meet the following requirements.
 - 1. Specific gravity shall be 1.30 maximum, tested in accordance with ASTM D 792.
 - 2. Hardness shall have a minimum Durometer reading of A 95 in accordance with ASTM D 2240. Ultimate elongation shall be 275% in accordance with ASTM D 412.
 - 3. Tensile strength shall have a test minimum of 3,300 psi in accordance with ASTM D 412.
 - 4. Vinyl shall be a dense and impervious covering free of voids, having a smooth, lustrous surface without pinholes, bubbles, voids, or rough or blistered surface.
- E. Thickness of fabric shall conform to the following.
 - 1. Uncoated (PVC) wire dimensions for 2 in. mesh openings shall be 0.148 in. in diameter. Zinc coating shall be minimum 0.30 ounces per square foot of wire surface. Vinyl coating shall be not less than 0.006 in.

2.02 CHAIN LINK FENCE POSTS, HARDWARE, AND FITTINGS - GENERAL

- A. Fittings shall be of best quality malleable iron casting, wrought iron forgings, or pressed steel and provided with pin connections. Equipment shall be designed to carry 100% overload.
 - 1. Malleable iron castings shall be hot-dipped galvanized in accordance with ASTM A 153.
 - 2. Wrought iron forgings or pressed steel fitting and appurtenances shall be hot-dipped galvanized in accordance with ASTM A 123.
 - 3. Fence hardware coatings shall match fence fabric coating.
- B. Piping for posts and rails shall be the following:
 - 1. Piping shall be Schedule 40 hot-dip galvanized steel pipe, conforming to ASTM A 53.
 - a. Zinc used for coating shall conform to ASTM B 6, High Grade and Special High Grade Zinc. Minimum average zinc coating shall be 1.8 oz./sq. ft. meeting ASTM F 1083 for standard weight (Schedule 40) galvanized pipe.
- C. Galvanized items shall be galvanized in accordance with ASTM A 123, A 153, or A 385, as applicable.
- D. Bolts which are installed 6 ft. or less above grade shall not protrude more than 1/4 in.

beyond the nut after tightening. Rough edges shall be filed smooth to the satisfaction of the Architect. Peen ends of all bolts after tightening.

2.03 POSTS

- A. Line post shall be 2.375 in. O.D., Schedule 40 pipe weighing 3.65 lb./ft.
- B. End and corner posts shall be 2.875 in. O.D. Schedule 40 pipe weighing 5.79 lb./ft.

2.04 CHAIN LINK RAILS AND POST BRACES

- A. Bottom rail and mid-rail, and post braces shall be 1-5/8 in. O.D. Schedule 40 pipe weighing 2.27 lb./ft.
- B. Truss braces: Fence shall have a brace rail of 1-5/8 in. O.D. between each terminal post and the next adjacent line post. Each brace rail shall have attachments for a 5/16 in. vinyl coated truss rod and turnbuckle attachment.
- C. Top rail shall be 1-5/8 in. O.D., Schedule 40 pipe weighing 2.27 lb./ft.

2.05 STRETCHER BARS

- A. Stretcher bars shall not be less than 3/16 in. x 3/4 in. and be full height of the fabric with which they are being used.
 - 1. Provide stretcher bars for each gate, end, corner and pull post.
- B. Stretcher bar bands and clips shall be heavy pressed steel, or malleable iron. At square post provide special design clips.
- C. Attachment bolts for bands shall be 5/16 in. x 1-1/2 in. galvanized carriage bolts with nuts, field painted to match vinyl fence color.

2.06 CAPS

- A. Posts shall have caps which shall be designed to exclude water from post. Caps shall have holes suitable for the through passage of the top rail where necessary.

2.07 TENSION AND TIE WIRE

- A. Tension wire shall be 6 gauge vinyl coated galvanized steel wire. Fabric shall be attached to the tension wire at intervals indicated on the Drawings. with vinyl coated hog rings.
- B. Tie wire shall be 13 gauge (.091 in.) vinyl-coated galvanized steel wire spaced as indicated on the Drawings; ends shall be wound in a telegraph twist two and one-half turns.

2.08 GALVANIZED PAINT

- A. Cold galvanized paint shall be one of the following:

Product

Manufacturer

Galvicon

Galvicon Corporation

Zinc Shield

Stanley Chemical Division of
The Stanley Works

2.09 VINYL COATING

- A. Galvanized posts, rails, braces, gates, and other frame components and fittings shall be vinyl coated to match the color of the vinyl coated fence fabric.

2.10 CONCRETE

- A. Concrete shall be air-entrained type, conforming to Section 033000, CAST-IN-PLACE CONCRETE, except as modified below:
 - 1. Minimum 28 day compressive strength shall be 2500 psi.
 - 2. Maximum size of aggregate shall be 1-1/2 in.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Chain link fence installation shall conform to ASTM F 567, except as modified below.
- B. Line posts shall be placed at not more than 10 ft. on center, or as indicated on Drawings.
- C. Fence shall be of height and dimension as shown on Drawings, from finish grade to top rail.
- D. Install fabric on security side of fence. Wire fabric shall be attached to frame, and tightly stretched such that it is flat, in uniform tension with no bulges or warping of fence or gate after pulling force is released. Ties shall be spaced at 15 in. on horizontal rails and braces, and 12 in. on posts. Bend ends of wire to minimize hazard to person or clothing. Set selvage at 1-1/2 in. below top of rail as indicated on the Drawings. Top of fence shall approximately follow grade and shall have no abrupt changes in slope. Height of fence shall be constant.
 - 1. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
 - 2. Bolts: Used in the construction of fence shall be thoroughly peened.
- E. Tension Wire: Provide tension line at bottom of fabric and at top (if top rail is not specified). Install tension wires before stretching fabric and tie to each post with ties or clips. Attach to fabric with hog rings 24 in. o.c.
- F. Stretcher Bars: Extend through fabric and secure to end, corner, pull and gate posts with bands or clips spaced not over 15 in. o.c.

3.02 FOUNDATIONS

- A. General: Unless otherwise indicated on the Drawings, footing diameter shall be four times the largest cross section of the post. The depth shall be as indicated on the Drawings.
- B. Concrete shall be crowned at top to shed water.

- C. Post hole footings shall be allowed to cured 72 hours prior to any additional work.

3.03 POSTS

- A. Layout:

- 1. End, corner and pull post: Provide at each termination and change in horizontal or vertical direction of 30 degrees or more.

- 2. Line Posts: Space uniformly at approximately 10 feet on center.

- B. Concrete Set Posts: (Corner, End and Pull Posts) Drill holes (after final grading) in firm, undisturbed or compacted soil. Holes shall have a diameter equal to four times the diameter of the post, and depths approximately 6 in. deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

- 1. Set post not less than 35 in. below surface when in firm, undisturbed soil.

- 2. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish tops of footings, and slope or dome to direct water away from posts, except at tennis courts, backstops and walks.

- 3. Gate posts and hardware: Set keepers, stops, sleeves and other accessories into concrete.

3.04 BRACING AND FRAMING

- A. Bracing: Install horizontal pipe brace at mid height for fences 6 ft. and over, on each side of corner posts and at gate, end, and pull posts. Firmly attach with proper fittings. Install diagonal tension rods at these points. Install braces so posts are plumb when diagonal rod is under proper tension.

- B. Top Rail:

- 1. Random length, averaging not less than 18 feet.

- 2. Pressed steel sleeve joints, for rigid connections and expansion/contraction.

3.05 TOUCH UP

- A. Following installation, scratches and marred spots in galvanized surfaces shall be power wire brushed and painted with a cold-applied galvanized paint at a rate of 2 oz. zinc per sq. ft. of surface.

- B. Following installation, scratches and marred spots in vinyl coated surfaces shall be field coated with a vinyl coating supplied by the fence manufacturer.

END OF SECTION

SECTION 323223

SEGMENTAL RETAINING WALLS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 DESCRIPTION OF WORK

- A. Provide all equipment and materials, and do all work necessary to construct segmental retaining walls and soil reinforcement as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other specification sections which directly relate to the work of this section include, but are not limited to the following:
 - 1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation and backfill and establishing subgrade elevations.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

C1372

Standard Specification for Dry-Cast Segmental Retaining Wall Units

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.05 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each color and texture of concrete unit specified.
- C. Submit manufacturer's certification that wall materials conform to specification requirements.

1.06 QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
- B. Comply with requirements in Section 312300 SITE EXCAVATING, BACKFILLING AND

COMPACTING for field quality control.

1. In each compacted backfill layer, perform at least one field in-place compaction test for each 50 feet or less of segmental retaining wall length.

PART 2 PRODUCTS

2.01 SEGMENTAL RETAINING WALL UNITS

- A. Concrete Units: ASTM C 1372, Normal Weight, except that **maximum water absorption shall not exceed 7 percent by weight and** units shall not differ in height more than plus or minus 1/16 inch from specified dimension.
- B. Provide units that comply with requirements in ASTM C 1372 for freeze-thaw durability.
- C. Color: As selected by Architect from manufacturer's full range.
- D. Shape and Texture: Provide units with **flat exposed face**.

2.02 INSTALLATION MATERIALS

- A. Pins and Clips: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.
- B. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.
- C. Compacted Aggregate Base: Comply with requirements in Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING for base course.
- D. Drainage Fill: Comply with requirements in Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING for drainage fill.

PART 3 EXECUTION

3.01 RETAINING WALL INSTALLATION

- A. General: Place units according to NCMA's "Segmental Retaining Wall Installation Guide" and segmental retaining wall unit manufacturer's written instructions.
 1. Lay units in running bond.
 2. Form corners and ends by splitting units with mason's hammer and chisel.
- B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
- C. First Course: Place first course of segmental retaining wall units for full length of wall. Place units in firm contact with each other, properly aligned and level.
 1. Tamp units into leveling base as necessary to bring tops of units into a level plane.

- D. Subsequent Courses: Remove excess fill and debris from tops of units in course below. Place units in firm contact, properly aligned, and directly on course below.
- E. Cap Units: Place cap units and secure with cap adhesive.

3.02 FILL PLACEMENT

- A. General: Comply with requirements in Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING, with NCMA's "Segmental Retaining Wall Installation Guide," and with segmental retaining wall unit manufacturer's written instructions.
- B. Fill voids between and within units with drainage fill. Place fill as each course of units is laid.
- C. Place, spread, and compact drainage fill and soil fill in uniform lifts for full width and length of embankment as wall is laid. Place and compact fills without disturbing alignment of units. Where both sides of wall are indicated to be filled, place fills on both sides at same time. Begin at wall, and place and spread fills toward embankment.
 - 1. Use only hand-operated compaction equipment within 48 inches of wall, or one-half of height above bottom of wall, whichever is greater.
 - 2. Compact reinforced-soil fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.
 - a. In areas where only hand-operated compaction equipment is allowed, compact fills to not less than 90 percent maximum dry unit weight according to ASTM D 698.
 - 3. Compact nonreinforced-soil fill to comply with Section 312300 SITE EXCAVATING, BACKFILLING AND COMPACTING.
- D. Place a layer of drainage fill at least 10 inches wide behind wall to within 4 1/2" inches finished grade.

END OF SECTION

SECTION 323225

STONE WALLS

PART 1 GENERAL

1.01 GENERAL REFERENCE

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.02 WORK INCLUDED

- A. Provide all materials and equipment, and do all work required to construct stacked and mortared, cut granite walls constructed to give the appearance of dry laid walls, as indicated on the Drawings and as specified.

1.03 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 14339, MOCK-UPS.
 - 2. Section 3123000, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.

1.04 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Society for Testing and Materials (ASTM):

C 5	Quicklime for Structural Purposes
C 144	Aggregate for Masonry Mortar
C 150	Portland Cement
C 270	Mortar for Unit Masonry
D 1557	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18 in. (457-mm) Drop
 - 2. Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Roads, Bridges and Incidental Construction
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1.05 QUALITY ASSURANCE

- A. Installer shall be a firm which has successfully installed stonework for comparable project for a period of not less than five (5) years.

- B. Supplier must be able to adequately demonstrate to the Landscape Architect that it can supply the quantities and types of stone which are required for the project.
 - 1. The right is reserved, at the source or job site, to reject materials deemed by the Landscape Architect to be unsuitable. Such material shall be removed from the job site at the Contractor's expense.
 - 2. Stone from specified source shall display consistent color range and texture throughout the work.

1.06 SUBMITTALS

- A. Samples: Submit one pallet of granite samples to Landscape Architect for review as soon as possible after award of contract. Include full range of color, finish, and texture to be expected in completed work.
 - 1. Obtain Landscape Architect's acceptance of visual qualities of stone before start of stonework. Retain samples during construction as a standard for judging completed stonework.
 - 2. Mortar Samples: Submit a set of colored pointing mortar samples.
- B. The following mock-up shall be constructed as prototype for the stone wall work.
 - 1. Construct wall mockup, 8 ft. long x full width x full height before start of any stone wall work. Sample shall exhibit proposed color range, texture, coursing, jointing, cap treatment, workmanship and relationship to abutting work.
- C. Mockup will be inspected by the Landscape Architect. If the mockup is not acceptable, construct additional at no cost to the Owner until an acceptable mockup is constructed. Accepted mockup shall become the standard for the entire job, and shall remain undisturbed until completion of all work. Acceptable mock-up may be incorporated into the finished work.

1.07 QUALITY CONTROL

- A. Wall contractor shall assume single source responsibility for entire wall construction including necessary excavation and compaction, gravel base or concrete footing (as indicated on the Drawings), providing stone wall materials, erecting stone wall, required drain stone and backfill, weepholes and subdrainage as indicated on the Drawings.

PART 2 PRODUCTS

2.01 GRANITE

- A. Granite Wall Stone: shall be reclaimed or salvaged stones with the appearance of a mix of New England granites, supplied by Olde New England Granite, 1 New Salem Street, Wakefield, MA 01880; Tel. 1-781-334-4805, or approved equal.
- B. Stone shall meet the requirements of this section and shall be approved by the Landscape Architect.
- C. Stones shall be selected or split to provide a reasonably flat top surface and visible face. Sides of stones shall be cut or split to minimize the joints between stones.

- D. Stretcher stones (1 ft. - 0 in. x 3 ft. - 0 in. minimum size) shall have a depth in the wall of at least 1-1/2 times the rise of the stone and a length on the face of at least 1/3 the rise. Headers (0 ft. - 8 in. x 1 ft. - 4 in. x 1 ft. - 8 in. deep minimum size) shall have a length on the face at least twice the rise. Headers shall hold in the heart of the wall the same size as shown on the face and shall extend into the wall at least 12 in. more than the stretchers. At least 75% of stretcher stones shall have vertical face dimensions in the range of 8 to 16 in.
- E. Existing Memorial stone to be reused in face of wall. Cut to dimensions shown on the drawings.

2.02 MORTAR

- A. Mortar shall be ASTM C 270, Type M.
- B. Portland cement shall be any American brand conforming to ASTM C 150, Type I or II.
- C. Sand shall conform to ASTM C 144.
- D. Water shall be potable.
- E. Lime shall be fresh-burned, pulverized, unslaked when received, conforming to ASTM C 5, or an approved brand of Type S mason's hydrated lime conforming to ASTM C 207.
- F. Waterproofing admixture for mortar shall be one of the following:

<u>Admixture</u>	<u>Manufacturer</u>
Hydratite Plus	W.R. Grace & Company
Medusa Waterproofing	Medusa Portland Cement Company
Omicron Mortarproofing	Master Builders Company
Mortaron	The Aquabar Company
Hydracide Paste	Sonneborn Building Products, Inc.

2.03. AGGREGATE BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
 - 1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.04 WEEPHOLES

- A. Weepholes shall be constructed of 1 in. diameter copper pipe with stainless steel screen, at intervals indicated on the drawings.

2.05 FILTER FABRIC

- A. Filter fabric shall be a non-woven polypropylene fabric made specifically for use in subsurface drainage structures equal to Mirafi 140N, manufactured by Tencate, 365 South Holland Drive, Pendergrass, GA 30567; Tel 800 685 9990; Tel 706 693 2226; Fax 706 693 4400; www.mirafi.com, or approved equal.

PART 3 EXECUTION

3.01 ESTABLISHING WALL LINE

- A. Establish location and line of all stone walls prior to construction by staking in the field with stake spacing not exceeding 15 ft. o.c., showing length and height of wall. Location and line shall be inspected and approved by the Landscape Architect before construction.

3.02 PREPARATION OF SUBGRADE

- A. Subgrade to receive stone wall shall be smoothed and compacted prior to placing aggregate base. Excavation and backfill shall meet requirements of Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.

3.03 AGGREGATE BASE

- A. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2 in. shall be excluded from course.
- B. Width of base course shall be greater than or equal to the width of wall surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- C. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density.
- D. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with aggregate base. Materials spilled outside pavement lines shall be removed and area repaired.
- E. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.04 MORTAR BEDDING AND JOINTS

- A. Mortar shall be stiff mix, using smallest amount of water possible.
 - 1. Lime shall be kept dry until used.
 - 2. Quicklime shall be thoroughly water-slaked at the site for at least 72 hours.
 - 3. Lime putty shall be kept moist until used.
- B. Add mortar waterproofing to mortar in accordance with waterproofing manufacturer's directions.
- C. Plasticity of mortar shall be maintained by retempering as required up to 2-1/2 hours after original mixing of mortar. Mortar requiring retempering to maintain proper workability after this period shall be discarded.
- D. Mortar grout shall contain a coloring additive. Color shall be approved by the Landscape Architect.

1. Coloring additive shall be equal to SGS Colors, manufactured by Solomon Grind Service, Springfield, IL 62705.
2. Mortar coloring additive shall have mineral oxide pigment and shall be certified by the supplier to be resistant to alkali, light, and weather, and shall be of a chemical composition unaffected by cement and free of water and soluble salts.
3. Color pigment in grout mixture shall not exceed 10% of the Portland cement content.
4. Color will be selected by Architect.

3.05 STONE WALL CONSTRUCTION

- A. Wall pattern shall follow image shown on the drawings. Rectangular shaped stones shall be laid horizontally, no stones set vertically, with a minimum 6 in. below finish grade. Vertical joints shall be offset by at least 3 in. at each course, and no vertical joint shall be located directly above or below a header.
- B. Each stone shall be cleaned and thoroughly wetted before being set. Selected stone, roughly shaped to provide suitable exposed faces, shall be used at wall angles.
- C. A minimum of 50% of Cap stones at top of wall shall extend across full width of wall; the remaining cap shall be made up of no more than 2 stones across the width.
- D. No Chinking in joints.
- E. Stones shall be laid on full mortar bed. Mortar joints shall be full, and the stones settled in place before the mortar has set. Mortar joints and beds shall be raked back and forcibly tamped before mortar has set to produce sound, dense faces lying 6 in. inside the visible face of the wall, to give the appearance of a dry laid wall. Joints in top of wall shall be raked back approximately 1 in., pointed full with a dense, stiff mortar. Top joints shall be forcibly tooled to finish 1/4 in. (at center of wall) to 1/2 in. (at face of wall) below top of stones, and shall be uniformly sloped between high and low point. No mortar shall be visible at joints.
- F. Wall shall be constructed with weepholes between stone joints at base above finished grade. Maximum spacing of weepholes shall be as indicated on the Drawings.
- G. Masonry shall be covered at night and during bad weather with non-staining waterproof coverings for a minimum of seven days following completion of the wall.
- H. Mortar and mortar stains shall not be permitted on visible faces of stone. Mortar stains and excess mortar shall be removed and the wall shall be left in a neat and workmanlike condition.

3.06 BACKFILL

- A. Where back of wall is below grade, back of wall shall be backfilled with stone aggregate material. Aggregate shall be not less than 6 in. thick from back of wall, and shall extend for full depth of wall, except for the top 6 in.

END OF SECTION

SECTION 328000

IRRIGATION SYSTEM

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 DESCRIPTION OF WORK

- A. This is a Design/Build Specification: The Contractor is responsible for the design and engineering of the entire irrigation system including sizing all piping, calculating system hydraulics, testing, and all other work required for a complete operable system and for providing the specified guarantees. Design and install irrigation system in compliance with ASIC Standards.
1. The mechanical point of connection for the irrigation system shall be after the water meter (provided by the City), a dedicated backflow preventer will need to be installed for the irrigation system. The water source will be from the city system, confirmed at 82psi”.
 2. Irrigation timer/clock will be a Rainbird TBOS (Battery Operated Timer Controller) (or equal) with matching solenoids thus no electrical connections needed.
- B. On-Site Conditions
1. Inspection of the Site: The Contractor shall acquaint himself with all on-site conditions. Should utilities not shown on the Drawings be found during excavations, the Contractor shall promptly notify the Owner for instruction as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on the Drawings.
 2. Protection of Property: The Contractor shall be responsible for the preservation and protection of all site conditions to remain from damage due to this work. In the event damage does occur, all damage shall be completely repaired to its original condition at no additional cost to the Owner.
 3. Trenching: All trenching or other work under the leaf canopy of any and all trees shall be done by hand or by other methods so that no branches, and minimal root systems are damaged in any way.
 - a. Trenching around existing plant material shall be done by hand so as to minimize root disturbance.
 - b. Buildings, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flagged and barricaded by the Contractor by approved means. The Contractor shall restore disturbed areas to their original condition.
 4. Protection and Repair of Underground Utilities: The Contractor shall be responsible for requesting the proper utility company to stake the exact location of any underground lines

including but not limited to electric, gas, telephone service, water, and cable.

- a. Call "DIGSAFE," at 811 at least 3 business days before you dig. Contractor shall verify the location of existing utilities in the field prior to commencing construction. No adjustments will be made after construction has commenced.
- b. The Contractor shall take whatever precautions are necessary to protect these underground lines from damage. In the event damage does occur, all damage shall be completely repaired to its original condition, at no additional cost to the Owner.

1.03 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other specification sections which directly relate to the work of this section include, but are not limited to the following:

1. Section 329200, LAWNS AND GRASSES; Lawns and grasses.
2. Section 329300, TREES, PLANTS AND GROUND COVERS; New plantings.

1.04 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute (ANSI):

B16.26 Tubes	Cast Copper Alloy Fittings for Flared Copper
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2. American Society of Irrigation Consultants (ASIC):

Standards	Minimum Standards for Landscape Irrigation
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3. American Society for Testing and Materials (ASTM):

B 88	Seamless Copper Water Tube
D 1785	Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120
D 2239	Polyethylene (PE) Plastic Pipe (SLPR - PR) Based On Controlled Diameter.
D 2241	Poly(Vinyl Chloride) (PVC) Plastic Pipe (SDR- PR)
D 2464	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D 2466	Poly (Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40

F 690

Underground Installation of Thermoplastic
Pressure Piping Irrigation Systems

1.05 SUBMITTALS

- A. Submit a complete materials list indicating name of manufacturer, with model numbers of proposed irrigation system equipment and accessories.
- B. After completion of installation, furnish complete As-built drawings showing locations of all sprinkler heads, valves, drains, and piping to scale, with dimensions where required or necessary.
 - 1. On or before the date of final field observation, deliver completed AutoCAD computer plots of "As-built record drawings on vellum and AutoCAD electronic files on disk to Owner as part of contract closeout. Delivery of plots will not relieve Contractor of the responsibility of furnishing required information that may have been omitted from the prints.

1.06 LAWS, CODES, AND ORDINANCES

- A. Irrigation system shall be installed in accordance with the latest laws, ordinances, rules, and regulations of all local, state, and federal authorities having jurisdiction.

1.07 GUARANTEE

- A. In addition to the manufacturer's guarantees, the Contractor shall warrant the entire irrigation system, both parts and labor for a period of two (2) years from the date of acceptance by the Owner.
 - 1. The Contractor will be held strictly responsible for all parts of his work. If failure in the irrigation system or appurtenances develop within two (2) years from the date of final approval and acceptance of the work, the Contractor will be required to replace all faulty materials at his full expense.
 - 2. Labor and materials to fulfill the requirements of this warranty shall be furnished by the Contractor at no additional cost to the Owner. All labor shall include premium time to correct any faulty material or workmanship.
 - 3. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.

1.08 QUALITY ASSURANCE

- A. All applicable ANSI, AWWA, and ASTM Standards and Specifications, and all applicable building codes and other public agencies having jurisdiction upon the work.
- B. Protection of Existing Plants and Site Conditions: The Contractor shall take necessary precautions to protect site conditions to remain. Should damages be incurred, this Contractor shall repair the damage to its original condition at his own expense. Any disruption, destruction, or disturbance of any existing plant, tree, shrub, or turf, or any structure shall be completely restored to the satisfaction of the Owner, solely at the Contractor's expense.
- C. Permits and Fees: Obtain all permits and pay required fees to any governmental

agency having jurisdiction over the work. Inspection required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to Architect to show that all work has been installed in accordance with the ordinances and code requirements.

- D. The Contractor shall provide full coverage in all irrigated areas and shall be responsible for additional heads and components as required, installed at his own cost.
- E. On-Site Observation: At any time during the installation of the irrigation system by the Contractor, the Owner or Architect may visit the site to observe work underway. Upon request, the Contractor shall be required to uncover specified work as directed by the Owner or Architect without compensation. Should the material, workmanship or method of installation not meet the standards specified herein, the Contractor shall replace the work at his own expense.
- F. Workmanship: All work shall be installed by skilled personnel, proficient in the trades required, in a neat, orderly, and responsible manner with recognized standards of workmanship. The Contractor shall have had considerable experience and demonstrated ability in the installation of sprinkler irrigation systems of this type.

1.09 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Contractor shall include in their Bid an allowance for four (4) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Architect's 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 SPLAINE PARK IRRIGATION SYSTEM, shall be submitted to the Architect's 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 all irrigation equipment;

- b. Operation:
 - c. Maintenance: including complete troubleshooting charts.
 - d. Parts list.
 - e. Names, addresses and telephone numbers of recommended repair and service companies. 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.
6. Winterization and spring start-up procedures.
7. Guarantee data.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. Polyvinyl chloride (PVC) plastic pipe shall be continuously and permanently marked with the following information: Manufacturer's name, pipe size, type of pipe and material, SDR number, ASTM number, and the NSF (National Sanitation Foundation) seal.
- B. Main Lines (irrigation line on the supply side of the system up to the zone control valves).
 - 1. Pipe 4 in. diameter and less shall be Schedule 40 polyvinyl chloride (PVC) plastic pipe 1120 or 1220, NSF approved, conforming to ASTM D 1785.
 - 2. Pipe larger than 4 in. diameter shall be polyvinyl chloride (PVC) plastic pipe, SDR 21, 1120 or 1220, conforming to ASTM D 2241, with a minimum pressure rating of 200 psi.
 - 3. Plastic pipe fittings shall be polyvinyl chloride (PVC) molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld or slip joint ringtite seal (Schedule 40) conforming to ASTM D 2466, or threaded connections (Schedule 80) conforming to ASTM D 2464.
 - 4. Slipfitting socket taper shall be sized so that a dry unsoftened pipe end conforming to these specifications can be inserted no more than halfway into the socket. Plastic saddle and flange fittings shall not be used. Only Schedule 80 pipe may be threaded.
- C. Lateral Lines (irrigation lines on the sprinkler head side of the system from the control valves to the sprinkler heads).
 - 1. Pipe 2 in. diameter and less shall be polyethylene (PE) pipe, SDR 9, Class 160, Type III, Grade 3, Class C conforming to ASTM D 2239, with a minimum pressure rating (PR) of 160 psi.
 - 2. Pipe larger than 2 in. diameter shall be polyvinyl chloride (PVC) plastic pipe, SDR 26 conforming to ASTM D 2241, with a minimum pressure rating (PR) of 160 psi.
 - 3. Polyethylene pipe fittings shall be insert PVC or nylon type fitting recommended by pipe

manufacturer. Fittings shall conform to NSF Standards, and be attached with two (2) dog-eared stainless steel clamps supplied by Harvard, Liverpool, NY, or approved equal. Fittings shall be per ASTM D2609, manufactured by Dura, Lasco or approved equal

4. 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.

- D. Copper tubing: Hard, straight lengths of domestic manufacture only Type "K" conforming to ASTM B 88. No copper tube of foreign extrusion or thin wall copper tubing shall be used.

1. Where necessary, joints shall be made with cast brass three-part compression coupling or flared tube fittings conforming to ANSI B16.26.

- E. Sleeves

1. For Control Wires: Schedule 40 PVC pipe or Schedule 40 galvanized steel pipe.
2. For Water Lines: Schedule 40 PVC or Schedule 40 galvanized steel pipe.
3. Sleeve size shall be at least twice the diameter of the pipe line.

- F. Adapters

1. All adapters shall be provided as required by the manufacturer, and are required to construct the proposed system.

2.02 WARNING AND DETECTOR TAPE

- A. Detector tape for identification of irrigation main locations shall be manufactured by Reef Industries, Inc., Houston, TX 77275-0218, or approved equal. Detector tape shall consist of a solid aluminum foil core running the full length and width of the tape and encased in a protective, high visibility, color coded inert plastic jacket.

1. Color of tape shall be "Safety Precaution Blue."
2. Tape shall be imprinted with the following legend: "Caution Buried Irrigation Line Below".

2.03 SPRINKLERS AND RISER ASSEMBLY

- A. Sprinklers: Manufacturer's standard sprinklers designed for uniform coverage over entire spray area indicated, at available water pressure.

1. Flush, Surface Sprinklers: Fixed pattern, with screw-type flow adjustment.
2. Bubblers: Fixed pattern, with screw-type flow adjustment.
3. Pop-up, Spray Sprinklers: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.
4. Pop-up, Rotary, Spray Sprinklers: Gear drive, full-circle and adjustable part-circle types.

5. Pop-up, Rotary, Impact Sprinklers: Impact drive, full-circle and part-circle types.

2.04 DRIP SYSTEM COMPONENTS

- A. Dripperline and Integral Dripperline Components: The dripperline shall be Techline CV or Techline pressure compensating dripperline or 8mm Techlite non-pressure compensated dripperline, manufactured by Netafim Irrigation, Inc., or approved equal. Dripper flow rate and spacing shall be as recommended by drip system component manufacturer based on specific plant material to be irrigated.
 1. Techline CV/Techline/8mm Techlite Fittings: All Techline CV/Techline/8mm Techlite connections shall be made with approved Techline CV/Techline/8mm Techlite insert fittings.
 2. Soil Staples: All on-surface/under mulch Techline CV/Techline/8mm Techlite installations shall be held in place with Techline Soil Staples spaced evenly every 3' - 5' on center, and with two staples on each change of location.
 3. Line Flushing Valves: All Techline/Techlite systems shall be installed with Netafim Automatic Line Flushing Valves. Techline CV zones do not require an automatic line flushing valve but must have a manual flushing port(s) in the position that an automatic flush valve would be positioned.
 4. Air/Vacuum Relief Valves: Each independent Techline subsurface irrigation zone shall be installed with an Air/Vacuum Relief Valve at the zone's highest point(s). Techline CV zones do not require an Air/Vacuum Relief Valve.
 5. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. The pressure regulator shall be a Netafim Pressure Regulator.
 6. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be a Netafim Disc Filter.
 7. Reduced Pressure or other Backflow Prevention Units: Reduced pressure backflow prevention units or any unit as required by local codes shall be provided as indicated on drawings and shall comply with local codes.

2.05 SOIL MOISTURE SENSOR

- A. Soil moisture sensor shall sense soil moisture status by measuring the conductivity of a soil volume between two stainless steel probes. Moisture sensor device shall interrupt programmed irrigation cycles until the soil moisture matrix potential has reached a predetermined state. Soil moisture sensor shall be "Baseline Watertec S100" Soil Moisture Sensor, manufactured by Baseline LLC, 2700 E Lanark St. Ste. 100, Meridian, ID 83642 USA; Tel. Day Time Voice (208) 323-1634; Fax (208) 323-1834; Toll Free (866) 294-5847, or approved equal.
 1. Soil moisture sensor shall be electrically isolated from other electrical potentials, and be wired from the sensor controller to the probes with water tight materials and connections.

2.06 AUTOMATIC REMOTE CONTROL VALVE AND BOX

- A. Automatic remote control valves shall be pressure regulating electric remote control

valves. Valve size shall not be less than the size of the lateral served.

- B. Each remote control valve shall have a valve box.

1. Valve box shall be impact resistant cyclac plastic with locking cover, similar to those manufactured by Ametek, Sheboygan, WI 53081. Cover color shall be green.

- C. Remote control valve tags shall be yellow with thermofused numbers.

2.07 GATE VALVE AND BOX

- A. Gate valves 2 in. and smaller shall be cast iron body, bronze mounted with non-rising stem and working pressure rating of 200 psi.

- B. Gate valves larger than 2 in. shall be mechanical joint or flanged cast iron with non-rising stem and working pressure rating of 200 psi.

- C. Gate valves for above grade or pit use shall be supplied with wheel handles.

- D. Gate valve for underground use shall be supplied with 2 in. square operating nut.

- E. Each gate valve shall have a valve box.

1. Valve box shall be impact resistant cyclac plastic with locking cover, similar to those manufactured by Ametek, Sheboygan, WI 53081. Cover color shall be green.

2.08 DRAIN VALVE AND BOX

- A. Drain valves shall be all bronze construction manual angle valves installed at low points in system.

- B. Each drain valve shall have a valve box.

1. Valve box shall be impact resistant cyclac plastic with locking cover, similar to those manufactured by Ametek, Sheboygan, WI 53081. Cover color shall be green.

2.09 CONTROL AND GROUND WIRE

- A. Control and ground wiring shall be minimum Type "UF", #12 wire, 600 volt, solid copper, single conductor wire with PVC insulation and shall bear UL approval for direct underground burial feeder cable.

- B. A minimum of one extra wire for each direction of run to last valve shall be supplied. Extra wire shall be a fugitive color, loop at each valve.

- C. Wire types, connectors, splices, and installation procedures shall conform to applicable local codes.

- D. Multi conductor cable will not be acceptable.

- E. Wire splices shall be made with "scotch lock connectors" or "snip snap caps" (per title connectors) or other approved method.

2.10 QUICK COUPLING VALVES

- A. Quick coupling valves shall be 1 in. heavy duty brass construction one-piece body design, with locking rubber cover. Furnish to the Owner the following additional items: three hollow coupler keys and three swivel hose ell adapters.
 - 1. For use on systems using non-potable water, locking rubber cover shall have molded-in warnings of "DO NOT DRINK" in English and Spanish

2.11 BACKFLOW PREVENTER

- A. Backflow preventer shall be required at all cross-connections between irrigation system and potable water.
- B. Backflow preventer, based upon prevailing local codes, shall be of the following type:
 - 1. Double check valve backflow preventer

2.12 AUTOMATIC CONTROLLER

- A. Automatic controller shall be a battery operated timer controller type similar to Rainbird TBOS. Controller shall have the following features:
 - 1. Convenient temporary option for providing uninterrupted irrigation while repairs are made to an AC-powered system.
 - 2. 365-day calendar (adjusts for leap year).
 - 3. AM/PM or 24-hour display.
 - 4. Basic programming (standard mode) includes 3 independent programs, each with 8 start times per day. Run time is from 1 minute to 12 hours in 1-minute increments on a 7-day calendar.
 - 5. Additional cycles (turbo mode) include even, odd, odd-31 and 1-6 day program cycles for maximum flexibility.
 - 6. The low battery indicator warns of failing batteries in the TBOS field transmitter or TBOS control module.
 - 7. Independent station operation allows simultaneous start times or sequential start times based on system hydraulic capacity.
 - 8. The TBOS field transmitter has a large Liquid Crystal Display (LCD), with self-explanatory function icons. Each function is indicated by an easy-to-understand symbol.
 - 9. The 7-key keypad is equipped with a 'beep' sound to confirm that a key has been pressed for fast and sure programming.
 - 10. One TBOS field transmitter programs an unlimited number of TBOS and UNIK Control Modules
 - 11. Fully backward compatible - operates in standard mode with all components of Rain Bird's UNIK controller line.

12. The field transmitter and control module have external optical connectors for easy plug-in.
13. It is possible to transmit information even if the module is under water.
14. The TBOS potted latching solenoid will mount on all Rain Bird valves in the DV, DVF, ASVF, PGA, PEB, PESB, GB, EFB-CP, BPE and BPES series.
15. The TBOS solenoid adapters will adapt the potted latching solenoid for use in retrofit applications with selected Irritrol® (Hardie/Richdel) and Buckner® valves or Champion® and Superior® valve actuators

- B. Controller shall be Rain Bird Series, Hunter Industries series, or approved equal. Controller shall be UL listed and tested.
- C. Location of controller unit and type of mounting will be determined by the Owner and Architect.
- D. Controller shall be equipped with a valve output lightning/electrical surge protection kit.
- E. Exterior Controller Enclosure: NEMA 250, Type 4, weatherproof, with locking cover and 2 matching keys; include provision for grounding.
 1. Material: Stainless-steel.
 2. Mounting: Surface type for wall mounting.

2.13 THRUST BLOCKS

- A. Concrete for thrust blocks shall be 2500 psi, minimum, air-entrained concrete.

PART 3 EXECUTION

3.01 GENERAL

- A. Coordinate all installation/repair work with landscape planting work, especially fine grading, and soil preparation for lawn areas per Section 329200, LAWNS AND GRASSES.
- B. Excavation required for the installation of the irrigation system shall conform to ASTM F 690.

3.02 PIPE, CONTROL VALVE, AND CONTROL WIRE INSTALLATION

- A. Plastic pipe shall be delivered to the site in manufacturer's packaging, stacked in such a manner as to provide adequate protection from compression and deformation of the pipe ends. Pipe shall be protected from exposure to direct sunlight.
- B. Pipe interior shall be thoroughly cleaned of all dirt or foreign matter before lowering pipe into trenches. Pipe interiors shall be kept clean during pipe installation by plugs or other approved methods. Piping shall not be installed in water or mud. Ends of pipe shall be securely closed when work is not in progress to prevent water and foreign matter from entering the lines.
- C. PVC pipe shall be cut with a hand saw or hack saw with the assistance of a square in sawing vise, or other manner to ensure a square cut. Burrs at cut ends shall be

removed prior to installation so that a smooth unobstructed flow will be obtained.

- D. Installation of plastic pipe shall conform strictly to manufacturer's recommendations and to ASTM F 690.
1. Metallic fittings shall not be supported by PVC pipe. Metallic fittings shall be supported by a concrete block or cradle.
 2. When damaged, plastic pipe shall be replaced by cutting out entire damaged area and replacing with same Schedule, Class, and type of pipe, or heavier, at no additional cost. Plastic pipe shall be thoroughly dry when this replacement is made.
- E. Snake pipe in trench from side to side to allow for expansion and contraction.
- F. Threaded Joints for Plastic Pipes:
1. Use Teflon tape on the threaded PVC fittings except where Marlex fittings are used.
 2. Use strap-type friction wrench only: Do not use metal-jawed wrench.
 3. When connection is plastic to metal, male adapters shall be used. Male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon tape or equal upon approval.
- G. Threaded Joints for Galvanized Steel Pipes:
1. Factory-made nipples shall be used wherever possible. Field-cut threads in pipes will be permitted only where absolutely necessary and approved by Architect; when field threading, cut threads accurately on axis with sharp dies.
 2. Use pipe joint compound or Teflon tape to male threads only.
- H. Joints for Polyethylene Pipes:
1. Double-clamp all connections 1-1/4 in. diameter and greater.
 2. Make all connections between polyethylene pipes and metal valves or pipes with threaded fittings using male adapters.
- I. Connections between plastic pipe and metal valves or steel pipe shall be made with threaded fittings using plastic toe nipples or shall be made with adapters and a non-hardening pipe compound applied to male threads.
- J. Solvent weld joints shall be made according to manufacturer's instructions. Joints shall be tight and inseparable. Joints shall be allowed to cure 24 hours at temperatures over 40oF. before testing.
1. Solvent shall be compatible with plastic material of heads, pipe, and fittings.
- K. Remote control valve shall be installed in a valve box with a locking lid.

1. Clearance between the highest part of the valve and the bottom of the valve box lid shall be 2 in., minimum, and 4 in., maximum. The lid shall not rest on any part of the valve.
2. Clearance between the top of the piping and the bottom of the valve box or the valve box knock-outs shall be 2 in., minimum. Valve box shall not rest on piping.
3. Clearance between the valve body and the sides of the valve box shall be 3 in., minimum.

- L. Control wire splices shall be made at electric valve locations. Make no splices between the controller and the remote control valve. Lay to the side of pipeline. Provide looped slack at valves and snake wires in trench to allow for contraction. Tie wires in bundles at 10 ft. intervals. Control wires crossing under pavements shall be installed in conduit.

1. Install a minimum of one extra control wire to the control valve located the greatest distance from the controller in each direction and label each end.
2. Install tag to valve wire before making final connection.
3. Separate color coding of control wires by satellite if required.

3.03 INSTALLATION OF SPRINKLER HEADS

- A. After irrigation piping and risers are in place and connected, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system. Sprinkler heads shall be installed only after flushing of the system has been completed.
- B. Sprinklers shall be set plumb and perpendicular to finish grade.
- C. Sprinklers and valve box covers adjacent to walls, curbs, and other paved areas, shall be set to finish grade unless otherwise noted on Drawings.

3.04 INSTALLATION OF DRIP SYSTEM

- A. Dripperline Installation:
1. Install all dripperline as indicated on Drawings. Dripperline shall be installed in areas designated, by hand under the mulch, and shall have an average depth of 4 inches unless otherwise indicated on the Drawings. Tubing should not be visible through the mulch. All in-line emitter tubing shall be installed on the high side of the plant material being watered to help insure dispersion of the water. Use only Teflon tape on all threaded connections.
 - a. In-line emitter tubing is to be installed 4 inches from all planter edges, curbs and walls. Spacing of in-line emitter tube is to be 18 inches center-to-center in all irrigated areas.
 - b. All in-line tubing shall have a minimum incoming pressure of not less than 5-PSI of the pressure regulator, 45-PSI, to assure a maximum linear length of 280 feet at zero elevation lift.
 2. Clamp Techline/Techlite fittings with Oetiker clamps when operating pressure exceeds specific dripperline fitting requirements.

3. When installing Techline CV, Techline, or 8mm Techlite dripperlines on-surface, install soil staples as listed below:
 - a. Sandy Soil - One staple every three (3') feet and two (2) staples on each change of direction (tee, elbow, or cross).
 - b. Loam Soil - One staple every four (4') feet and two (2) staples on each change of direction (tee, elbow, or cross).
 - c. Clay Soil - One staple every five (5') feet and two (2) staples on each change of direction (tee, elbow, or cross).
4. Cap or plug all openings as soon as lines have been installed to prevent the intrusion of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
5. Thoroughly flush all water lines before installing valves.

- B. Pressure regulator shall assure a 45-PSI downstream pressure entering drip supply header. Pressure shall be verified by contractor to assure proper operating pressure for the in-line emitter tubing at maximum linear run of 280 feet. Contractor may need to manifold pressure regulators to reach the mid-range flow of the regulator.
- C. n-line 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 in-line drip tubing at minimum 5-foot intervals to prevent movement.
- D. Air relief valves shall be installed in the emitter tubing, at high elevation points as indicated on the drawing.

3.05 GATE VALVES

- A. Install isolation and branch gate valves directly on main as required.
- B. Where gate valves isolate branch mains of a smaller size, size valve to largest main and add reducing fittings downstream of valves.
- C. Install valve and valve box to finish grade as indicated on the Drawings.

3.06 TESTING AND COMPLETION

- A. Flushing:
 1. After all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals, open the control valves and flush out the system under a full head of water.
 2. Sprinkler internals, flush caps and riser nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
 3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles for thirty (30) days after substantial completion of this portion of the landscape irrigation system.

- B. Irrigation system shall be tested for leakage prior to backfilling of piping. Leakage test shall be at 100 psi pressure at furthest point of system being tested for a minimum period of one hour. System is acceptable if no leakage or loss of pressure occurs.
- C. When the irrigation system is completed, perform a coverage test in the presence of the Architect to determine if the coverage of water for all areas is completely adequate. All valves, and the alignment and coverage of all sprinkler heads shall be adjusted, prior to final inspection, for required coverage. Correct inadequacies of coverage as directed by Architect.
- D. All testing shall be at the expense of the Contractor.
- E. Instruct Owner's designated personnel in proper operation of irrigation system, including programming controller; valves; adjustment of sprinkler heads.

3.07 BACKFILL AND COMPACTING

- A. After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil, free of debris.
- B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum 95% density under pavements, 85% under planted areas.
- C. Dress off all areas to finish grades.

3.08 PRESSURE SETTING

- A. Prior to final inspection Contractor shall adjust each remote control valve to an agreed operating pressure by installing temporary pressure gauge on schrader valve and making necessary adjustments while valve is operating.

3.09 CLEAN UP

- A. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.
- B. Contractor shall remove all debris resulting from work of this section.
- C. Contractor shall regrade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.
- D. Contractor shall fill all 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.

3.10 WINTERIZATION

- A. Winterization: The irrigation system is designed to be completely drained to protect pipe from bursting prior to freezing temperatures. To adequately drain the system the following procedure must be followed:
 - 1. Air blow-out
 - a. Set automatic controller stations to 3 minutes timing.
 - b. Attach hose from portable air compressor to 1-inch air inlet installed on main line

at back flow prevention device in basement.

c. Operate compressor at 100 cubic feet per second at 60-80 psi.

2. Manual drain valves: Open manual drain valves located at low points on the main line to drain main completely after air blow-out has been completed.

END OF SECTION

SECTION 329119

LANDSCAPE GRADING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. The work includes furnishing all labor, materials, equipment, and supervision to complete the site grading work in accordance with the Drawings and Specifications.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 014000, QUALITY REQUIREMENTS; Topsoil and other planting materials testing.
 - 1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Excavation, backfill; establishment of subgrade elevations.
 - 2. Section 329200, LAWNS AND GRASSES.
 - 3. Section 329300, TREES, PLANTS AND GROUND COVERS.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Society for Testing and Materials (ASTM):
 - D 1556 Density of Soil in Place by the Sand-Cone Method
 - D 2167 Density and Unit Weight of Soil In Place by the Rubber-Balloon Method

1.04 EXISTING CONDITIONS

- A. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

1.05 QUALITY CONTROL

- A. The Architect reserves the right to perform on-site observation during the grading operations. The observations may include, but not be limited to the following:

1. Observation of subgrade preparation for slab-on-grade and paved areas.
 2. Observation of rough and finish grading operations.
 - B. Perform field density tests (conducted by independent inspection and testing agency and paid for by the Contractor) in accordance with ASTM D 1556 or ASTM D 2167.
 1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
 2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved area, but in no case less than five tests.
 3. Test reports shall be submitted to Architect within one business day.
 - C. If, in the opinion of the Architect, based on reports of the testing service and inspection, the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained.
 1. The results of density tests of soil-in-place will be considered satisfactory if the average of any four consecutive density tests which may be selected are in each instance equal to or greater than the specified density, and if not more than one density test out of five has a value more than 2% below the required density.
 - D. The Architect's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Architect, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
- 1.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES
- A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property.
 - B. In case of any damage or injury caused in the performance of the grading work, the Contractor shall, at his 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 grading work shall be repaired or replaced to their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing bench marks, monuments, and other reference points which are disturbed or destroyed.
- 1.07 COORDINATION
- A. Prior to start of grading operations, the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.
 - B. As construction proceeds, the Contractor shall be responsible for notifying the Architect a minimum of two days in advance prior to start of grading operations requiring inspection and/or testing.

- C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

PART 2 - PRODUCTS

2.01 SOURCE OF MATERIALS

- A. Material shall be obtained from required on-site excavation, to the extent that suitable material is available, and from off-site sources, to the extent that suitable material is not available from on-site excavation. Refer to Section 329200 and Section 329300 for planting soil.

PART 3 - EXECUTION

3.01 GRADING

- A. Uniformly grade areas within the limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, and between points where elevations are shown, or between such points and existing grades.
- B. The degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.
1. Ditches: Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce a hard, uniform, and smooth cross-section.
 2. Finish Grading - Lawn or Unpaved Areas:
 - a. Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture.
 - b. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation.
 - c. Hold finish landscape grade to . in. to 1 in. below adjacent pavements. Allow sufficient depth for placement of mulch.
 - d. Roll and rake, remove ridges, and fill depressions to meet finish grades.
 - e. Limit finish grading to areas that can be planted in the immediate future.
 3. Grade Breaks shall be crisp transitions, not blended or rounded edges. These should be clean, sharp, and uniform in line and curve.
 4. Walks: Shape the surface of areas under walks to line, grade and cross-section, with the finish surface not more than 0.00 ft. above or 0.10 ft. below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.
 5. Pavements: Shape the surface of the areas under pavement to line, grade and cross-section, with the finish surface not more than 1/2 in. above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction. Fill low areas resulting from removal

of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross-section as shown on the Drawings.

3.02 MAINTENANCE

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape, and compact to the required density prior to further construction.

3.03 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and dispose of it legally off the Owner's property.

END OF SECTION

SECTION 329200

LAWN AND GRASSES

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all materials and equipment, and do all work required to complete the seeding and sodding of lawn areas, including furnishing and placing topsoil, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.
2. Section 329300, TREES, PLANTS, AND GROUND COVERS; New plantings.
3. Section 329119, LANDSCAPE GRADING.
4. Section 328000, IRRIGATION SYSTEM.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

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

C 136	Sieve Analysis of Fine and Coarse Aggregates
D 422	Particle-Size Analysis of Soils
E 11	Wire-Cloth Sieves for Testing Purposes

1.04 SUBMITTALS

- A. Samples: The following samples shall be submitted:

<u>Material</u>	<u>Quantity (lb.)</u>
Fertilizer	10
Lime	10
Compost	10
Seed, each mix	1
Loam borrow	10

- B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Fertilizer

- C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Commercial fertilizer
Grass seed
Ground limestone

1.05 OWNER'S INSPECTION AND TESTING

- A. Work will be subject to inspection at all times by the Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Division 01, GENERAL REQUIREMENTS to analyze and test materials used in the construction of the work. Where directed by the Architect, the testing laboratory will make material analyses and will report to the Architect whether materials conform to the requirements of this specification.
1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.
 2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Architect, shall provide such auxiliary personnel and services needed to accomplish the testing work.
 3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

1.06 CONTRACTOR'S INSPECTION AND TESTING

- A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.
1. Particle size analysis shall include the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm</u>
Gravel	+ 2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5-1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Clay	< 0.002 mm
 2. Chemical analysis shall include the following:
 - a. pH and buffer pH
 - b. percentage of organic content by oven-dried weight
 - c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.

- d. Soluble salt by electrical conductivity of a 1:2 soil/water sample.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Digging Sod:

1. Sod shall not be dug at the nursery or approved source until ready to transport sod to the site of the work or acceptable storage location.
2. Before stripping, sod shall be mowed at a uniform height of 2 in.
3. Cut sod to specified thickness and to standard width and length desired.

B. Transportation of Sod:

1. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury. Closed vehicles shall be adequately ventilated to prevent overheating of the sod.
2. Evidence of inadequate protection following the digging, carelessness while in transit, or improper handling shall be cause for rejection.
3. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or are in temporary storage.
4. Upon arrival at the temporary storage location or the site of the work, sod material shall be inspected for proper shipping procedures. Should the sod be dried out, the Architect will reject the sod. When sod has been rejected, the Contractor shall at once remove it from the area of the work and replace it with acceptable material.
5. Unless otherwise authorized by the Architect, the Contractor shall notify the Architect at least two working days in advance of the anticipated delivery date of sod material. Certificate of Inspection when required shall accompany each shipment.

C. Handling and Storage of Sod:

1. Sod material shall be handled with extreme care to avoid breaking or tearing strips.
2. Sod shall not be stored for longer than 30 hours prior to installation. Sod shall be stored in a compact group and shall be kept moist. Sod shall be prevented from freezing.
3. Sod that has been damaged by poor handling or improper storage will be rejected by the Architect.

D. Deliver seed in original sealed containers, labeled with analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, location of packaging, and name of seed grower. Damaged packages will not be accepted.

E. Seed shall be stored under cool and dry conditions so that the endophytic seed in the mixture is capable of maintaining a high level of endophytes

F. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

1.08 PLANTING SEASON

A. Planting season shall be as follows:

<u>Material</u>	<u>Planting Season</u>	
	<u>Spring</u>	<u>Fall</u>
Seeding and sodding	3/15 to 5/15	8/15 to 10/15

B. Planting shall only be performed when weather and soil conditions are suitable for

planting the material specified in accordance with locally accepted practice.

- C. Planting season may be extended with the written permission of the Architect.

1.09 ACCEPTANCE

- A. Acceptance:

1. The Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
2. Acceptance of material by the Architect will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.
3. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Architect, the Architect will recommend to the Owner that the work of this Section be accepted.

- B. Sod and seed areas will be accepted when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil;
2. Absence of visible joints (sodded areas);
3. All areas show a uniform stand of specified grass in healthy condition;
4. At least 60 days have elapsed since the completion of work under this Section.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials shall be extracted or recovered and manufactured from within 500 miles of project site.

2.02 SEED

- A. Seed mixture: Standard grade seed of the most recent season's crop. Seed shall be dry and free of mold. Seed shall be inoculated with endophytes. Seed mixture shall be as follows:

LAWN SEED MIX

<u>Name of seed</u>	<u>% by weight in mixture</u>	<u>Minimum % Purity</u>	<u>Minimum % Germination</u>
Certified Julia, Dawn Or Shamrock Kentucky Bluegrass	40	98	99
Shademaster Creeping Red Fescue	40	98	85
Commander Perennial Ryegrass	20	90	80

2.03 SOD

- A. Certified Turfgrass Sod: Superior sod grown from certified, high quality seed of known origin or from plantings of certified grass seedlings or stolons. It shall be inspected by the certification agency of the state in which it is grown to assure 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 must be certified. Turfgrass sod shall meet the published state standards for certification.
1. Sod shall be a mixture of four or five current and improved bluegrass varieties found in the top 25% of the NTEP (National Turfgrass Evaluation Proceedings), with last two tests spanning over 8 years. Mixture shall contain approximately equal proportions of each hybrid component.
- B. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully, and otherwise maintained from planting to harvest.
- C. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 5/8 in., plus or minus 1/4 in., at the time of cutting. Measurement for thickness shall exclude top growth and thatch.
- D. Strip Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width, and plus or minus 5% on length. Broken strips and torn and uneven ends will not be acceptable.
- E. Strength of Sod Strips: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.
- F. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.
- G. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 36 hour period unless a suitable preservation method is approved prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Architect prior to its installation.
- H. Thatch: Sod shall be relatively free of thatch. A maximum of 1/2 in. (uncompressed) thatch will be permitted.
- I. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil-borne insects. State Nursery and Plant Materials Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.
- J. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds. Turfgrass sod shall be considered free of such weeds if less than five such plants are found per 100 sq. ft. of area.
1. Turfgrass sod shall not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and brome grass.

2.04 SOD FARM GROWING MEDIUM

- A. Soil in which sod was grown shall be classified as loam or sandy loam (silt loam is not acceptable) and shall conform to the following grain size distribution for material passing the #10 sieve:

<u>U.S. Sieve No.</u>	<u>% Passing by Weight</u>	
	<u>Minimum</u>	<u>Maximum</u>
10	100	---
20	75	100
40	30	85
100	12	45
270	5	25
0.002 mm	1	4

1. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.
2. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422.
3. The organic content shall be between 3.0 and 8.0 percent.

2.05 PLANTING SOIL

A. Existing Topsoil

1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.

B. Planting Soil

1. Planting soil shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications. Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Planting soil shall have a pH value between 5.5 and 6.5 and organic matter content of 5 to 10% of total dry weight.
2. Planting soil shall have the following mechanical analysis (see paragraph 1.06 for particle sizes):

Approximate Particle Distribution

Gravel	Less than 10%
Coarse to medium sand	55 – 65%
Fine to very fine sand	15 – 25%
Silt	10– 20%
Clay	15 – 20%

3. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.
4. The Contractor shall provide the Architect with planting soil test results, as specified in

Paragraph 1.06, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring it within the specified limits.

2.06 COMPOST

- A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) 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.

1. Compost shall have the following properties:

<u>Parameters</u>	<u>Range</u>
pH	5.5 – 8.0
Moisture Content	35% - 55%
Soluble Salts	≤ 4.0 mmhos (dS)
C:N ratio	15 – 30:1
Particle Size	< 1"
Organic Matter Content	> 50%
Bulk Density	< 1000 lbs./cubic yard
Foreign Matter	< 1% (dry weight)

2. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements.
3. Compost shall be "AllGro", distributed by AllGro, 4 Liberty Lane West, Hampton, NH 03842; "Agresoil", distributed by Agresource, 100 Main Street, Amesbury, MA 01913; or approved equal.
4. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer.

2.07 LIMESTONE

- A. Ground limestone shall be an agricultural limestone containing a minimum of 85% total carbonates, by weight. Ground limestone shall be graded within the following limits:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
No. 10	100
No. 20	90
No. 100	60

2.08 WATER

- A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

2.09 COMMERCIAL FERTILIZER

- A. Starter fertilizer shall be HD Scotts Starter Fertilizer or approved equal.
- B. Fertilizer shall conform to the following:

1. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing the topsoil.
 - a. 50% of nitrogen shall be derived from natural organic source of ureaform.
 - b. Available phosphorus shall be derived from superphosphate, bone meal, or tankage.
 - c. Potassium shall be derived from muriate of potash containing 60% potash.
 - C. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.
 - D. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorus, and potassium is equal to that specified.
- 2.10 SUPERPHOSPHATE
- A. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than 20% available phosphoric acid. The superphosphate shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.
- 2.11 CELLULOSE FIBER MULCH
- A. Cellulose fiber mulch shall be composed of virgin wood, contain a green color additive, be weed free, and non-polluting, containing no germination or growth - inhibiting factors, similar to Hydro Mulch, manufactured by Conwed Corporation, St. Paul, Minnesota 55113.
- 2.12 WEED CONTROL
- A. Weed control for stockpiled topsoil shall be a non-selective weed killer for control of grassy and broadleaf weeds; weed control shall have short residual, allowing seeding and sodding operations to occur within 7 days of application.
- PART 3 EXECUTION
- 3.01 PREPARATION OF SUBGRADE
- A. Subgrade shall be examined to ensure that rough grading and all other subsurface work in lawn areas and other areas to be seeded or sodded is done prior to start of seeding.
 - B. Existing subgrade shall be loosened or scarified to a minimum depth of 3 in. prior to spreading topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 3 in., sticks, and other extraneous material.
- 3.02 SPREADING OF PLANTING SOIL
- A. Planting soil shall not be spread until it is possible to follow immediately or within 24 hours with seeding operations. If topsoil is spread prior to this time it shall be cultivated to loosen soil prior to seeding.

- B. Planting soil shall not be placed when subgrade or topsoil material are frozen, excessively wet, or excessively dry.
- C. Planting soil shall be spread in a uniform layer, to a thickness which will compact to the depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated minimum depth of topsoil for sodded areas shall be 4 in. and 6 in. for seeded areas.
 - 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
- D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.
- E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.03 APPLICATION OF FERTILIZER AND CONDITIONERS

- A. Fertilizer and conditioners shall be applied at the following rates:
 - 1. Compost - as required by test results of topsoil.
 - 2. Limestone - as required by test results of topsoil.
 - 3. Fertilizer - as required by test results of topsoil.
- B. Mixing with planting soil:
 - 1. Fertilizer and conditioners shall be spread over the entire lawn areas at the application rates indicated above.
 - 2. Materials shall be uniformly and thoroughly mixed into the top 4 in. of planting soil by discing, rototilling, or other approved method.

3.04 FINISH GRADING

- A. Contractor shall set grade lines for Landscape Architect's review and approval.
 - 1. Final surface of topsoil immediately before seeding and sodding shall be within + 1/2 in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface.
- B. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down

all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.

1. Lawn: Compaction of topsoil for finish grade shall be 85% to 88%.

- C. In the event of settlement, the Contractor shall readjust the work to required finished grade.

3.05 HYDROSEED APPLICATION

- A. Lawn Seed shall be applied in two applications; by mechanical spreader with cellulose fiber mulch, hydro-seed.
- B. First Application: Seed shall be broadcast by means of an approved mechanical spreader, to give a uniform application at the following rates:

<u>Seed</u>	<u>Application Rate</u>
Seed Mixture	4.0 lb./1,000 s.f.

1. Seed shall be applied in two equal applications for uniform coverage; direction of travel of spreader for second pass shall be perpendicular to that of the first pass. Seeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.
2. Following seeding the area shall be lightly raked to mingle seed with top 1/8 to 1/4 in. of soil. Area shall then be fine graded. Stones and other debris greater than 1 in. in any dimension which are visible on surface shall be removed.
- C. Following seeding and raking, entire area shall be rolled with a hand roller having a weight of 60 to 90 lb./ft. of width, and a minimum diameter of 2 ft. Entire area shall then be watered by use of lawn sprinklers, or other approved means. Initial watering shall continue until the equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge the seed. Watering shall be repeated thereafter as frequently as required to prevent drying of the surface, until the grass attains an average height of 1/4 in. Watering methods and apparatus which may cause erosion of the surface shall not be permitted.
- D. Fence or rope off entire seeded area to prevent vehicles and pedestrians from entering area until a uniform stand of grass is established and accepted by the Owner.

3.06 SODDING

- A. Edges of the sodded areas shall be smooth, and all sodded areas shall conform to the design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 in. below adjacent hard surface.
- B. Sod shall be placed and all sodding operations completed within 72 hours following stripping from sod source bed.
- C. On slopes steeper than 2 to 1, sod shall be fastened in place with suitable wood pins or other approved methods, spaced at not less than 1 pin per square foot.
- D. Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Sod shall be carefully placed to insure that it is

neither stretched or overlapped. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, topsoil shall be used to fill all cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.

- E. Immediately after sodding operations have been completed, entire surface shall be compacted with a cultipacker roller or other approved equipment weighing 100 to 160 lb./ft. of roller.
- F. Completed sod shall immediately be watered sufficiently to uniformly wet the soil to at least 1 in. below the bottom of sod bed.
- G. Fence or rope off entire sodded area to prevent vehicles and pedestrians from entering area until a uniform stand of grass is established and accepted by the Owner.

3.07 CONTRACTOR MAINTENANCE

- A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

- Fertilizing
 - Mowing
 - Replanting
 - Watering
 - Weeding

- B. Maintenance of seeded areas shall begin upon completion of seeding and shall continue until acceptance of the building, or until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later.

1. Watering

- a. Week No. 1: Provide all watering necessary to keep seed bed moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in.
 - b. Week No. 2 and until acceptance of the building, or until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later: Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote seed germination.

2. Mowing

- a. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
 - b. Bluegrass and other cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
 - c. All clippings shall be removed.

- C. Maintenance of sodded areas shall begin upon completion of sodding and shall continue for 45 days thereafter, unless sodding is not completed until after September

15, in which case maintenance shall continue until the June 15 following.

1. Watering

- a. Week No. 1: Provide all watering necessary for rooting of sod. Soil on sod pads shall be kept moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in. Watering shall be done during the heat of the day to prevent wilting.
- b. Week No. 2 and Subsequent Weeks: Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote deep root growth.

2. Mowing

- a. Mowing shall not be attempted until the sod is firmly rooted and securely in place. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
- b. Bluegrass and other cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
- c. All clippings shall be removed.
- d. After 2 mowings, the Contractor shall top dress the sod with an application of fertilizer at the rate of 1 pound of actual nitrogen per 1000 square feet.

- D. After grass has sprouted, seeded areas which fail to show a uniform stand of grass shall be replanted as often as necessary to establish an acceptable stand of grass.

1. Scattered bare spots, shall not exceed 15 sq. in. each.

- E. Weeds and growth other than varieties of grass named in grass seed formula shall be removed. Removal may be accomplished by use of suitable herbicides or by physical removal, in which case top growth and roots shall both be removed, and bare spots exceeding specified limits shall be reseeded.

- F. If lawn or grass is established in the fall and maintenance is required to continue into spring months, lawn and grass shall receive an application of lime and fertilizer in the spring. Lime and fertilizer shall be spread in a uniform layer over the entire lawn surface, at the following rates.

<u>Material</u>	<u>Application Rate</u>
Lime	100 lb./1000 sq. ft.
Fertilizer	20 lb./1000 sq. ft.

- G. Remove rope barricades only after second cutting of lawns.

END OF SECTION

SECTION 329300

TREES, PLANTS, AND GROUND COVERS

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all materials and equipment, and do all work required to complete the planting, including furnishing and placing planting soil, and structural soil, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 024113, SELECTIVE SITE DEMOLITION AND REMOVALS; Clearing and grubbing and stripping of topsoil.
 - 2. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.
 - 3. Section 329200, LAWNS AND GRASSES; Seeding and sodding lawns.
 - 4. Section 328000, IRRIGATION SYSTEM.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American National Standards Institute, Inc. (ANSI):
 - Z60.1 American Standard for Nursery Stock
(Sponsor: American Association of Nurserymen, Inc.)
 - 2. American Society for Testing and Materials (ASTM):
 - C 136 Sieve Analysis of Fine and Coarse Aggregates
 - D 422 Particle-Size Analysis of Soils
 - E 11 Wire-Cloth Sieves for Testing Purposes
 - F 405 Corrugated Polyethylene (Pe) Tubing and Fittings

3. "Hortus Third", A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillian Publishing Co., New York, NY.

1.04 SUBMITTALS

- A. Samples: The following samples shall be submitted:

<u>Material</u>	<u>Sample Size or Quantity</u>
Mulch	1 ft.3
Compost	1 ft.3
Planting soil	1 ft.3
Loam borrow	1 ft.3
Tree stake	36 in. length

- B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Aluminum sulfate
Antidessicant
Fertilizer
Fungicide
Herbicide
Insecticide
Compost

- C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Commercial fertilizer
Limestone

- D. Test Reports: Test reports from an approved testing agency indicating compliance with the specifications shall be submitted for topsoil, peat moss, planting soil mixture, and any other materials designated by the Architect.

1.05 OWNER'S INSPECTION AND TESTING

- A. Work will be subject to inspection at all times by the Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Division 01, GENERAL REQUIREMENTS to analyze and test materials used in the construction of the work. Where directed by the Architect, the testing laboratory will make material analyses and will report to the Architect whether materials conform to the requirements of this specification.
1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.
 2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Architect, shall provide such auxiliary personnel and services needed to accomplish the testing work.
 3. Gradation of granular materials shall be determined in accordance with ASTM C 136.

Sieves for determining material gradation shall be as described in ASTM E 11.

1.06 CONTRACTOR'S INSPECTION AND TESTING

- A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.

1. Particle size analysis shall include the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm</u>
Gravel	+ 2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5-1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	< 0.002 mm

2. Chemical analysis shall include the following:

- a. pH and buffer pH
- b. percentage of organic content by oven-dried weight
- c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.
- d. Soluble salt by electrical conductivity of a 1:2 soil/water sample.

1.07 SOURCE QUALITY CONTROL

- A. Identification of plant materials shall be as named in "Hortus Third".
- B. Selection of Plant Materials: Submit to the Architect the names and locations of nurseries proposed as sources of acceptable plant material. Inspect all nursery materials to determine that the materials meet the requirements of this section. Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Architect.
 1. Schedule with the Architect a time for viewing plant material at the nursery. Trips to nurseries shall be efficiently arranged to allow Architect to maximize viewing time. A minimum of six weeks shall be allowed for this viewing prior to time that plants are to be dug.
 2. Architect may choose to attach seal to each plant, or representative samples.

3. Where requested by the Architect, photographs of plant material or representative samples of plants shall be submitted.
4. Viewing and/or sealing of plant materials by the Architect at the nursery does not preclude the Architect's right to reject material at the site of planting.

1.08 AVAILABILITY OF PLANT MATERIAL

- A. Before changes or substitutions can be made due to unavailability of plant material, submit satisfactory evidence that the Contractor has advertised for a one month period in a trade journal such as the "American Nurseryman", with no response, or has undertaken other methods of locating plant material acceptable to the Architect.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Digging Plant Material: Plants shall not be dug at the nursery or approved source until the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.
- B. Transportation of Plant Material: Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Plants shall not remain in darkened enclosed trailer for more than 48 hours cumulative.
 1. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.
 2. Unless otherwise authorized by the Architect, notify the Architect at least three working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Architect.
- C. Storage: Unless specific authorization is obtained from the Architect, plants shall not remain on the site of work longer than three days prior to being planted.
 1. Plants that are not planted immediately shall be protected as follows:
 - a. Earth balls shall be kept appropriately moist and their solidity carefully preserved.
 - b. Plants shall not be allowed to dry out or freeze.
 2. Both the duration and method of storage of plant materials shall be subject to the approval of the Architect.
- D. Handling of Plant Materials: Exercise care in handling plant materials to avoid damage or stress.

1.10 REJECTION OF MATERIALS

- A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

- B. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, balls of earth broken or loosened, or areas of bark be torn, the Architect will reject the injured plant.
- C. When a plant has been rejected, remove it from the area of the work within 3 days and replace it with one of the required size and quality.

1.11 PLANTING SEASON

- A. Planting: Planting may commence as soon as the ground has thawed at the nursery and at the site of planting, and weather conditions make it practicable to work both at the nursery and at the site.

1. Planting shall not occur any later than the following:

<u>Material</u>	<u>End of Spring Planting Period</u>
Deciduous Trees and Shrubs	July 15
Evergreen Trees and Shrubs	June 30

2. Fall Planting: Fall planting will be permitted with the exception of oak trees. Oak trees shall not be planted in the fall.

- B. Regardless of the dates specified above, planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.
- C. Planting season may be extended only with the written permission of the Architect. Plant material guarantee shall be honored regardless of extended planting season.

1.12 ACCEPTANCE

- A. The Architect will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance of plant material by the Architect will be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents.
- C. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect will recommend to the Owner that acceptance of the work of this Section be given.
- D. Acceptance in Part
 - 1. The work may be accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.
 - 2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

1.13 MAINTENANCE

- A. Contractor shall maintain plant material until the completion of guarantee period and Final Acceptance of work, as described in Part 3 of this Section.

1.14 GUARANTEE

- A. Plants shall be guaranteed for a period of one year after the date of Acceptance by the Owner.

- 1. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.

- B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.

- C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.

- 1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.

- 2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.

- 3. The guarantee of all replacement plants shall extend for an additional one year period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.

- D. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials, and tree wrap and ties shall be removed from the site.

1.15 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the guarantee period, the Architect will, upon written notice of end of guarantee period inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.

- B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Architect at that time, the Architect will recommend to the Owner that Final Acceptance of the Work of this Section be given.

PART 2 PRODUCTS

2.01 PLANTS

- A. Except as otherwise specified, size and grade of plant materials shall conform to ANSI Z60.1. In no case shall ball size be less than 11 in. in diameter for each inch of caliper.
- B. Plants shall have outstanding form; symmetrical, heavily branched with an even branch distribution, densely foliated and/or budded, and a strong, straight, distinct leader where this is characteristic of species. Plants shall possess a normal balance between height and spread. The Architect will be the final arbiter of acceptability of plant form.
- C. Plants shall be healthy and vigorous, free of disease, insect pests and their eggs, and larvae.
- D. Plants shall have a well-developed fibrous root system.
- E. Plants shall be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects. These defects shall not interrupt more than 25% of the circumference of the plant cambium.
- F. Plants shall meet the sizes indicated on the Plant List. Plants larger or smaller than specified may be used only if accepted by the Architect.
- G. Where a size or caliper range is stated, at least 50% of the material shall be closer in size to the top of the range stated.
- H. Plants shall not be pruned before delivery.
- I. All trees and shrubs shall be labeled. Labels shall be durable and legible, stating the correct plant name and size in weather-resistant ink or embossed process. Labels shall be securely attached to all plants prior to delivery to the site, being careful not to restrict growth.
- J. Plants indicated as "B&B" shall be balled and burlapped.
- K. Container grown plants shall be well rooted and established in the container in which they are growing.
- L. Groundcover: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.02 PLANTING SOIL

- A. Existing Topsoil
 - 1. Existing topsoil from on-site source(s) may be used for planting soil, or amended, to the extent available, to meet the requirements of this Section for planting soil, or if approved by the Architect.
- B. Planting Soil
 - 1. Planting soil shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative growth, with

additives, if required, to achieve particle distribution and organic content specifications . Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Planting soil shall have a pH value between 5.5 and 6.5 and organic matter content of 5 to 10% of total dry weight.

2. Planting soil shall have the following mechanical analysis (see paragraph 1.06 for particle sizes):

Approximate Particle Distribution

Gravel	Less than 10%
Coarse to medium sand	55 – 65%
Fine to very fine sand	15 – 25%
Silt	10 – 20%
Clay	15 – 20%

3. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.
4. The Contractor shall provide the Architect with planting soil test results, as specified in Paragraph 1.06, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring it within the specified limits.
5. Planting soil for ericaceous shrubs shall have a pH value range of 4.5 to 5.0.

2.03 COMPOST

- A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) 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.

1. Compost shall have the following properties:

<u>Parameters</u>	<u>Range</u>
pH	5.5 – 8.0
Moisture Content	35% - 55%
Soluble Salts	<4.0 mmhos (dS)
C:N ratio	15 – 30:1
Particle Size	< 1"
Organic Matter Content	> 50%
Bulk Density	< 1000 lbs./cubic yard
Foreign Matter	< 1% (dry weight)

2. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements.
3. Compost shall be "AllGro", distributed by AllGro, 4 Liberty Lane West, Hampton, NH 03842; "Agresoil", distributed by Agresource, 100 Main Street, Amesbury, MA 01913; or approved equal.

4. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer.

2.04 WATER

- A. Water shall be suitable for irrigation and shall be free from ingredients harmful to plant life.

2.05 FERTILIZER

- A. Commercial grade complete fertilizer of neutral character, consisting of fast and slow release nitrogen, 50% of nitrogen shall be derived from natural organic source of ureaform phosphorus and potassium in the following composition.
- B. Controlled-release fertilizer shall be granular consisting of 50% water and insoluble nitrogen, phosphorus and potassium.

2.06 MULCH

- A. Mulch shall be a 100% fine-shredded pine bark, of uniform size.

2.07 STAKING AND GUYING MATERIALS

- A. As indicated on Drawings.

2.08 ANTIDESICCANT

- A. Antidesiccant shall be an emulsion specifically manufactured for plant protection which provides a protective film over plant surfaces which is permeable enough to permit transpiration. Antidesiccant shall be delivered in manufacturer's sealed containers and shall contain manufacturer's printed instructions for use.

PART 3 EXECUTION

3.01 EXAMINATION OF SUBGRADE

- A. Examine subgrade and rough grading before planting. Alert Architect to unacceptable rough grading or subgrade.

3.02 DRAINAGE OF SOILS

- A. Test drainage of five plant beds and pits chosen by the Architect shall be done by filling with water twice in succession. The time at which water is put into the pit or bed for a second filling shall be noted. Architect shall then be notified of the time it takes for pit or bed to drain completely. Planting operations shall not proceed until Architect has reviewed test drainage results.
- B. Notify the Architect in writing of all soil or drainage conditions that he considers detrimental to growth of plant material. Submit proposal and cost estimate for correction of the conditions for Architect's approval before starting work.

3.03 LAYOUT OF PLANTING AREAS

- A. Individual trees shall be located in the field as indicated on the Drawings for Architect's approval prior to planting. Contractor shall provide one foreman, one loader with operator and two laborers to work with Architect in the field to determine the final location and orientation of each tree prior to planting. It is anticipated that this process may take several days to complete. Contractor shall plan to have this layout crew available to work with Architect at a slow and deliberate pace in order to achieve the desired results.
- B. Individual shrub locations and outlines of shrub and ground cover areas to be planted shall be staked by the Contractor in ample time to allow inspection by the Architect.
- C. Individual vines and groundcovers to be planted shall be laid out in plant beds by the Contractor in ample time to allow inspection by the Architect.
- D. Digging shall not begin until locations are approved by the Architect.
- E. Location of trees shall be staked using color coded stakes. A different stake color shall be used for each tree species.

3.04 PREPARATION OF SUBGRADE

- A. Subgrade of planting areas shall be loosened or scarified to a minimum depth of 3 in. prior to spreading planting soil. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 in., sticks, and other extraneous material.

3.05 PLANT PIT EXCAVATION

- A. Planting pits for trees and shrubs shall be excavated to the depth and dimension indicated on the Drawings.
- B. Excavation shall not begin until locations are approved by the Architect.

3.06 SPREADING OF PLANTING SOIL

- A. Planting soil shall be spread and placed to required depths.
- B. Surfaces shall be graded and smoothed, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.07 PLANTING

- A. Walls of plant pits shall be dug so that they are sloped and scarified.
- B. Plants shall be set as indicated on Drawings. Plants shall have same relationship to finished grade as in the nursery.
- C. Plants shall be turned to the desired orientation when required by Architect.
- D. Containerized plants shall be removed from container taking care not to damage roots. The side of the root ball shall be scarified to prevent root-bound condition and plant positioned in planting pit.
- E. Place bare root plants so that the roots lie in a natural position. Encircling roots are to be separated or cut and laid out radially from the root crown.

- F. Planting shall be positioned in center of planting pit, set plumb, and rigidly braced in position until all planting soil has been tamped solidly around the ball.
- G. Pits shall be backfilled with planting soil. Soil shall be worked carefully into voids and pockets, tamping lightly every 6 in.
 - 1. When pit is two-thirds full, plants shall be watered thoroughly, and water left to soak in before proceeding.
 - 2. At this time, ropes or strings on top of ball shall be cut and shall be pulled back. Burlap or cloth wrapping shall be left intact around ball except that portions of wrap that are exposed at top of ball shall be turned under and buried. Non-biodegradable ball wrapping and support wire shall be totally removed from ball and planting pit.
 - 3. Wire baskets shall be completely cut away from sides of root ball, and removed from pit. Bottom of basket may remain.
 - 4. Remove nursery plant identification tags.
- H. Backfilling and tamping shall then be finished and a saucer formed around plant pits as indicated on the Drawings.
- I. Saucer shall be filled with water and water left to soak in. Saucer shall then be filled with water again.

3.08 APPLICATION OF FERTILIZER

- A. Fertilizer shall be applied when planting pits are backfilled two-thirds full. Fertilizer application shall be of the type, rate, and timing recommended by fertilizer manufacturer.

3.09 STAKING AND GUYING

- A. Each tree shall be staked or guyed immediately following planting. Plants shall stand plumb after staking or guying. Staking or guying shall not be used as a means to straighten trees.

3.10 MULCHING

- A. Mulch shall be applied as follows (entire area listed shall be mulched):

<u>Plant Type</u>	<u>Mulch Area</u>	<u>Mulch Depth, in.</u>
Tree	Saucer	2
Shrub	Saucer or Bed	2
Vine	Bed	2

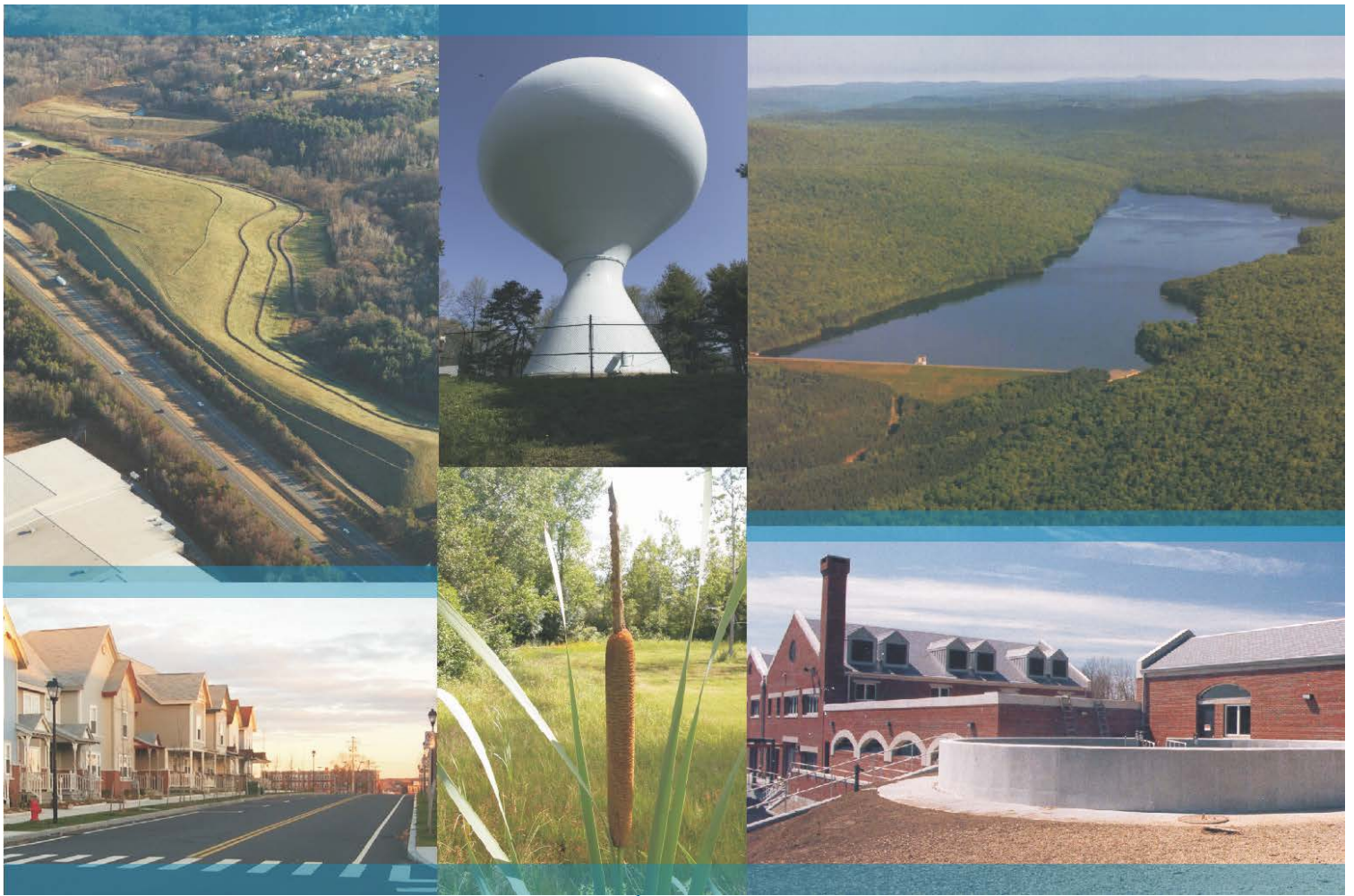
3.11 PRUNING

- A. Each tree and shrub shall be pruned to preserve the natural character of the plant. Pruning shall be done after delivery of plants and after plants have been inspected and approved by the Architect. Pruning procedures shall be reviewed with Architect before proceeding.

3.12 MAINTENANCE OF PLANTING

- A. Maintenance shall begin immediately after each plant is planted and shall continue through guarantee period until Final Acceptance.
- B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, repairing and replacing of damaged tree wrap material, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings free of insects and disease, and in a healthy growing condition.
- C. Planting areas shall be kept free of weeds, grass, and other undesired vegetative growth.

END OF SECTION



Tighe&Bond

McGlew Park
Off North Street
Salem, Massachusetts
(RTN 3-33413)

Permanent Solution with Conditions Statement

Prepared For:
City of Salem

June 2016

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Section 1

Introduction

On behalf of the City of Salem, Tighe & Bond has completed this *Permanent Solution Statement (PSS) with Conditions* for the McGlew Park property off North Street in Salem, Massachusetts (the site). This report was completed in accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000). A Site Locus map, a Massachusetts Geographic Information System (MassGIS) Priority Resource Map, and an Orthophotograph plan are provided in Appendix A as Figures 1, 2 and 3, respectively.

In preparation for renovation design of the site, the City conducted due diligence subsurface investigations earlier in 2016. Those findings indicated that metals and polycyclic aromatic hydrocarbons (PAHs) were detected above applicable reportable concentrations in site soils, triggering a 120-day reporting condition. The Massachusetts Department of Environmental Protection (MassDEP) was notified of this release condition on June 6, 2016 through an on-line submittal of Bureau of Waste Site Cleanup form BWSC103-120 Day. MassDEP subsequently assigned Release Tracking Number (RTN) 3-33413 to the site.

Subsequent investigations and site risk characterization have been completed, and those findings indicate that RTN 3-33413 can be closed with a Permanent Solution Statement with Conditions, as further discussed herein.

1.1 Conceptual Site Model

McGlew Park is approximately 3 acres in size, and is situated in a residential area with residences generally abutting the entire site parcel. The park currently includes a playground area, softball field, basketball court, and a former tennis court area. There are no permanent building structures on the site.

Site topography is generally flat with a “bowl-shaped” rim in that elevated bedrock outcrops are situated along the western, southern, and eastern perimeters of the property.

There are no resource areas located on or near the site, and the nearest surface water body is situated close to ½ mile from the site.

Historical records indicate that limited gravel or rock removal operations may have occurred at the site in the early 1900s, which is consistent with bedrock bowl shape of the park. A residential dwelling also was situated on a portion of the site in the earlier half of the 20th century. McGlew Park became in existence between 1947 and 1950, and the historical records indicate that the site has been used as park since that time.

The site is currently used for recreational use by children and adults, and will continue to be used as such for the foreseeable future. The renovation of the park is in a preliminary design stage, with funding being applied for by the City for that future renovation work.

In preparation for park renovation, due diligence subsurface investigations were conducted across the park area, which included soil boring advancement and test pit

explorations. Those findings indicated that the site is underlain by anthropogenic fill to depths approaching or at the bedrock ledge. Laboratory analysis of soil samples indicate that the fill contains elevated concentrations of metals and PAHs in some locations, and that the non-homogenous nature of the historic fill is the reason for the inconsistent findings across the site. Although coal and coal ash were identified within the fill material, the elevated metals and PAH detections could not be entirely attributed to their presence only in each of the soil samples that were analyzed. Therefore, the contamination was not exempt from reporting under the MCP. However, the fill at the site meets the definition of "historic fill" under the MCP as it was emplaced well before 1983 (e.g., a bottle dated 1908 was identified in the fill during test pit explorations), and there is no evidence that a historical release incident (or incidents) at the park caused the impacts to site soils.

Although "anthropogenic background" has been achieved for the site under the MCP, best management practices for the limiting exposure to the historic fill and for proper handling of this material (as warranted) are required during future site work, including the anticipated park renovation work.

Section 2

General Site Description

2.1 Existing Conditions

2.1.1 General Property Description and Site Use

McGlew Park is generally used by local residents for recreational use.

According to Salem Assessors office on-line records, the site is identified as parcel 17-0276-0, and the listed property address is 201 ½ North Street. The latitude and longitude coordinates for the site are approximately 42.53014 north and 70.90931 west, respectively.

As shown on Figure 3, the park area entrance is located off North Street, and the park area currently includes a playground area, softball field, basketball court, and a tennis court area (used as a skate park). There are no permanent building structures on the site. Elevated bedrock outcrops are situated along the western, southern, and eastern perimeters of the property, and these elevated areas are mostly covered by tree vegetation (see Figure 3).

The site area is serviced by municipal water and sewer.

2.1.2 Surrounding Property Description

As shown on Figure 3, the site property is surrounded by residential properties on the surrounding street block.

2.2 Site Hydrogeological Characteristics

2.2.1 Site Topography

The site location is illustrated on the United States Geological Survey (USGS) Topographic Map for the Salem Quadrangle (Figure 1 in Appendix A). As shown on Figure 1, the site is situated between approximately 15 and 18 meters above mean sea level, and site area topography is sloped to the northeast. The North River and Danvers River are situated to the east and north of the site, respectively. An unnamed surface water body that drains toward the Danvers River is the nearest water body, and is situated approximately ½ mile to the north/northeast of the site.

2.2.2 Geology and Hydrogeology

According to the Surficial Geologic Map of the Salem Depot (compiled by Stone, Stone and DiGiacomo-Cohen; 2006), the site area is mapped within glacial stratified deposits identified as coarse deposits for the immediate site area.

According to the USGS *Bedrock Geology of the Salem Quadrangle and Vicinity, Massachusetts* (Toulmin, Priestly; 1964), the site is underlain by the Salem Gabbro-Diorite formation, which is an intrusive igneous rock.

Based on our subsurface investigations, the open park area is underlain by mostly anthropogenic fill to the depth of bedrock. Bedrock ledge was encountered between

approximately 6 feet and 9.5 feet below surface grade (BSG) through the park area. [Note: Visible bedrock outcrop is present along the western, southern, and eastern perimeters of the property.] The groundwater table is situated below the depth of bedrock ledge in the park area. Further description of subsurface conditions for the site is discussed in Section 3 below.

2.2.3 Surrounding Resource Area Description

According to the Mass GIS map (see Figure 2 in Appendix A), the site is not located within a Zone II or an Interim Wellhead Protection Area of a public water supply or a Potentially Productive Aquifer. Also, no areas of Critical Environmental Concern, Sole Source Aquifers, Priority Habitat or Solid Waste Landfills are identified within 500 feet of the site. The site property is mapped as a Protected and Recreational Open Space area.

2.3 Site History

Tighe & Bond conducted a limited research of historical uses of the park area through a database search using Environmental Data Resources (EDR) of Milford, Connecticut. The historical databases searched included Sanborn Fire Insurance Maps, aerial photographs, topographic maps and City directories. Copies of these documents are provided in Appendix B.

Sanborn Fire Insurance Maps for the site location were provided for the years 1906, 1950, 1957, 1965 and 1970. In summary, the 1906 map shows a “rock crusher” structure on the site, off the entrance from North Street. There’s another small structure on the southeastern portion of the site that may be associated with a former residential dwelling further to the southeast. On the 1950, 1957, 1965 and 1970 maps, the general layout of the park parcel seems consistent with the current site parcel, and on each of these maps there are no structures or site uses listed for the park area. In addition, the abutting property uses are residential for these years, with only one abutting parcel showing a non-residential use (a storefront) on earlier maps.

Historical aerial photographs were provided for the years 1938, 1952, 1955, 1969, 1978, 1986, 1995, 2006, 2008, 2010 and 2012. The resolution of the photographs does not allow detailed observation of the site. However, the open area associated with the current park is visible on each aerial photograph. The current softball diamond, basketball court, and tennis court (or current skate park) areas can be observed on the 1986, 1995, 2006, 2008, 2010 and 2012 aerial photographs. On the 1938, 1952, 1955 and 1969 aerial photographs, these park features are either not present or not discernible, and there appears to be a small structure situated on the eastern portion of the site for each of those earlier years.

Historical topographic maps were provided for the years 1888, 1893, 1919, 1943, 1944, 1949, 1956, 1970, 1979, 1985, 2005 and 2012. The location of the park area is not labeled on any of these maps. Topography across the site areas is either similar on each topographic map or significant differences in site elevations are not readily discernible.

City directories were provided for the years 1924, 1926, 1941, 1947, 1950, 1957, 1961, 1964, 1969, 1974, 1979, 1983, 1988, 1992, 1995, 1999, 2003, 2008 and 2013. “McGlew Park” is listed at “201 North Street” in the 1950 through 1988 directories. In the 1950 directory, 201 North Street also has a residence listed, with a Frank H. Fowler listed as owner. For the 1924 through 1947 directories, the same Frank H. Fowler is

listed at 201 North Street, but there is no separate listing for McGlew Park or any other entity for those earlier years.

Section 3

Subsurface Investigations

Subsurface investigations included soil boring advancement and exploratory test pit excavations, as further described below. Prior to conducting subsurface investigations, Tighe & Bond pre-marked the locations, and notified Dig-Safe and municipal offices for marking underground utilities. A Site Plan is provided as Figure 4 in appendix A for reference.

3.1 Drilling Activities

On January 22, 2016, 10 borings (SB-01 through SB-10) were advanced across the open, field portion of the site parcel. The approximate locations of the borings and site parcel boundary are depicted on Figure 4. Boring advancement was conducted by Martin GeoEnvironmental, LLC of Belchertown Massachusetts using a tracked-mounted Geoprobe® 6610DT vibratory direct-push rig under Tighe & Bond observation.

During boring advancement, soil samples were collected continuously using macro core liners. Each boring was to be advanced to approximately 10 feet below surface grade (BSG), unless refusal occurred first in the boring. Boring refusal occurred in each of the borings, except in SB-01, at depths ranging between 4 feet BSG (in boring SB-10) and 9 feet BSG (in SB-05). No significant soil staining or olfactory evidence of contamination was observed during boring advancement. The presence of anthropogenic fill, including evidence of coal, coal ash, brick, glass, and/or wood, were observed in each of the borings, except in boring SB-02. There was also evidence of seashell fragments in borings SB-04 and SB-08. Boring logs are provided in Appendix C for reference.

Tighe & Bond screened each of the soil boring samples in the field for volatile compounds using a photo-ionization detector (PID) instrument. In summary, PID results ranged from 0.5 parts per million (ppm) to 2.4 ppm in the samples. Consistent with these trace level readings, there was little to no evidence of volatiles or other olfactory evidence in the soil borings. Three select soil samples were also screened in the field for total petroleum hydrocarbons (TPH) using a Dextsil® Petroflag analyzer kit. Dextsil results ranged between 38 ppm to 72 ppm. These low concentrations are typical of anthropogenic fill, and consistent with these findings there was little to no evidence of petroleum staining in the soil boring samples.

Based on field observations, select samples from the borings were submitted for laboratory analysis of volatile organic compounds (VOCs; 2 samples), extractable petroleum hydrocarbons (EPH) with target polycyclic aromatic hydrocarbons (PAHs; 8 samples), polychlorinated biphenyls (PCBs; 4 samples), and RCRA 8 metals (8 samples), and pesticides (2 samples). Two samples were also submitted for electron microscopy to confirm the presence of coal, coal ash, and/or wood ash.

3.2 Test Pit Explorations

On March 30, 2016, eight test pits (ExTP-1 through ExTP-8) were excavated in general areas of concern identified during the soil boring program (based on laboratory results - see below for further discussion). Test pit excavations were conducted by Technical Drilling Services of Sterling Massachusetts under Tighe & Bond observation.

At each test pit location (except ExTP-8), excavation occurred to at least 6 feet below surface grade (BSG) or to bedrock ledge, whichever occurred first. [Note: Test pit ExTP-8 was only excavated to 1 foot BSG for the purpose of collecting a shallow soil sample, as further described herein.] If there was evidence of anthropogenic fill at depths of 6 feet, then the excavation continued until native materials were encountered. During this work, the top 1 to 2 feet of excavated materials were stockpiled separately from the materials excavated from the lower depths. The "lower" depth materials were temporarily stockpiled on metal sheeting to limit the commingling of these materials with ground surfaces outside of the test pits. When completed, the excavated materials were returned to the open excavation in the order removed, and the surface of the previously excavation area was hand raked to return the area to its previous condition, to the extent feasible.

In summary, bedrock ledge was encountered in the test pits between 6 feet BSG and 9.5 feet BSG. In each test pit, evidence of anthropogenic fill was encountered, with varying amounts of ash observed in each of the test pits, except in ExTP-1 on the northern portion of the site where only trace amounts of ash/anthropogenic fill were observed. In most cases, the anthropogenic fill contains greater than 50% soil. In test pits ExTP-2 through ExTP-7, pieces of debris including glass, metal, brick, and porcelain (limited) were encountered, with total volumes of debris approaching 10% (or higher) at some depth intervals. This included intact glass bottles at some locations, with one bottle labeled with a date of 1908 (specifically at test pit ExTP-5). Most of the metal debris could not be identified, but there was no evidence of containers or drums observed. In these test pits, the presence of anthropogenic fill generally began immediately below the ground surface and continued until ledge was encountered (i.e., native soils were not evident). In many of the test pits, seashell fragments were also observed at varying depths. Beginning evidence of water was encountered at the depth of ledge (i.e., end of exploration) at 8.5 feet BSG in ExTP-6. Evidence of perched water and/or the groundwater table was not encountered in the other test pits. Test pit logs are provided in Appendix C for reference.

From the test pits, select soil samples were submitted for laboratory analysis of mercury (10 samples), lead (6 samples), target PAHs (6 samples), and total and hexavalent chromium (4 samples).

Section 4

Laboratory Results

Soil samples were submitted to ESS Laboratory (ESS) of Cranston, RI. Laboratory reports for the soil samples are provided in Appendix D.

4.1 Soil Results

As discussed earlier, a total of 10 soil boring samples and 18 test pit soil samples were submitted for laboratory analysis. Soil results are summarized in Table 1 provided in Appendix E. Within the table, soil results are compared to the applicable RCS-1 values for soils. In accordance with 310 CMR 40.0361, the RCS-1 reporting category is applicable because the site is located within 500 feet of residential dwellings and the site is an active playground/park. For further reference, PAH and metals results are also compared to the background levels for fill soils containing coal or wood ash, as referenced in MassDEP's *Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil* (May 23, 2002).

As summarized in Table 1,

- Lead was detected above the RCS-1 value of 200 milligrams per kilogram (mg/kg) in 11 of the 14 samples submitted for lead analysis.
- Mercury was detected above the RCS-1 value of 20 mg/kg in 1 of the 17 samples submitted for mercury analysis. This exceedance was in soil boring sample SB-07 (2-5').
- Total chromium as detected above the RCS-1 value of 100 mg/kg in 1 of the 12 samples submitted for chromium analysis. This exceedance was in soil boring sample SB-1 (2-5').
- A total of seven target PAHs were detected above RCS-1 values in soil boring sample SB-09 (5-6') and one target PAH was detected above a RCS-1 value in soil boring sample SB-05 (2-4').
- No VOCs, PCBs, or pesticides were detected above laboratory reporting limits in the soil boring samples submitted for these respective analyses. All reporting limits were below RCS-1 values for these compounds.
- Coal and coal ash were detected in both samples (and wood ash in one sample) submitted for electron microscopy analysis

4.2 Further Discussion

As indicated above, lead, mercury, total chromium, and some target PAHs were detected above applicable RCS-1 values in site soils. Although coal and coal ash were identified within the fill material, the elevated metals and PAH detections cannot be entirely attributed to their presence only. Therefore, these RC exceedances are not exempt from 120-day reporting under the MCP.

Within Table 1, soil results are also compared to MCP Method 1 standards and to MCP Method 3 Upper Concentration Limits (UCLs) for further reference (see Section 5 below for further site risk characterization review.)

Chromium: In accordance with the MCP, when only total chromium analysis is conducted, it must be assumed that the chromium present is the more toxic hexavalent chromium (versus trivalent chromium) in the absence of species-specific data. As part of the test pit program, ExTP-1 was excavated in the immediate vicinity of earlier soil boring SB-01 (see Figure 3), and soil samples were collected from 0 to 2 feet, 2 to 4 feet, and 4 to 6 feet BSG from this test pit for hexavalent chromium and total chromium analysis. As summarized in Table 1, hexavalent chromium was not detected in any of these three samples. Hexavalent chromium was also not detected in test pit sample ExTP-7 (2-4'). Therefore, the earlier value of 109 mg/kg for total chromium in soil boring sample SB-01 (2-5') can be attributed to the presence of trivalent chromium, and the RCS-1 value for trivalent chromium is 1,000 mg/kg.

Mercury: As summarized in Table 1, mercury was detected at 282 mg/kg in soil boring sample SB-07 (2-5'), well above the RCS-1 value of 20 mg/kg. As part of the test pit program, ExTP-7 was excavated in the immediate vicinity of earlier soil boring SB-07, and test pits ExTP-6 and ExTP-8 were also excavated in this same general vicinity (see Figure 3). From these three test pits, eight samples were submitted for mercury analysis, including a sample collected from ExTP-7 from a similar depth interval as the earlier soil boring sample SB-07 (2-5'). As indicated in Table 1, mercury concentrations in those eight test pit soil samples ranged between 0.198 mg/kg and 8.3 mg/kg, which are well below the earlier detection of 286 mg/kg and below the RCS-1 value of 20 mg/kg. As also mentioned, mercury concentrations in other soil boring and test pit soil samples collected from other portions of the site were also below the RCS-1 value of 20 mg/kg. [Note: It should be noted that seven of the samples submitted for mercury analysis were collected from top three feet of soils, which has the higher exposure potential.] Therefore, the elevated level of mercury detected in soil boring sample SB-07 (2-5') appears to be a laboratory anomaly and/or may be related to the non-homogenous nature of the historic fill that is prevalent across the majority of the site.

PAHs and Lead: The detection of PAHs and often lead above RCS-1 values is typical for anthropogenic fill containing coal, coal ash or wood ash. As indicated, lead (and to a lesser extent PAHs) were detected at concentrations well above MassDEP's published background levels for anthropogenic fill in some of the samples. Therefore, there is evidence that the presence of coal and coal ash may not be the only source of the elevated lead (and PAHs) in site soils.

As summarized in Table 1, lead was detected at 30,600 mg/kg in test pit sample Ex-TP-5 (0-2'). This concentration is above the Method 3 UCL of 6,000 mg/kg. As shown in Table 1, the next highest lead concentration in the other 13 soil samples submitted for lead analysis was 2,100 mg/kg in soil boring SB-09 (5-6'). Due to this finding, Tighe & Bond requested that ESS re-analyze sample Ex-TP-5 (0-2'). The re-run result for this sample was 572 mg/kg. On further visual inspection of the sample jar containing the remaining soil sample Ex-TP-5 (0-2'), it appears that there was trace amounts of small paint chips or flakes present in the sample. It is probable that one or more of these chips were present in the aliquot used in the first analysis which caused the very high lead concentration, and these varying lead results for this same sample further highlight the non-homogenous nature of the historic fill at the site.

In conclusion, the site may have had gravel or rock removal operations in early 1900s but there is limited documentation of that use. However, there is significant evidence that the site was subsequently filled in prior to it becoming a park pre-1950, and that no other use of the site property is known to have occurred which would have impacted site soils. Given the location of directly abutting residences, the site would have also not operated as a municipal burn dump and past historic information reviewed did not identify this site use. Therefore, the weight of evidence supports the conclusion that the fill material at the site meets the definition of historic fill under the MCP.

Section 5

Site Risk Characterization

5.1 Selection of Risk Characterization Method

The MCP describes two basic approaches (a constituent-specific approach and a cumulative risk approach) and three methods (Method 1, Method 2, and Method 3) for evaluation of risk.

In a Method 1 Risk Characterization, soil and groundwater exposure point concentrations are compared to applicable Method 1 Cleanup Standards, and the risk of harm to safety is also characterized separately [310 CMR 40.0971(5)].

A Method 2 Risk Characterization supplements and modifies the MCP Method 1 standards with site and constituent-specific information [310 CMR 40.0981]. Method 2 can be used to modify existing Method 1 Standards and/or to derive additional standards for those constituents for which Method 1 standards have not been promulgated and can also account for site-specific fate and transport mechanisms.

A Method 3 Risk Characterization is a cumulative, site-specific risk approach that includes assessment of the impacts to identified human and ecological receptors, as well as characterizing the risk of harm to safety and public welfare. This method is used when environmental media (e.g., sediment, surface water) other than, or in addition to soil and groundwater have been identified as media of concern due to contamination by a release. Subpart I of the MCP (310 CMR 40.0900) describes the procedures, criteria, and standards for the characterization of the risk of harm to human health, safety, public welfare, and the environment

Since risks associated with the site are through contamination of site soil only, a Method 1 Risk Characterization was used to characterize site risk, as further described in the sections below.

5.2 Current and Foreseeable Site Use

The site is currently used as a recreational park area. The City is in the process of planning renovation to the park. The final design plans for those renovations are not completed to date. However, based on preliminary plans prepared by the City's landscape architect consultant (and which were reviewed with the general public at open meetings), the park use is not anticipated to significantly change in that there will still be a softball field and playground use areas, along with some impervious surfaces.

5.3 Identification of Receptors

5.3.1 Identification of Human Receptors

Under current and foreseeable site conditions, human receptors at the site include park users.

5.3.2 Identification of Environmental Receptors

The environmental receptors associated with the site are limited because, although the site is a park area, the surrounding area is heavily urbanized. Per MassDEP guidance, since the property is considered “disturbed”, the property would not be characterized as an ecological resource area/receptor.

5.4 Contaminants of Concern

As indicated earlier, lead, mercury, total chromium, and some target PAHs were detected above applicable RCS-1 values in site soils. In addition, other metals and petroleum compounds were also detected above laboratory reporting limits in site soils. However, each of these contaminants have been attributed to the presence of historic fill and therefore defined as anthropogenic background in the MCP. Therefore, no other contaminants of concern have been identified that are not associated with background conditions. Since no contaminants of concern exist and site conditions are consistent with anthropogenic background, the completion of a human health risk characterization is not needed, and site conditions meet the definition of “No Significant Risk”, per the MCP.

5.5 Exposure Pathway Evaluation

5.5.1 Soil

Under normal site use as a park, exposure to accessible soils is anticipated.

Site soil is not currently used (nor will be in the foreseeable future) for growing fruits or vegetables for human consumption.

Future potential exposures to site soils are not restricted by any Activity and Use Limitation (AUL) placed on the site in accordance with the MCP. Therefore, all site soils are considered to be a potential exposure pathway.

5.5.2 Groundwater

The site is not located in a Current or Potential Drinking Water Source Area, and there is no evidence that site groundwater is impacted. Therefore, groundwater can be eliminated from further evaluation as a potential exposure pathway for the site.

5.5.3 Surface Water

As mentioned, there are no surface water bodies on the site, and no impacts to groundwater were identified. Therefore, surface water can be eliminated from further evaluation as a potential exposure pathway for the site.

5.5.4 Indoor Air

There are no structures on site, no organic (volatile) contaminants were detected in site soils, and groundwater does not represent a current (or future) exposure pathway to indoor air. Therefore, indoor air can be eliminated from further evaluation as a potential exposure pathway for the site.

5.6 Exposure Point Concentrations

No exposure point concentrations (EPCs) were calculated for site soils because there are no COCs in site soils that are being through the risk characterization.

5.7 Characterization of Risk of Harm

5.7.1 Risk of Harm to Human Health

As indicated in Table 1, each of the contaminants detected in site soils have Method 1 standards. However, as reviewed above, no COCs are being carried through the risk characterization for site soils because they are consistent with anthropogenic fill and no EPCs were calculated. Therefore, there is no risk of harm to human health through the soil exposure pathway for the site under the MCP.

5.7.2 Risk of Harm to Environment

As discussed, there are no COCs for the site. Therefore, a condition of No Significant Risk of harm to the environment exists for the site.

5.7.3 Risk of Harm to Public Welfare

The assessment of risk of harm to public welfare for the site is evaluated by considering the presence of nuisance conditions (i.e. odors) resulting from the release, loss of active or passive property use(s), and any non-pecuniary effects not otherwise considered in the characterization of risk of harm, safety and the environment which may occur due to the degradation of public resources directly attributable to the release. None of these conditions are applicable to the site release. Based on these findings, a condition of No Significant Risk of harm to public welfare exists at the site.

5.7.4 Risk of Harm to Safety

An evaluation relative to the risk of harm to safety posed by current and foreseeable conditions at the disposal site has been made in accordance with 310 CMR 40.0960. There are no dangerous structures, explosive vapors, uncontained hazardous materials or other unsafe conditions within the disposal site boundary. As such, there are no conditions considered to represent threats to public safety at the disposal site and current practices do not indicate the likelihood of a threat to public safety under reasonably foreseeable conditions.

5.8 Representativeness Evaluation and Data Usability Assessment

The following section presents a discussion of the site information and analytical data used to support the Permanent Solution as required by 310 CMR 40.1056(2)(k). The Representativeness Evaluation and Data Usability Assessment presented below were conducted in general conformance with MassDEP Policy WSC-07-350.

5.8.1 Representativeness Evaluation

The elements evaluated as part of the Representativeness Evaluation in support of this Permanent Solution as further reviewed below.

Conceptual Site Model: See above in Section 1.1.

Field Screening: During our subsurface investigations, field screening of each soil boring was conducted using a PID instrument, and screening of select soil boring samples was conducted using a Dexsil kit. Field screening findings were non-detect to low, and were consistent with physical observations (i.e., no odors or significant staining) and the presence of anthropogenic fill.

Laboratory results for VOCs and EPH were also consistent with these findings.

Sampling Rationale: The sampling rationale for the park during the due diligence soil boring program was to assess the open, park area across the parcel since there was no suspect release area(s) or other specific areas of potential concern associated with the park based on the site history. The sampling program during the boring program was to assess a broad-range of potential contamination through laboratory analysis of EPH/target PAHs, RCRA 8 metals, VOCs, PCBs, and pesticides.

During the follow-up test pit exploration work, the investigation areas and sampling program areas focused on the elevated contamination of metals and PAHs identified in site soils in areas of concern. This included further assessment of elevated concentrations of mercury, total chromium, lead and PAHs, which were ultimately determined to be attributed to the non-homogenous nature of the historic fill at the site.

In conclusion, it is our opinion that number of samples collected and their distribution is sufficient to define the “site release impacts” associated with the presence of historic fill at the site.

Temporal Data: There is no temporal data for the site.

Field Completeness: Based on the presence of historic fill throughout the park area (and because no other suspect causes of the release were identified), it is our opinion that the sampling program completed as part of the site investigations are sufficient to assess the impacts at the site, and are of a sufficient level to meet the requirements of 310 CMR 40.1056(2)(k).

Data Inconsistency: As discussed earlier, there was some inconsistency in the data for the site. Specifically, elevated mercury levels detected in soil boring sample SB-07 (2-5') was not consistent with the mercury levels detected in nearby soil samples, or in other areas of the site. Also, lead concentrations in sample Ex-TP-5 (0-2') were an order of magnitude higher than in other soil samples. However, these findings can be attributed to the non-homogenous nature of the historic fill prevalent across the site.

Based on this evaluation, it is our opinion that the data is both useable and representative of site conditions and is appropriate to support this Permanent Solution.

Data Not Used: All laboratory data collected by Tighe & Bond was used to evaluate conditions at the site.

5.8.2 Data Usability Assessment

All soil samples collected by Tighe & Bond were submitted in compliance with Data Quality Enhancement (DQE) protocols. The MCP Case Narratives and Analytical Method Report Certification Forms are included in the analytical reports provided in Appendix D. In accordance with the DQE protocols, the laboratory analytical reports were reviewed for compliance with the DQE policy.

Based on a review of the data, field observations, and the laboratory MCP Case Narrative descriptions, the data collected during the site investigations are commensurate with its intended use and meet the PARCCS criteria, recommended for specifying quality assurance goals by the MassDEP. Details of those criteria are specified below.

Precision: Precision is the degree to which a set of observations or measurements of the same property, usually obtained under similar conditions, conform to themselves. Precision may be quantifiably measured through analysis of duplicates, or as discussed in the Compendium of Analytical Methods (CAM), in lieu of field duplicates, sampling precision related to the non-homogeneity of the impacted matrix may be most appropriately addressed via the analysis of an adequate data set of samples using field screening techniques.

No duplicate samples were collected as part of site investigations. Although some variations were observed in the concentrations detected in soil samples, their differences were attributed to the non-homogenous nature of the historic fill prevalent across the site.

Accuracy: Accuracy is the degree of agreement of a measurement with an accepted reference or true value. According to the MCP Case Narratives in the laboratory analytical reports, QA/QC performance standards and recommendations, which may affect Data Usability, were achieved.

Some analytical deficiencies (relatively minor) were noted in VOC and EPH analysis for the soil boring samples. However, VOCs were not detected above laboratory reporting limits in site soils, and EPH concentrations were relatively low (where detected) and are associated with the historic fill. Therefore, it is our opinion that the data is usable to support this Permanent Solution Statement.

Representativeness: Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variation, or environmental condition. It is our opinion that the data set sufficiently characterizes the site release associated with the presence of historic fill at the site.

Completeness: Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected under normal conditions. It is our opinion that the soil sample density and spatial distribution of the samples submitted for laboratory analysis was sufficient to characterize the release conditions associated with the historic fill at the site.

Comparability: Comparability expresses the confidence with which one data set can be compared to another. Data used to support this Permanent Solution includes laboratory analysis of soil samples for VOCs (via EPA Method 8260), mercury (via EPA Method 7471A), other metals (via EPA Method 6010B), EPH/target PAHs (via MassDEP EPH Method), PCBs (via EPA Method 8082B), and pesticides (via EPA 8081B). These analytical methods are the most current methodologies for these analyses and are appropriate for characterization of the site.

Sensitivity: Sensitivity is the ability of the method to detect contaminants of concern at the concentrations of interest. The reporting limits for the compounds analyzed were below Method 1 standards for all soil samples, with the exception of some VOCs that have low level standards. However, VOCs are not considered to be COCs for the site.

Information Considered Unrepresentative: Is defined as the information generated during course of the response actions that was not used to support the Permanent Solution because it was determined to be unrepresentative or no longer representative of disposal site conditions (e.g., conditions changed as the result of remedial actions). As indicated, the information collected by Tighe & Bond during the site investigations was all used to support the Permanent Solution.

Summary: The data used to support this Permanent Solution are commensurate with their intended use and meet the PARCCS criteria recommended for specifying quality assurance goals by MassDEP. It is our opinion that the data is both useable and representative of site conditions and is appropriate to support this Permanent Solution.

Section 6

Permanent Solution and Public Notification

6.1 Permanent Solution

6.1.1 Boundary of PSS

The boundary of the PSS statement is shown on Figure 4.

6.1.2 Feasibility of Achieving Background

This section was completed in accordance with the final version *"Conducting Feasibility Evaluations under the MCP"* guidance document, Policy # WSC-04-160, prepared by the MassDEP in July 2004. Since remedial actions for this RTN were not necessary to achieve No Significant Risk, a feasibility determination for achieving or approaching background is not required.

6.1.3 Permanent Solution Statement with Conditions

This PSS with Conditions for RTN 3-33413 is being filed for the entire parcel for McGlew Park. The disposal site boundary for RTN 3-33413 is shown on Figure 4 in Appendix A.

In accordance with the MCP at 310 CMR 40.1013, the following MCP-defined Condition(s) are required in order to maintain the Permanent Solution and a condition of No Significant Risk.

1. Best Management Practices (BMPs) for Non-commercial Gardening in a residential setting to minimize and control potential risk qualitatively evaluated pursuant to 310 CMR 40.0923(3)(c).

Because some fruits and vegetables can uptake metals and PAHs through their root system, and since these contaminants are present at elevated concentrations in the historic fill, item 1 above applies to the site. The following Best Management Practices for Non-Commercial Gardening are recommended at the site to minimize and control potential risk per 310 CMR 1056(2)(j):

- Gardening in raised planting beds using clean soil;
- Removing existing soil and replacing it with clean soil; and/or,
- Placing landscape fabric between existing soil and new clean soil.

2. The location of OHM that are consistent with Anthropogenic Background levels.

Since there is evidence of historic fill across the vast majority of the site and because park renovation work is likely to be scheduled in the near future, the following Best Management Practices are recommended:

- Worker protection in event soils are encountered in the future.
- Limiting the presence of anthropogenic fill materials near the ground surfaces or managing these materials in place beneath direct contact barriers (e.g.,

layer of clean soil fill, placement of impervious surfaces, etc.). In areas where erosion of surface soil is more common (e.g., beneath swing sets or within designated playground areas), a deeper clean soil layer may be necessary, including additional separation layers (e.g., fabric barriers).

- o Excess anthropogenic fill materials removed from the site should be sampled/characterized and managed at appropriate sites permitted to receive the materials in accordance with current MassDEP guidance and/or regulations, including 310 CMR 40.0030.
- o Furthermore, if soil excavation is to occur during future site work (e.g., during park renovation), then an upfront determination must be as to whether those excavations would result in the generation of greater than 20 cubic yards of Remediation Waste. If that volume is to be exceeded, then a Release Abatement Measure (RAM) Plan submittal is required per 310 CMR 40.1067(5)(b) and 310 CMR 40.0440 prior to conducting "response actions," and further reporting would be required for RTN 3-33413 under the MCP.

The requirements of a Permanent Solution with Conditions have been met at the site pursuant to 310 CMR 40.1013. Limiting conditions include the use of gardening BMPs for non-commercial gardening in a residential setting and implementing BMPs associated with the presence of anthropogenic fill.

6.1.4 LSP Opinion

The material facts, data and other information in support of this Permanent Solution with Conditions are summarized throughout this report. The LSP Opinion is that a Condition of No Significant Risk exists at the site.

Tighe & Bond has not identified other material facts, data and other information that may support a contrary opinion to the LSP Opinions provided above.

6.2 Public Notification

In accordance with the public notification requirements of the MCP at 310 CMR 40.1403(3f), the Mayor's office and the Salem Board of Health have been notified of the availability of this PS Statement with Conditions. Copies of the public notification letter is provided in Appendix F.

Section 7

Limitations

Each report and any and all work product provided in connection with the performance of each environmental site assessment is subject to the following conditions:

1. Each report is prepared on behalf of and for the exclusive use of the City of Salem (Client) and is subject to and issued in accordance with the Agreement and the provisions thereof. Each report and any findings contained therein shall not, in whole or in part, be provided to or used by any other person, firm, entity or governmental agency in whole or in part, without the prior written consent of Client and Tighe & Bond. However, Tighe & Bond acknowledges and agrees that, subject to the Limitations set forth herein and prior written approval by Tighe & Bond, a report may be provided to specific financial institutions, attorneys, title insurers, lessees and/or governmental agencies identified by Client at or about the time of issuance of a report in connection with the conveyance, mortgaging, leasing, or similar transaction involving the real property which is the subject matter of a report and any work product. Use of a report for any purpose by any persons, firm, entity, or governmental agency shall be deemed acceptance of the restrictions and conditions contained therein, these Limitations and the provisions of Tighe & Bond's Agreement with Client. No warranty, express or implied, is made by way of Tighe & Bond's performance of services or providing an environmental site assessment, including but not limited to any warranty with the contents of a report or with any and all work product.
2. In preparing a report, Tighe & Bond, Inc. may rely on certain information provided by governmental agencies or personnel as well as information and/or representations provided by other persons, firms, or entities, and on information in the files of governmental agencies made available to Tighe & Bond at the time of the site assessment. To the extent that such information, representations, or files may be inaccurate, missing, incomplete or not provided to Tighe & Bond, Tighe & Bond is not responsible. Although there may be some degree of overlap in the information provided by these various sources, Tighe & Bond does not assume responsibility for independently verifying the accuracy, authenticity, or completeness of any and all information reviewed by or received from others during the course of the site assessment.
3. Unless otherwise noted, a survey (which includes observations, sampling and analysis) for the presence of asbestos-containing materials, mold and/or lead-based paint is not conducted as part of an assessment.
4. No attempt is made to assess the compliance status of any past or present Owner or Operator of a site with any Federal, state, or local laws or regulations, unless specifically indicated otherwise in writing.
5. Findings, observations, and conclusions presented in each report, including but not limited to the extent of any subsurface explorations or other tests performed by Tighe & Bond, are limited by the scope of services outlined in the Agreement, which may establish schedule and/or budgetary constraints for an environmental assessment or phase thereof. Furthermore, while it is anticipated that each assessment will be performed in accordance with generally accepted professional

practices and applicable standards (such as ASTM, AAI, etc.) and then applicable state and Federal regulations, as may be further described in the report and/or the Agreement, Tighe & Bond does not assume responsibility for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of its services.

6. The assessment presented in each report is based solely upon information obtained or received prior to issuance of the report, including a limited number of subsurface explorations (if performed) made on the dates indicated. If additional environmental or other relevant information is developed at a later date, Client agrees to bring such information to the attention of Tighe & Bond promptly. Upon evaluation of such information, Tighe & Bond reserves the right to recommend modification of this report and its conclusions.
7. If groundwater samples are collected for analysis or water level measurements are made in monitoring wells, such results/observations are provided as representative of conditions at the times stated in this report. Fluctuations in groundwater elevation may occur due to variations in precipitation cycle and multiple other factors, which may influence the concentrations of constituents present in the groundwater. Should additional data become available in the future, such data should be provided to Tighe & Bond for review and Tighe & Bond reserves the right to recommend modification of this report and its conclusions.
8. Except as may be noted specifically within the text of a report, no laboratory testing is performed as part of a site assessment. If such analyses have been conducted by an outside laboratory, Tighe & Bond may rely upon the analyses or data provided, and makes no representation that an independent evaluation of the reliability of such testing has been conducted, with the exception of reviewing standard quality assurance/quality control data that may have been provided with the test results.
9. Although chemical analyses may be performed for specific parameters at specific locations during the course of a site assessment, as described in a report, the results are not definitive regarding the presence of the parameters at other concentrations or the absence of the parameters at other locations on the site. Additional chemical constituents not included in the list of analyzed parameters for a study may be present in soil and/or ground water at a site, and Tighe & Bond assumes no responsibility for chemical constituents or parameters not analyzed.

If included, any database search is conducted under the Notice of Disclaimer/Waiver of Liability included in the database search report.

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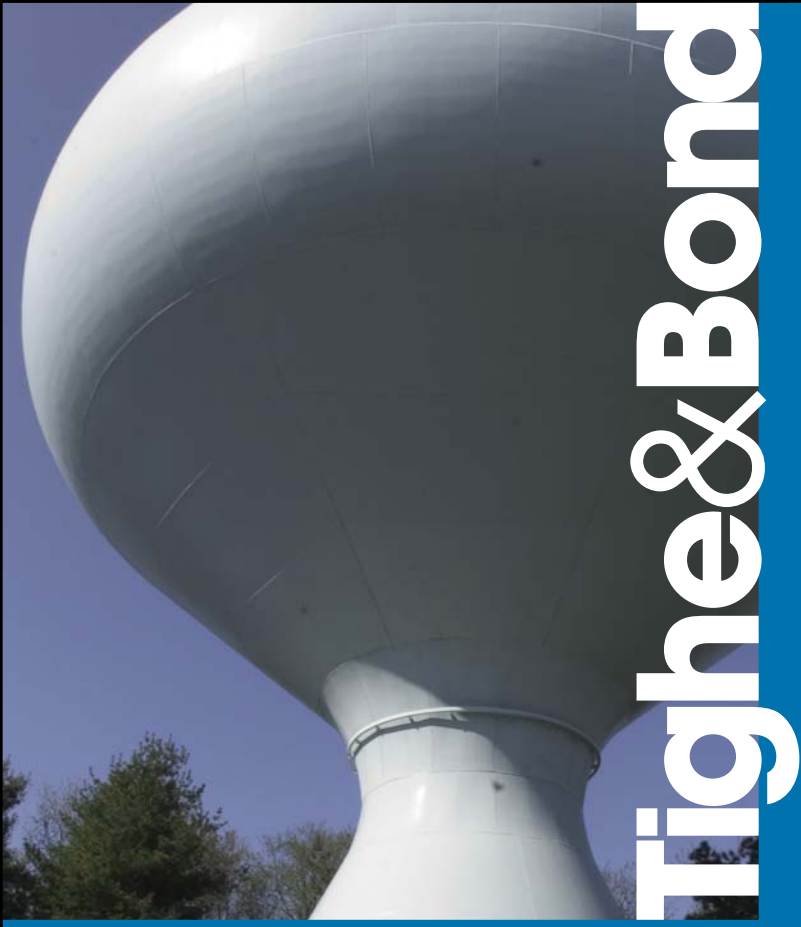
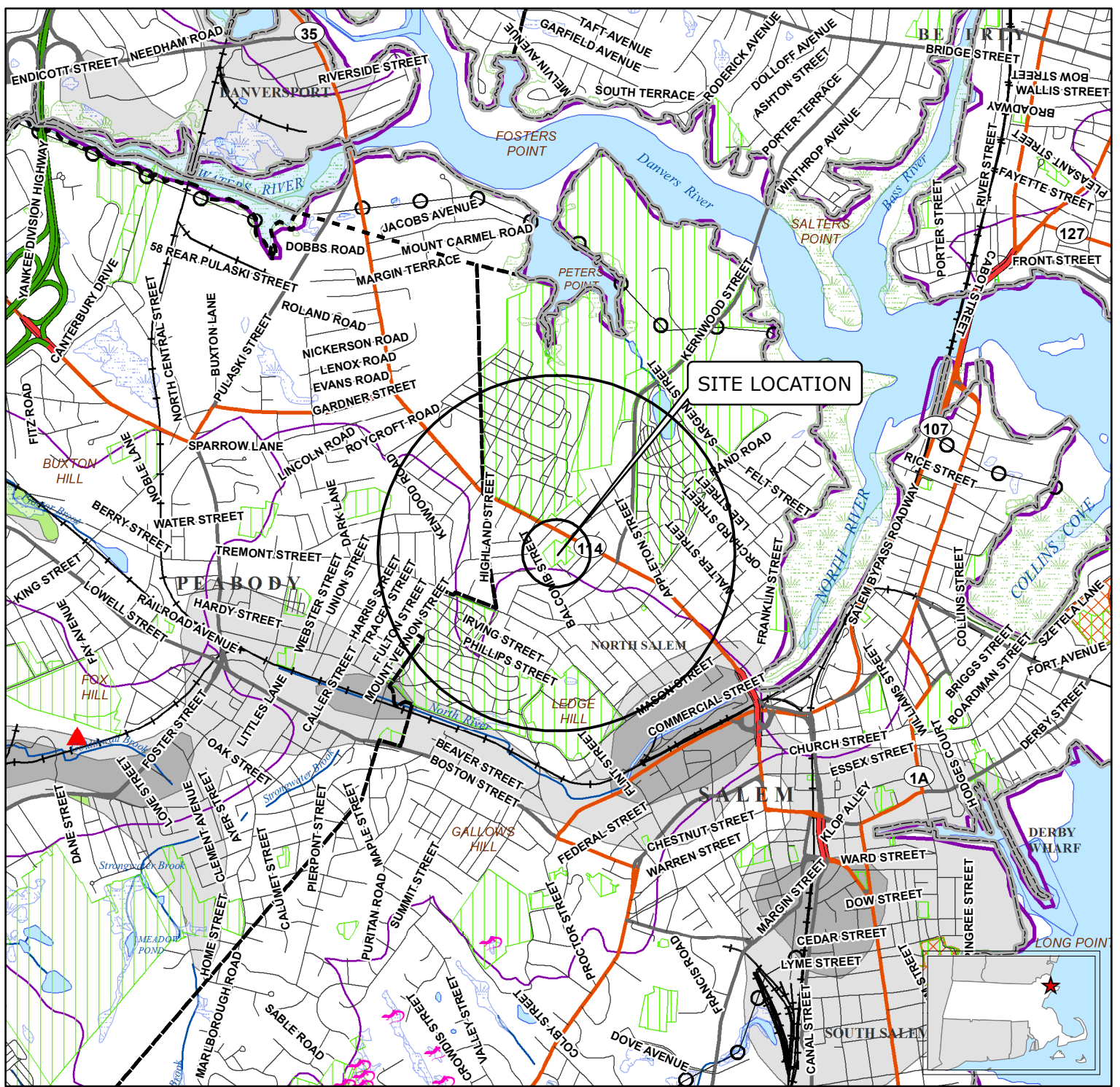




FIGURE 1
SITE LOCATION MAP

McGlew Park
Limited Subsurface Investigation
201 1/2 North Street
Salem, MA

January 2016



Legend

- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Community Public Water Supply - Surface Water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient Public Water Supply
- Non-Community Transient Public Water Supply
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Aqueducts
- Powerline
- Pipeline
- Track or Trail
- Trains
- Public Surface Water Supply Protection Area (Zone A)
- DEP Approved Wellhead Protection Area (Zone I)
- DEP Approved Wellhead Protection Area (Zone II)
- DEP Interim Wellhead Protection Area (IWPA)
- Protected and Recreational Open Space
- Solid Waste Landfill
- Non-Landfill Solid Waste Sites
- Area of Critical Environmental Concern (ACEC)
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- EPA Designated Sole Source Aquifer
- Major Drainage Basin
- Sub Drainage Basin
- Inland Wetlands
- Coastal Wetlands
- Public Surface Water Supply (PSWS)
- Water Bodies
- Stream/Intermittent Stream
- Non-Potential Drinking Water Source Area - High Yield
- Non-Potential Drinking Water Source Area - Medium Yield
- Potentially Productive Medium Yield Aquifer
- Potentially Productive High Yield Aquifer
- County Boundary
- Town Boundary

FIGURE 2 PRIORITY RESOURCE MAP

McGlew Park
Limited Subsurface Investigation
201 1/2 North Street
Salem, MA

Data source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, MassIT)
Executive Office of Environmental Affairs.
Circles indicate 500-foot and half-mile radii.
Data valid as of January 2016.

1:24,000
0 1,000 2,000
Feet

January 2016



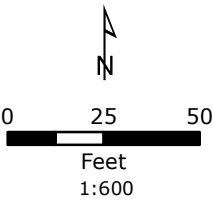


**FIGURE 3
ORTHOPHOTOGRAPH**

Legend

 Parcel Boundary

LOCUS MAP



NOTES

- 1. Based on MassGIS Color Orthophotography (2013)
- 2. Salem parcel (2012) downloaded from MassGIS.

**McGlew Park
201 1/2 North Street
Salem, MA**

June 2016



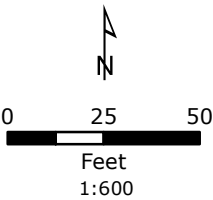


**FIGURE 4
SITE PLAN**

Legend

- Boring Location (Approximate)
- Test Pit Location (Approximate)
- Disposal Site Boundary/Limits of PSS for RTN 3-33413

LOCUS MAP



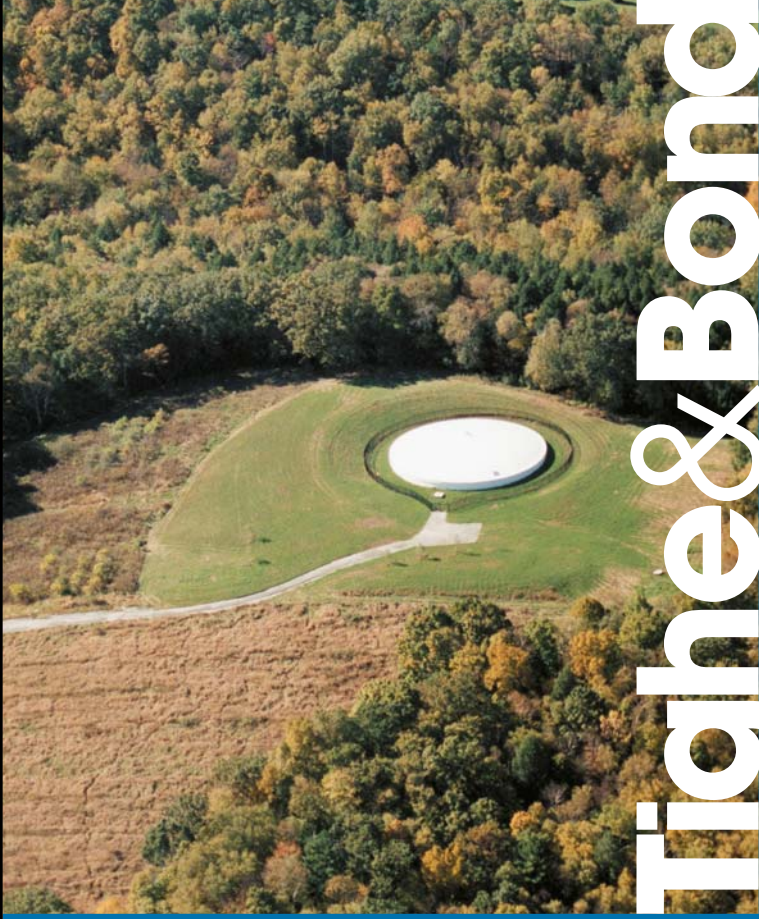
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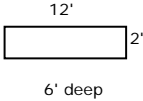
**McGlew Park
201 1/2 North Street
Salem, MA**

June 2016





Tighe & Bond

Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608		Test Pit No. <u>EX-TP1</u> Page No. <u>1 of 1</u> File No. _____ Checked By: _____	
T&B Rep. <u>KCL</u> Weather <u>60°, Sunny</u>		Excavation Equipment Contractor <u>Technical Drilling Services</u> Operator <u>Darwin</u> Make <u>Ford</u> Model <u>555E</u> Capacity _____ Reach <u>14.5</u> ft.	
		Date <u>3/30/2016</u> Ground Elev. <u>Not encountered</u> Time Started <u>8:00</u> Time Completed <u>9:00</u>	
Depth	General Sample Description	Sample No.	PID Reading (ppm) Excav. Effort Boulder Count/Class Note No.
0'	Brown SAND, little GRAVEL, trace ash, brick, and seashell pieces.		M
1'			
2'			M
3'	Brown SAND, little Gravel, trace ash, brick, glass, and seashell pieces.		
4'			D
5'			
6'	Refusal at 6' BSG on apparent ledge.		
7'			
8'			
9'			
10'			
11'			
12'			
13'			
14'			
15'			
16'			
Notes:			
<div> <div> Test Pit Plan  </div> <div> Volume = <u>5.33</u> cu. yd. </div> </div> <div> Boulder Class Letter Designation A B C Size Range Classification 6" - 17" 18" - 36" 36" and Larger Excavation Effort E-----Easy M-----Moderate D-----Difficult </div> <div> Proportions Used TRACE (TR.) 0 - 10% LITTLE (LI.) 10 - 20% SOME (SO.) 20 - 35% AND 35 - 50% </div> <div> Abbreviations F = Fine M = Medium C = Coarse V = Very F/M = Fine to medium F/C = Fine to coarse GR = Gray BN = Brown YEL = Yellow </div> <div> GROUNDWATER () Encountered (x) Not Encountered Elapsed Time to Reading (Hours) Depth to Ground-water </div>			
J:\S\S1758 Salem MA On Call Engineering\McGlew Park\MCP Report\[test pit log 3-30-16.xls]EX-TP1			

Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP2</u> Page No. <u>1 of 1</u> File No. _____ Checked By: _____			
T&B Rep. <u>KCL</u>		Contractor <u>Excavation Equipment Technical Drilling Services</u>		Date <u>3/30/2016</u>			
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>Not encountered</u>			
		Make <u>Ford</u> Model <u>555E</u>		Time Started <u>13:00</u>			
		Capacity _____ Reach <u>14.5 ft.</u>		Time Completed <u>13:50</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND and ASH, little GRAVEL, trace brick, shell, coal and glass.			M		
1'						
2'	ASH and SAND, trace GRAVEL, trace, brick, shell and glass.			M		
3'						
4'	ASH and SAND, little GRAVEL, little coal, trace glass, shell and brick.			D		
5'						
6'	Refusal at 6' BSG on apparent ledge.					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <p>11' 2'</p> <p>6' deep</p> </div> <p>Volume = <u>4.88</u> cu. yd.</p>	<table border="0"> <tr> <th colspan="2">Boulder Class</th> </tr> <tr> <td>Letter Designation</td> <td>Size Range Classification</td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table border="0"> <tr> <th colspan="2">Excavation Effort</th> </tr> <tr> <td>E-----</td> <td>Easy</td> </tr> <tr> <td>M-----</td> <td>Moderate</td> </tr> <tr> <td>D-----</td> <td>Difficult</td> </tr> </table>	Boulder Class		Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort		E-----	Easy	M-----	Moderate	D-----	Difficult	<table border="0"> <tr> <th colspan="2">Proportions Used</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used		TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table border="0"> <tr> <th colspan="2">Abbreviations</th> </tr> <tr> <td>F =</td> <td>Fine</td> </tr> <tr> <td>M =</td> <td>Medium</td> </tr> <tr> <td>C =</td> <td>Coarse</td> </tr> <tr> <td>V =</td> <td>Very</td> </tr> <tr> <td>F/M =</td> <td>Fine to medium</td> </tr> <tr> <td>F/C =</td> <td>Fine to coarse</td> </tr> <tr> <td>GR =</td> <td>Gray</td> </tr> <tr> <td>BN =</td> <td>Brown</td> </tr> <tr> <td>YEL =</td> <td>Yellow</td> </tr> </table>	Abbreviations		F =	Fine	M =	Medium	C =	Coarse	V =	Very	F/M =	Fine to medium	F/C =	Fine to coarse	GR =	Gray	BN =	Brown	YEL =	Yellow	<table border="0"> <tr> <th colspan="2">GROUNDWATER</th> </tr> <tr> <td>()</td> <td>Encountered</td> </tr> <tr> <td>(x)</td> <td>Not Encountered</td> </tr> </table> <table border="0"> <tr> <td>Elapsed Time to Reading (Hours)</td> <td>Depth to Ground-water</td> </tr> <tr> <td style="border-bottom: 1px solid black; width: 50px;"></td> <td style="border-bottom: 1px solid black; width: 50px;"></td> </tr> </table>	GROUNDWATER		()	Encountered	(x)	Not Encountered	Elapsed Time to Reading (Hours)	Depth to Ground-water		
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Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP3</u> Page No. <u>1 of 1</u> File No. _____ Checked By: _____			
T&B Rep. <u>KCL</u>		Contractor <u>Excavation Equipment Technical Drilling Services</u>		Date <u>3/30/2016</u>			
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>Not encountered</u>			
		Make <u>Ford</u> Model <u>555E</u>		Time Started <u>13:50</u>			
		Capacity _____ Reach <u>14.5 ft.</u>		Time Completed <u>14:45</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND and ASH, little GRAVEL, trace coal and brick.			M		
1'						
2'	ASH and SAND, little Gravel, trace coal brick, shell and glass.			M		
3'						
4'	ASH and SAND, little GRAVEL, trace coal and glass.			D		
5'						
6'	Refusal at 6' BSG on apparent ledge.					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> <p>9' x 6' deep</p> </div> <p>Volume = <u>4</u> cu. yd.</p>	<table border="0"> <tr> <th colspan="2">Boulder Class</th> </tr> <tr> <td>Letter Designation</td> <td>Size Range Classification</td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table border="0"> <tr> <th colspan="2">Excavation Effort</th> </tr> <tr> <td>E-----</td> <td>Easy</td> </tr> <tr> <td>M-----</td> <td>Moderate</td> </tr> <tr> <td>D-----</td> <td>Difficult</td> </tr> </table>	Boulder Class		Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort		E-----	Easy	M-----	Moderate	D-----	Difficult	<table border="0"> <tr> <th colspan="2">Proportions Used</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used		TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table border="0"> <tr> <th colspan="2">Abbreviations</th> </tr> <tr> <td>F =</td> <td>Fine</td> </tr> <tr> <td>M =</td> <td>Medium</td> </tr> <tr> <td>C =</td> <td>Coarse</td> </tr> <tr> <td>V =</td> <td>Very</td> </tr> <tr> <td>F/M =</td> <td>Fine to medium</td> </tr> <tr> <td>F/C =</td> <td>Fine to coarse</td> </tr> <tr> <td>GR =</td> <td>Gray</td> </tr> <tr> <td>BN =</td> <td>Brown</td> </tr> <tr> <td>YEL =</td> <td>Yellow</td> </tr> </table>	Abbreviations		F =	Fine	M =	Medium	C =	Coarse	V =	Very	F/M =	Fine to medium	F/C =	Fine to coarse	GR =	Gray	BN =	Brown	YEL =	Yellow	<table border="0"> <tr> <th colspan="2">GROUNDWATER</th> </tr> <tr> <td>()</td> <td>Encountered</td> </tr> <tr> <td>(x)</td> <td>Not Encountered</td> </tr> </table> <table border="0"> <tr> <td>Elapsed Time to Reading (Hours)</td> <td>Depth to Ground-water</td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	GROUNDWATER		()	Encountered	(x)	Not Encountered	Elapsed Time to Reading (Hours)	Depth to Ground-water		
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Tighe & Bond Consulting Engineers 446 Main Street, 6th Floor Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP4</u> Page No. <u>1 of 1</u> File No. <u>10:11</u> Checked By: <u>11:00</u>			
T&B Rep. <u>KCL</u>		Contractor <u>Excavation Equipment Technical Drilling Services</u>		Date <u>3/30/2016</u>			
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>Not encountered</u>			
		Make <u>Ford</u> Model <u>555E</u>		Time Started <u>10:11</u>			
		Capacity _____ Reach <u>14.5 ft.</u>		Time Completed <u>11:00</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND and ASH, little gravel, trace brick and seashell.			M		
1'						
2'	ASH and SAND, little GRAVEL, little coal, trace glass, metal, seashell and brick.			M		
3'						
4'	ASH and SAND, some coal/slag, trace glass, shards of metal, brick and porcelain.			M		
5'						
6'	SAND and ASH, some glass, trace brick, glass and metal.			D		
7'				D		
8'						
9'						
10'	Refusal at 9.5' BSG on apparent ledge.					
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> </div> Volume = <u>7.74</u> cu. yd.	<table border="0"> <tr> <th colspan="2">Boulder Class</th> </tr> <tr> <td>Letter Designation</td> <td>Size Range Classification</td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table border="0"> <tr> <th colspan="2">Excavation Effort</th> </tr> <tr> <td>E-----</td> <td>Easy</td> </tr> <tr> <td>M-----</td> <td>Moderate</td> </tr> <tr> <td>D-----</td> <td>Difficult</td> </tr> </table>	Boulder Class		Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort		E-----	Easy	M-----	Moderate	D-----	Difficult	<table border="0"> <tr> <th colspan="2">Proportions Used</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used		TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table border="0"> <tr> <th colspan="2">Abbreviations</th> </tr> <tr><td>F =</td><td>Fine</td></tr> <tr><td>M =</td><td>Medium</td></tr> <tr><td>C =</td><td>Coarse</td></tr> <tr><td>V =</td><td>Very</td></tr> <tr><td>F/M =</td><td>Fine to medium</td></tr> <tr><td>F/C =</td><td>Fine to coarse</td></tr> <tr><td>GR =</td><td>Gray</td></tr> <tr><td>BN =</td><td>Brown</td></tr> <tr><td>YEL =</td><td>Yellow</td></tr> </table>	Abbreviations		F =	Fine	M =	Medium	C =	Coarse	V =	Very	F/M =	Fine to medium	F/C =	Fine to coarse	GR =	Gray	BN =	Brown	YEL =	Yellow	<table border="0"> <tr> <th colspan="2">GROUNDWATER</th> </tr> <tr> <td>()</td> <td>Encountered</td> </tr> <tr> <td>(x)</td> <td>Not Encountered</td> </tr> </table> <table border="0"> <tr> <td>Elapsed Time to Reading (Hours)</td> <td>Depth to Ground-water</td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	GROUNDWATER		()	Encountered	(x)	Not Encountered	Elapsed Time to Reading (Hours)	Depth to Ground-water		
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Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP5</u> Page No. <u>1 of 1</u> File No. _____ Checked By: _____			
T&B Rep. <u>KCL</u>		Contractor <u>Excavation Equipment Technical Drilling Services</u>		Date <u>3/30/2016</u>			
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>Not encountered</u>			
		Make <u>Ford</u> Model <u>555E</u>		Time Started <u>9:08</u>			
		Capacity _____ Reach <u>14.5 ft.</u>		Time Completed <u>10:00</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND and ASH, little silt, trace organics and GRAVEL, brick and shell.			M		
1'						
2'	SAND and ASH, little GRAVEL, little coal, trace metal, brick, glass, and shell.			M		
3'						
4'	ASH and SAND, some coal and shell fragments, trace metal, glass, and brick.			D		
5'						
6'	ASH and SAND, some Glass, little GRAVEL, trace brick and metal.			D		
7'						
8'	Refusal at 7.5' BSG on apparent ledge.					
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> </div> <p style="text-align: center;">15'</p> <p style="text-align: center;">2'</p> <p style="text-align: center;">7.5' deep</p> <p>Volume = <u>8.33</u> cu. yd.</p>	<table border="0"> <tr> <th colspan="2">Boulder Class</th> </tr> <tr> <td>Letter Designation</td> <td>Size Range Classification</td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table border="0"> <tr> <th colspan="2">Excavation Effort</th> </tr> <tr> <td>E-----Easy</td> <td></td> </tr> <tr> <td>M-----Moderate</td> <td></td> </tr> <tr> <td>D-----Difficult</td> <td></td> </tr> </table>	Boulder Class		Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort		E-----Easy		M-----Moderate		D-----Difficult		<table border="0"> <tr> <th colspan="2">Proportions Used</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used		TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table border="0"> <tr> <th colspan="2">Abbreviations</th> </tr> <tr> <td>F = Fine</td> <td></td> </tr> <tr> <td>M = Medium</td> <td></td> </tr> <tr> <td>C = Coarse</td> <td></td> </tr> <tr> <td>V = Very</td> <td></td> </tr> <tr> <td>F/M = Fine to medium</td> <td></td> </tr> <tr> <td>F/C = Fine to coarse</td> <td></td> </tr> <tr> <td>GR = Gray</td> <td></td> </tr> <tr> <td>BN = Brown</td> <td></td> </tr> <tr> <td>YEL = Yellow</td> <td></td> </tr> </table>	Abbreviations		F = Fine		M = Medium		C = Coarse		V = Very		F/M = Fine to medium		F/C = Fine to coarse		GR = Gray		BN = Brown		YEL = Yellow		<table border="0"> <tr> <th colspan="2">GROUNDWATER</th> </tr> <tr> <td>() Encountered</td> <td></td> </tr> <tr> <td>(x) Not Encountered</td> <td></td> </tr> </table> <table border="0"> <tr> <td>Elapsed Time to Reading (Hours)</td> <td>Depth to Ground-water</td> </tr> <tr> <td><div style="border: 1px solid black; width: 100px; height: 20px;"></div></td> <td><div style="border: 1px solid black; width: 100px; height: 20px;"></div></td> </tr> </table>	GROUNDWATER		() Encountered		(x) Not Encountered		Elapsed Time to Reading (Hours)	Depth to Ground-water	<div style="border: 1px solid black; width: 100px; height: 20px;"></div>	<div style="border: 1px solid black; width: 100px; height: 20px;"></div>
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Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP6</u> Page No. <u>1 of 1</u> File No. _____ Checked By: _____			
T&B Rep. <u>KCL</u>		Contractor <u>Excavation Equipment Technical Drilling Services</u>		Date <u>3/30/2016</u>			
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>8.5'</u>			
		Make <u>Ford</u> Model <u>555E</u>		Time Started <u>12:30</u>			
		Capacity _____ Reach <u>14.5 ft.</u>		Time Completed <u>13:00</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND, some ASH, little GRAVEL, trace metal, brick and glass.			M		
1'				M		
2'	ASH, some SAND and GRAVEL, little coal/slag, trace brick, shell and glass.					
3'						
4'				M		
5'	SAND and ASH, some GRAVEL, little coal/slag, trace brick, shell and glass.					
6'						
7'	ASH, some SAND and GRAVEL, trace coal and shell, trace silt.			D		
8'						
9'	Refusal at 8.5' BSG on apparent ledge. Encountered evidence of groundwater at 8.5' BSG.					
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> </div> Volume = <u>6.93</u> cu. yd.	<table border="0"> <tr> <th colspan="2">Boulder Class</th> </tr> <tr> <td>Letter Designation</td> <td>Size Range Classification</td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table border="0"> <tr> <th colspan="2">Excavation Effort</th> </tr> <tr> <td>E-----</td> <td>Easy</td> </tr> <tr> <td>M-----</td> <td>Moderate</td> </tr> <tr> <td>D-----</td> <td>Difficult</td> </tr> </table>	Boulder Class		Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort		E-----	Easy	M-----	Moderate	D-----	Difficult	<table border="0"> <tr> <th colspan="2">Proportions Used</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used		TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table border="0"> <tr> <th colspan="2">Abbreviations</th> </tr> <tr><td>F =</td><td>Fine</td></tr> <tr><td>M =</td><td>Medium</td></tr> <tr><td>C =</td><td>Coarse</td></tr> <tr><td>V =</td><td>Very</td></tr> <tr><td>F/M =</td><td>Fine to medium</td></tr> <tr><td>F/C =</td><td>Fine to coarse</td></tr> <tr><td>GR =</td><td>Gray</td></tr> <tr><td>BN =</td><td>Brown</td></tr> <tr><td>YEL =</td><td>Yellow</td></tr> </table> <table border="0"> <tr> <th colspan="2">GROUNDWATER</th> </tr> <tr> <td>(x)</td> <td>Encountered</td> </tr> <tr> <td>()</td> <td>Not Encountered</td> </tr> </table> <table border="0"> <tr> <td>Elapsed Time to Reading (Hours)</td> <td>Depth to Ground-water</td> </tr> <tr> <td><div style="border: 1px solid black; width: 100px; height: 20px;"></div></td> <td><div style="border: 1px solid black; width: 100px; height: 20px;"></div></td> </tr> </table>	Abbreviations		F =	Fine	M =	Medium	C =	Coarse	V =	Very	F/M =	Fine to medium	F/C =	Fine to coarse	GR =	Gray	BN =	Brown	YEL =	Yellow	GROUNDWATER		(x)	Encountered	()	Not Encountered	Elapsed Time to Reading (Hours)	Depth to Ground-water	<div style="border: 1px solid black; width: 100px; height: 20px;"></div>	<div style="border: 1px solid black; width: 100px; height: 20px;"></div>
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Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP7</u> Page No. <u>1 of 1</u> File No. <u>11:04</u> Checked By: <u>11:40</u>			
T&B Rep. <u>KCL</u>		Contractor <u>Excavation Equipment Technical Drilling Services</u>		Date <u>3/30/2016</u>			
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>Not encountered</u>			
		Make <u>Ford</u> Model <u>555E</u>		Time Started <u>10:11</u>			
		Capacity _____ Reach <u>14.5 ft.</u>		Time Completed <u>11:00</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND and ASH, trace brick, glass, porcelein and coal.			M		
1'						
2'	SAND and ASH, trace coal, brick, glass and metal.			M		
3'						
4'	SAND and ASH, little brick and glass.			D		
5'						
6'	Refusal at 6' BSG on apparent ledge.					
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> </div> Volume = <u>4.22</u> cu. yd.	<table border="0"> <tr> <th colspan="2">Boulder Class</th> </tr> <tr> <td>Letter Designation</td> <td>Size Range Classification</td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table border="0"> <tr> <th colspan="2">Excavation Effort</th> </tr> <tr> <td>E-----</td> <td>Easy</td> </tr> <tr> <td>M-----</td> <td>Moderate</td> </tr> <tr> <td>D-----</td> <td>Difficult</td> </tr> </table>	Boulder Class		Letter Designation	Size Range Classification	A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort		E-----	Easy	M-----	Moderate	D-----	Difficult	<table border="0"> <tr> <th colspan="2">Proportions Used</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used		TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table border="0"> <tr> <th colspan="2">Abbreviations</th> </tr> <tr><td>F =</td><td>Fine</td></tr> <tr><td>M =</td><td>Medium</td></tr> <tr><td>C =</td><td>Coarse</td></tr> <tr><td>V =</td><td>Very</td></tr> <tr><td>F/M =</td><td>Fine to medium</td></tr> <tr><td>F/C =</td><td>Fine to coarse</td></tr> <tr><td>GR =</td><td>Gray</td></tr> <tr><td>BN =</td><td>Brown</td></tr> <tr><td>YEL =</td><td>Yellow</td></tr> </table> <table border="0"> <tr> <th colspan="2">GROUNDWATER</th> </tr> <tr> <td>()</td> <td>Encountered</td> </tr> <tr> <td>(x)</td> <td>Not Encountered</td> </tr> </table> <table border="0"> <tr> <td>Elapsed Time to Reading (Hours)</td> <td>Depth to Ground-water</td> </tr> <tr> <td><div style="border: 1px solid black; width: 100px; height: 20px;"></div></td> <td><div style="border: 1px solid black; width: 100px; height: 20px;"></div></td> </tr> </table>	Abbreviations		F =	Fine	M =	Medium	C =	Coarse	V =	Very	F/M =	Fine to medium	F/C =	Fine to coarse	GR =	Gray	BN =	Brown	YEL =	Yellow	GROUNDWATER		()	Encountered	(x)	Not Encountered	Elapsed Time to Reading (Hours)	Depth to Ground-water	<div style="border: 1px solid black; width: 100px; height: 20px;"></div>	<div style="border: 1px solid black; width: 100px; height: 20px;"></div>
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Tighe & Bond Consulting Engineers 446 Main Street Worcester, Massachusetts 01608				Test Pit No. <u>EX-TP8</u> Page No. <u>1 of 1</u> File No. _____ Checked By: _____			
Excavation Equipment							
T&B Rep. <u>KCL</u>		Contractor <u>Technical Drilling Services</u>			Date <u>3/30/2016</u>		
Weather <u>60°, Sunny</u>		Operator <u>Darwin</u>		Ground Elev. <u>Not encountered</u>			
		Make <u>Ford</u>	Model <u>555E</u>	Time Started <u>11:42</u>			
		Capacity _____	Reach <u>14.5</u> ft.	Time Completed <u>12:15</u>			

Depth	General Sample Description	Sample No.	PID Reading (ppm)	Excav. Effort	Boulder Count/Class	Note No.
0'	SAND and ASH, trace coal and brick. Piece of leather shoe material also observed.					
1'	Test pit ended at 1 foot for shallow soil sample collection only.					
2'						
3'						
4'						
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						
16'						

Notes:

Test Pit Plan <div style="text-align: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> <p>3' 2'</p> <p>1' deep</p> </div> <p>Volume = <u>0.22</u> cu. yd.</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Boulder Class</th> <th style="text-align: left;">Size Range Classification</th> </tr> <tr> <td>Letter Designation</td> <td></td> </tr> <tr> <td>A</td> <td>6" - 17"</td> </tr> <tr> <td>B</td> <td>18" - 36"</td> </tr> <tr> <td>C</td> <td>36" and Larger</td> </tr> </table> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Excavation Effort</th> </tr> <tr> <td>E-----Easy</td> </tr> <tr> <td>M-----Moderate</td> </tr> <tr> <td>D-----Difficult</td> </tr> </table>	Boulder Class	Size Range Classification	Letter Designation		A	6" - 17"	B	18" - 36"	C	36" and Larger	Excavation Effort	E-----Easy	M-----Moderate	D-----Difficult	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Proportions Used</th> <th style="text-align: left;">Proportions</th> </tr> <tr> <td>TRACE (TR.)</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE (LI.)</td> <td>10 - 20%</td> </tr> <tr> <td>SOME (SO.)</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </table>	Proportions Used	Proportions	TRACE (TR.)	0 - 10%	LITTLE (LI.)	10 - 20%	SOME (SO.)	20 - 35%	AND	35 - 50%	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Abbreviations</th> </tr> <tr> <td>F = Fine</td> </tr> <tr> <td>M = Medium</td> </tr> <tr> <td>C = Coarse</td> </tr> <tr> <td>V = Very</td> </tr> <tr> <td>F/M = Fine to medium</td> </tr> <tr> <td>F/C = Fine to coarse</td> </tr> <tr> <td>GR = Gray</td> </tr> <tr> <td>BN = Brown</td> </tr> <tr> <td>YEL = Yellow</td> </tr> </table>	Abbreviations	F = Fine	M = Medium	C = Coarse	V = Very	F/M = Fine to medium	F/C = Fine to coarse	GR = Gray	BN = Brown	YEL = Yellow	<table style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">GROUNDWATER</th> </tr> <tr> <td colspan="2">(x) Encountered</td> </tr> <tr> <td colspan="2">() Not Encountered</td> </tr> <tr> <td style="width: 50%;">Elapsed Time to Reading (Hours)</td> <td style="width: 50%;">Depth to Ground-water</td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	GROUNDWATER		(x) Encountered		() Not Encountered		Elapsed Time to Reading (Hours)	Depth to Ground-water				
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Tighe & Bond



CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: McGlew Park (S-1758)
ESS Laboratory Work Order Number: 1601467

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED

By ESS Laboratory at 3:45 pm, Feb 03, 2016

Analytical Summary

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with NELAC Standards, A2LA and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

SAMPLE RECEIPT

The following samples were received on January 25, 2016 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has performed and reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Data Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals were analyzed for a subset of the required MCP list per the client's request.

<u>Lab Number</u>	<u>Sample Name</u>	<u>Matrix</u>	<u>Analysis</u>
1601467-01	SB-8 0-3ft	Soil	8081B, 8082A
1601467-02	SB-4 2-5ft	Soil	8081B
1601467-03	SB-5 2-4ft	Soil	6010C, 7010, 7471B, 8082A, 8260B, EPH8270, MADEP-EPH
1601467-04	SB-5 8-9ft	Soil	6010C, 7010, 7471B, EPH8270, MADEP-EPH
1601467-05	SB-7 2-5ft	Soil	6010C, 7010, 7471B, 8082A, 8260B, EPH8270, MADEP-EPH
1601467-06	SB-1 0-2ft	Soil	6010C, 7010, 7471B, 8082A, EPH8270, MADEP-EPH
1601467-07	SB-3 0-3ft	Soil	6010C, 7010, 7471B, EPH8270, MADEP-EPH
1601467-08	SB-9 2-4ft	Soil	6010C, 7010, 7471B, EPH8270, MADEP-EPH
1601467-09	SB-9 5-6ft	Soil	6010C, 7010, 7471B, EPH8270, MADEP-EPH
1601467-10	SB-10 0-3ft	Soil	6010C, 7010, 7471B, EPH8270, MADEP-EPH



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

PROJECT NARRATIVE

5035/8260B Volatile Organic Compounds / Methanol

1601467-03 Surrogate recovery(ies) above upper control limit (S+).
4-Bromofluorobenzene (136% @ 70-130%), Toluene-d8 (141% @ 70-130%)
CA62847-BSD1 Blank Spike recovery is below lower control limit (B-).
1,4-Dioxane - Screen (% @ 44-241%)
CZA0311-CCV1 Continuing Calibration %Diff/Drift is below control limit (CD-).
1,4-Dioxane - Screen (38% @ 20%)

MADEP-EPH Extractable Petroleum Hydrocarbons

CZA0287-CCV6 Continuing Calibration %Diff/Drift is below control limit (CD-).
Hexatriacontane (C36) (27% @ 25%)
CZA0288-CCV4 Continuing Calibration %Diff/Drift is below control limit (CD-).
Hexatriacontane (C36) (36% @ 25%)
CZA0288-CCV5 Continuing Calibration %Diff/Drift is below control limit (CD-).
Hexatriacontane (C36) (40% @ 25%)
CZA0305-CCV4 Continuing Calibration %Diff/Drift is below control limit (CD-).
Benzo(a)pyrene (32% @ 20%), Benzo(b)fluoranthene (22% @ 20%), Benzo(g,h,i)perylene (65% @ 20%),
Benzo(k)fluoranthene (23% @ 20%), Dibenzo(a,h)Anthracene (59% @ 20%), Indeno(1,2,3-cd)Pyrene
(62% @ 20%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

[Definitions of Quality Control Parameters](#)
[Semivolatile Organics Internal Standard Information](#)
[Semivolatile Organics Surrogate Information](#)
[Volatile Organics Internal Standard Information](#)
[Volatile Organics Surrogate Information](#)
[EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015D - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1601467-01 through 1601467-10**

Matrices: () Ground Water/Surface Water (X) Soil/Sediment () Drinking Water () Air () Other: _____

CAM Protocol (check all that apply below):

(X) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	() MassDEP VPH CAM IV A	(X) 8081 Pesticides CAM V B	() 7196 Hex Cr CAM VI B	() MassDEP APH CAM IX A
() 8270 SVOC CAM II B	(X) 7010 Metals CAM III C	(X) MassDEP EPH CAM IV B	() 8151 Herbicides CAM V C	() 8330 Explosives CAM VIII A	() TO-15 VOC CAM IX B
(X) 6010 Metals CAM III A	() 6020 Metals CAM III D	(X) 8082 PCB CAM V A	() 6860 Perchlorate CAM VIII B	() 9014 Total Cyanide/PAC CAM VI A	

Affirmative responses to questions A through F are required for Presumptive Certainty's status

A	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?	Yes (X) No ()
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ()
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ()
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ()
E	a. VPH, EPH, APH and TO-15 only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ()
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes () No ()
F	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)?	Yes (X) No ()

Responses to Questions G, H and I below are required for Presumptive Certainty's status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? Data User Note: Data that achieve Presumptive Certainty's status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.	Yes (X) No ()*
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	Yes () No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes () No (X)*

***All negative responses must be addressed in an attached laboratory 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: Laurel Stoddard
Printed Name: Laurel Stoddard

Date: February 03, 2016
Position: Laboratory Director



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-8 0-3ft
Date Sampled: 01/22/16 10:15
Percent Solids: 71
Initial Volume: 19
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/26/16 16:02

8081B Organochlorine Pesticides

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
4,4'-DDD	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
4,4'-DDE	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
4,4'-DDT	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Aldrin	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
alpha-BHC	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
alpha-Chlordane	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
beta-BHC	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Chlordane (Total)	ND (0.0298)		8081B		1	01/28/16 8:28	CZA0245	CA62619
delta-BHC	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Dieldrin	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Endosulfan I	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Endosulfan II	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Endosulfan Sulfate	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Endrin	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Endrin Ketone	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
gamma-BHC (Lindane)	ND (0.0022)		8081B		1	01/28/16 8:28	CZA0245	CA62619
gamma-Chlordane	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Heptachlor	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Heptachlor Epoxide	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Hexachlorobenzene	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619
Methoxychlor	ND (0.0037)		8081B		1	01/28/16 8:28	CZA0245	CA62619

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: Decachlorobiphenyl	93 %		30-150
Surrogate: Decachlorobiphenyl [2C]	99 %		30-150
Surrogate: Tetrachloro-m-xylene	82 %		30-150
Surrogate: Tetrachloro-m-xylene [2C]	77 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-8 0-3ft
Date Sampled: 01/22/16 10:15
Percent Solids: 71
Initial Volume: 19
Final Volume: 10
Extraction Method: 3540

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: JXS
Prepared: 1/25/16 17:30
Cleanup Method: 3665A

8082A Polychlorinated Biphenyls (PCB)

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Aroclor 1016	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1221	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1232	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1242	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1248	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1254	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1260	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1262	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538
Aroclor 1268	ND (0.0745)		8082A		1	01/27/16 18:20		CA62538

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: Decachlorobiphenyl</i>	<i>81 %</i>		<i>30-150</i>
<i>Surrogate: Decachlorobiphenyl [2C]</i>	<i>94 %</i>		<i>30-150</i>
<i>Surrogate: Tetrachloro-m-xylene</i>	<i>96 %</i>		<i>30-150</i>
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	<i>99 %</i>		<i>30-150</i>



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-4 2-5ft
Date Sampled: 01/22/16 10:45
Percent Solids: 74
Initial Volume: 19
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/26/16 16:02

8081B Organochlorine Pesticides

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
4,4'-DDD	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
4,4'-DDE [2C]	0.0056 (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
4,4'-DDT	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Aldrin	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
alpha-BHC	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
alpha-Chlordane	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
beta-BHC	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Chlordane (Total)	ND (0.0286)		8081B		1	01/28/16 9:00	CZA0245	CA62619
delta-BHC	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Dieldrin	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Endosulfan I	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Endosulfan II	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Endosulfan Sulfate	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Endrin	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Endrin Ketone	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
gamma-BHC (Lindane)	ND (0.0021)		8081B		1	01/28/16 9:00	CZA0245	CA62619
gamma-Chlordane	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Heptachlor	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Heptachlor Epoxide	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Hexachlorobenzene	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619
Methoxychlor	ND (0.0036)		8081B		1	01/28/16 9:00	CZA0245	CA62619

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: Decachlorobiphenyl	65 %		30-150
Surrogate: Decachlorobiphenyl [2C]	74 %		30-150
Surrogate: Tetrachloro-m-xylene	66 %		30-150
Surrogate: Tetrachloro-m-xylene [2C]	64 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25
Percent Solids: 70

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	14.8 (3.01)		6010C		1	KJK	01/28/16 19:36	2.38	100	CA62708
Barium	169 (3.01)		6010C		1	KJK	01/28/16 19:36	2.38	100	CA62708
Cadmium	0.61 (0.60)		6010C		1	KJK	01/28/16 19:36	2.38	100	CA62708
Chromium	9.54 (1.20)		6010C		1	KJK	01/28/16 19:36	2.38	100	CA62708
Lead	356 (6.02)		6010C		1	KJK	01/28/16 19:36	2.38	100	CA62708
Mercury	0.097 (0.046)		7471B		1	PJP	01/28/16 12:33	0.62	40	CA62710
Selenium	ND (3.01)		7010		5	KJK	01/29/16 2:31	2.38	100	CA62708
Silver	ND (0.60)		6010C		1	KJK	01/28/16 19:36	2.38	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25
Percent Solids: 70
Initial Volume: 18.1
Final Volume: 15
Extraction Method: 5035

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MD

5035/8260B Volatile Organic Compounds / Methanol

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,1,1-Trichloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,1,2,2-Tetrachloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,1,2-Trichloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,1-Dichloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,1-Dichloroethene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,1-Dichloropropene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2,3-Trichlorobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2,3-Trichloropropane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2,4-Trichlorobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2,4-Trimethylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2-Dibromo-3-Chloropropane	ND (1.62)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2-Dibromoethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2-Dichlorobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2-Dichloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,2-Dichloropropane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,3,5-Trimethylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,3-Dichlorobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,3-Dichloropropane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,4-Dichlorobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
1,4-Dioxane - Screen	ND (64.7)		8260B		1	01/28/16 13:21	CZA0311	CA62847
2,2-Dichloropropane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
2-Butanone	ND (1.62)		8260B		1	01/28/16 13:21	CZA0311	CA62847
2-Chlorotoluene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
2-Hexanone	ND (1.62)		8260B		1	01/28/16 13:21	CZA0311	CA62847
4-Chlorotoluene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
4-Isopropyltoluene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
4-Methyl-2-Pentanone	ND (1.62)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Acetone	ND (1.62)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Benzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Bromobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Bromochloromethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25
Percent Solids: 70
Initial Volume: 18.1
Final Volume: 15
Extraction Method: 5035

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MD

5035/8260B Volatile Organic Compounds / Methanol

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Bromoform	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Bromomethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Carbon Disulfide	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Carbon Tetrachloride	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Chlorobenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Chloroethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Chloroform	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Chloromethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
cis-1,2-Dichloroethene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
cis-1,3-Dichloropropene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Dibromochloromethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Dibromomethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Dichlorodifluoromethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Diethyl Ether	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Di-isopropyl ether	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Ethyl tertiary-butyl ether	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Ethylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Hexachlorobutadiene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Isopropylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Methyl tert-Butyl Ether	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Methylene Chloride	ND (0.647)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Naphthalene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
n-Butylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
n-Propylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
sec-Butylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Styrene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
tert-Butylbenzene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Tertiary-amyl methyl ether	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Tetrachloroethene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Tetrahydrofuran	ND (1.62)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Toluene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25
Percent Solids: 70
Initial Volume: 18.1
Final Volume: 15
Extraction Method: 5035

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MD

5035/8260B Volatile Organic Compounds / Methanol

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
trans-1,3-Dichloropropene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Trichloroethene	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Trichlorofluoromethane	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Vinyl Chloride	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Xylene O	ND (0.324)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Xylene P,M	ND (0.647)		8260B		1	01/28/16 13:21	CZA0311	CA62847
Xylenes (Total)	ND (0.647)		8260B		2	01/28/16 13:21		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>126 %</i>		<i>70-130</i>
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>136 %</i>	<i>S+</i>	<i>70-130</i>
<i>Surrogate: Dibromofluoromethane</i>	<i>122 %</i>		<i>70-130</i>
<i>Surrogate: Toluene-d8</i>	<i>141 %</i>	<i>S+</i>	<i>70-130</i>



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25
Percent Solids: 70
Initial Volume: 19.5
Final Volume: 10
Extraction Method: 3540

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: JXS
Prepared: 1/25/16 17:30
Cleanup Method: 3665A

8082A Polychlorinated Biphenyls (PCB)

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Aroclor 1016	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1221	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1232	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1242	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1248	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1254	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1260	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1262	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538
Aroclor 1268	ND (0.0734)		8082A		1	01/27/16 18:40		CA62538

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: Decachlorobiphenyl</i>	76 %		30-150
<i>Surrogate: Decachlorobiphenyl [2C]</i>	80 %		30-150
<i>Surrogate: Tetrachloro-m-xylene</i>	88 %		30-150
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	71 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25
Percent Solids: 70
Initial Volume: 25.1
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-03
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (21.4)		MADEP-EPH		1	DPS	01/27/16 17:47	CZA0288	CA62618
C19-C36 Aliphatics1	ND (21.4)		MADEP-EPH		1	DPS	01/27/16 17:47	CZA0288	CA62618
C11-C22 Unadjusted Aromatics1	143 (21.4)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
C11-C22 Aromatics1,2	94.2 (21.4)		EPH8270			VSC	01/27/16 23:37		[CALC]
2-Methylnaphthalene	ND (0.29)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Acenaphthene	ND (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Naphthalene	ND (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Phenanthrene	5.68 (2.85)		EPH8270		5	VSC	01/27/16 23:37	CZA0275	CA62618
Acenaphthylene	ND (0.29)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Anthracene	1.16 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Benzo(a)anthracene	4.42 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Benzo(a)pyrene	4.07 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Benzo(b)fluoranthene	5.15 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Benzo(g,h,i)perylene	2.89 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Benzo(k)fluoranthene	1.57 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Chrysene	4.18 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Dibenzo(a,h)Anthracene	0.63 (0.29)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Fluoranthene	8.69 (2.85)		EPH8270		5	VSC	01/27/16 23:37	CZA0275	CA62618
Fluorene	ND (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Indeno(1,2,3-cd)Pyrene	2.79 (0.57)		EPH8270		1	VSC	01/27/16 19:21	CZA0275	CA62618
Pyrene	7.70 (2.85)		EPH8270		5	VSC	01/27/16 23:37	CZA0275	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	60 %		40-140
Surrogate: 2-Bromonaphthalene	92 %		40-140
Surrogate: 2-Fluorobiphenyl	82 %		40-140
Surrogate: O-Terphenyl	64 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 8-9ft
Date Sampled: 01/22/16 10:30
Percent Solids: 86

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	13.3 (2.59)		6010C		1	KJK	01/28/16 19:40	2.25	100	CA62708
Barium	189 (2.59)		6010C		1	KJK	01/28/16 19:40	2.25	100	CA62708
Cadmium	0.63 (0.52)		6010C		1	KJK	01/28/16 19:40	2.25	100	CA62708
Chromium	7.78 (1.03)		6010C		1	KJK	01/28/16 19:40	2.25	100	CA62708
Lead	769 (5.17)		6010C		1	KJK	01/28/16 19:40	2.25	100	CA62708
Mercury	0.208 (0.035)		7471B		1	PJP	01/28/16 12:35	0.65	40	CA62710
Selenium	ND (2.59)		7010		5	KJK	01/29/16 2:36	2.25	100	CA62708
Silver	40.4 (0.52)		6010C		1	KJK	01/28/16 19:40	2.25	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-5 8-9ft
Date Sampled: 01/22/16 10:30
Percent Solids: 86
Initial Volume: 24.1
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-04
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (18.1)		MADEP-EPH		1	DPS	01/27/16 18:35	CZA0288	CA62618
C19-C36 Aliphatics1	ND (18.1)		MADEP-EPH		1	DPS	01/27/16 18:35	CZA0288	CA62618
C11-C22 Unadjusted Aromatics1	ND (18.1)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
C11-C22 Aromatics1,2	ND (18.1)		EPH8270			VSC	01/27/16 19:58		[CALC]
2-Methylnaphthalene	ND (0.24)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Acenaphthene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Naphthalene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Phenanthrene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Acenaphthylene	ND (0.24)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Anthracene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Benzo(a)anthracene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Benzo(a)pyrene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Benzo(b)fluoranthene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Benzo(g,h,i)perylene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Benzo(k)fluoranthene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Chrysene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Dibenzo(a,h)Anthracene	ND (0.24)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Fluoranthene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Fluorene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Indeno(1,2,3-cd)Pyrene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618
Pyrene	ND (0.48)		EPH8270		1	VSC	01/27/16 19:58	CZA0275	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	64 %		40-140
Surrogate: 2-Bromonaphthalene	99 %		40-140
Surrogate: 2-Fluorobiphenyl	95 %		40-140
Surrogate: O-Terphenyl	71 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-7 2-5ft
Date Sampled: 01/22/16 11:15
Percent Solids: 71

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	14.9 (2.96)		6010C		1	KJK	01/28/16 19:50	2.38	100	CA62708
Barium	470 (2.96)		6010C		1	KJK	01/28/16 19:50	2.38	100	CA62708
Cadmium	1.10 (0.59)		6010C		1	KJK	01/28/16 19:50	2.38	100	CA62708
Chromium	18.8 (1.19)		6010C		1	KJK	01/28/16 19:50	2.38	100	CA62708
Lead	1340 (5.93)		6010C		1	KJK	01/28/16 19:50	2.38	100	CA62708
Mercury	282 (21.8)		7471B		500	PJP	01/28/16 15:29	0.64	40	CA62710
Selenium	ND (2.96)		7010		5	KJK	01/29/16 2:42	2.38	100	CA62708
Silver	ND (0.59)		6010C		1	KJK	01/28/16 19:50	2.38	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-7 2-5ft
Date Sampled: 01/22/16 11:15
Percent Solids: 71
Initial Volume: 5.7
Final Volume: 15
Extraction Method: 5035

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-05
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MD

5035/8260B Volatile Organic Compounds / Methanol

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,1,1-Trichloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,1,2,2-Tetrachloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,1,2-Trichloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,1-Dichloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,1-Dichloroethene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,1-Dichloropropene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2,3-Trichlorobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2,3-Trichloropropane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2,4-Trichlorobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2,4-Trimethylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2-Dibromo-3-Chloropropane	ND (4.13)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2-Dibromoethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2-Dichlorobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2-Dichloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,2-Dichloropropane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,3,5-Trimethylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,3-Dichlorobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,3-Dichloropropane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,4-Dichlorobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
1,4-Dioxane - Screen	ND (165)		8260B		1	01/28/16 13:53	CZA0311	CA62847
2,2-Dichloropropane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
2-Butanone	ND (4.13)		8260B		1	01/28/16 13:53	CZA0311	CA62847
2-Chlorotoluene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
2-Hexanone	ND (4.13)		8260B		1	01/28/16 13:53	CZA0311	CA62847
4-Chlorotoluene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
4-Isopropyltoluene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
4-Methyl-2-Pentanone	ND (4.13)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Acetone	ND (4.13)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Benzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Bromobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Bromochloromethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-7 2-5ft
Date Sampled: 01/22/16 11:15
Percent Solids: 71
Initial Volume: 5.7
Final Volume: 15
Extraction Method: 5035

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-05
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MD

5035/8260B Volatile Organic Compounds / Methanol

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Bromoform	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Bromomethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Carbon Disulfide	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Carbon Tetrachloride	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Chlorobenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Chloroethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Chloroform	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Chloromethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
cis-1,2-Dichloroethene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
cis-1,3-Dichloropropene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Dibromochloromethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Dibromomethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Dichlorodifluoromethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Diethyl Ether	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Di-isopropyl ether	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Ethyl tertiary-butyl ether	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Ethylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Hexachlorobutadiene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Isopropylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Methyl tert-Butyl Ether	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Methylene Chloride	ND (1.65)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Naphthalene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
n-Butylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
n-Propylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
sec-Butylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Styrene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
tert-Butylbenzene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Tertiary-amyl methyl ether	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Tetrachloroethene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Tetrahydrofuran	ND (4.13)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Toluene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-7 2-5ft
Date Sampled: 01/22/16 11:15
Percent Solids: 71
Initial Volume: 5.7
Final Volume: 15
Extraction Method: 5035

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-05
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MD

5035/8260B Volatile Organic Compounds / Methanol

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
trans-1,3-Dichloropropene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Trichloroethene	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Trichlorofluoromethane	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Vinyl Chloride	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Xylene O	ND (0.825)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Xylene P,M	ND (1.65)		8260B		1	01/28/16 13:53	CZA0311	CA62847
Xylenes (Total)	ND (1.65)		8260B		2	01/28/16 13:53		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	105 %		70-130
<i>Surrogate: 4-Bromofluorobenzene</i>	105 %		70-130
<i>Surrogate: Dibromofluoromethane</i>	103 %		70-130
<i>Surrogate: Toluene-d8</i>	112 %		70-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-7 2-5ft
Date Sampled: 01/22/16 11:15
Percent Solids: 71
Initial Volume: 19.2
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-05
Sample Matrix: Soil
Units: mg/kg dry
Analyst: JXS
Prepared: 1/26/16 16:00
Cleanup Method: 3665A

8082A Polychlorinated Biphenyls (PCB)

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Aroclor 1016	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1221	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1232	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1242	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1248	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1254	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1260	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1262	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613
Aroclor 1268	ND (0.0735)		8082A		1	01/27/16 23:09		CA62613

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: Decachlorobiphenyl	91 %		30-150
Surrogate: Decachlorobiphenyl [2C]	105 %		30-150
Surrogate: Tetrachloro-m-xylene	99 %		30-150
Surrogate: Tetrachloro-m-xylene [2C]	100 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-7 2-5ft
Date Sampled: 01/22/16 11:15
Percent Solids: 71
Initial Volume: 25.5
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-05
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (20.8)		MADEP-EPH		1	DPS	01/28/16 13:30	CZA0287	CA62618
C19-C36 Aliphatics1	21.1 (20.8)		MADEP-EPH		1	DPS	01/28/16 13:30	CZA0287	CA62618
C11-C22 Unadjusted Aromatics1	25.4 (20.8)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
C11-C22 Aromatics1,2	24.8 (20.8)		EPH8270			VSC	01/27/16 20:34		[CALC]
2-Methylnaphthalene	ND (0.28)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Acenaphthene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Naphthalene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Phenanthrene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Acenaphthylene	ND (0.28)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Anthracene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Benzo(a)anthracene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Benzo(a)pyrene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Benzo(b)fluoranthene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Benzo(g,h,i)perylene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Benzo(k)fluoranthene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Chrysene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Dibenzo(a,h)Anthracene	ND (0.28)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Fluoranthene	0.64 (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Fluorene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Indeno(1,2,3-cd)Pyrene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618
Pyrene	ND (0.55)		EPH8270		1	VSC	01/27/16 20:34	CZA0275	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	64 %		40-140
Surrogate: 2-Bromonaphthalene	100 %		40-140
Surrogate: 2-Fluorobiphenyl	98 %		40-140
Surrogate: O-Terphenyl	69 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-1 0-2ft
Date Sampled: 01/22/16 08:36
Percent Solids: 84

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	10.2 (2.08)		6010C		1	KJK	01/28/16 19:54	2.85	100	CA62708
Barium	126 (2.08)		6010C		1	KJK	01/28/16 19:54	2.85	100	CA62708
Cadmium	ND (0.42)		6010C		1	KJK	01/28/16 19:54	2.85	100	CA62708
Chromium	109 (0.83)		6010C		1	KJK	01/28/16 19:54	2.85	100	CA62708
Lead	318 (4.16)		6010C		1	KJK	01/28/16 19:54	2.85	100	CA62708
Mercury	0.254 (0.035)		7471B		1	PJP	01/28/16 12:55	0.67	40	CA62710
Selenium	ND (2.08)		7010		5	KJK	01/29/16 2:47	2.85	100	CA62708
Silver	ND (0.42)		6010C		1	KJK	01/28/16 19:54	2.85	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-1 0-2ft
Date Sampled: 01/22/16 08:36
Percent Solids: 84
Initial Volume: 19.9
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-06
Sample Matrix: Soil
Units: mg/kg dry
Analyst: JXS
Prepared: 1/26/16 16:00
Cleanup Method: 3665A

8082A Polychlorinated Biphenyls (PCB)

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Aroclor 1016	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1221	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1232	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1242	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1248	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1254	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1260	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1262	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613
Aroclor 1268	ND (0.0595)		8082A		1	01/27/16 23:28		CA62613

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: Decachlorobiphenyl	75 %		30-150
Surrogate: Decachlorobiphenyl [2C]	87 %		30-150
Surrogate: Tetrachloro-m-xylene	81 %		30-150
Surrogate: Tetrachloro-m-xylene [2C]	80 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-1 0-2ft
Date Sampled: 01/22/16 08:36
Percent Solids: 84
Initial Volume: 24.6
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-06
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (18.1)		MADEP-EPH		1	DPS	01/27/16 20:10	CZA0288	CA62618
C19-C36 Aliphatics1	44.7 (18.1)		MADEP-EPH		1	DPS	01/27/16 20:10	CZA0288	CA62618
C11-C22 Unadjusted Aromatics1	27.9 (18.1)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
C11-C22 Aromatics1,2	26.7 (18.1)		EPH8270			VSC	01/27/16 21:11		[CALC]
2-Methylnaphthalene	ND (0.24)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Acenaphthene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Naphthalene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Phenanthrene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Acenaphthylene	ND (0.24)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Anthracene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Benzo(a)anthracene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Benzo(a)pyrene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Benzo(b)fluoranthene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Benzo(g,h,i)perylene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Benzo(k)fluoranthene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Chrysene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Dibenzo(a,h)Anthracene	ND (0.24)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Fluoranthene	0.63 (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Fluorene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Indeno(1,2,3-cd)Pyrene	ND (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618
Pyrene	0.60 (0.48)		EPH8270		1	VSC	01/27/16 21:11	CZA0275	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	66 %		40-140
Surrogate: 2-Bromonaphthalene	93 %		40-140
Surrogate: 2-Fluorobiphenyl	89 %		40-140
Surrogate: O-Terphenyl	72 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-3 0-3ft
Date Sampled: 01/22/16 09:15
Percent Solids: 78

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	10.3 (3.09)		6010C		1	KJK	01/28/16 19:59	2.07	100	CA62708
Barium	85.8 (3.09)		6010C		1	KJK	01/28/16 19:59	2.07	100	CA62708
Cadmium	ND (0.62)		6010C		1	KJK	01/28/16 19:59	2.07	100	CA62708
Chromium	9.66 (1.24)		6010C		1	KJK	01/28/16 19:59	2.07	100	CA62708
Lead	114 (6.19)		6010C		1	KJK	01/28/16 19:59	2.07	100	CA62708
Mercury	0.139 (0.039)		7471B		1	PJP	01/28/16 12:57	0.65	40	CA62710
Selenium	ND (3.09)		7010		5	KJK	01/29/16 2:53	2.07	100	CA62708
Silver	ND (0.62)		6010C		1	KJK	01/28/16 19:59	2.07	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-3 0-3ft
Date Sampled: 01/22/16 09:15
Percent Solids: 78
Initial Volume: 25.5
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-07
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (18.8)		MADEP-EPH		1	DPS	01/27/16 20:57	CZA0288	CA62618
C19-C36 Aliphatics1	ND (18.8)		MADEP-EPH		1	DPS	01/27/16 20:57	CZA0288	CA62618
C11-C22 Unadjusted Aromatics1	29.6 (18.8)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
C11-C22 Aromatics1,2	23.3 (18.8)		EPH8270			VSC	01/27/16 21:48		[CALC]
2-Methylnaphthalene	ND (0.25)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Acenaphthene	ND (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Naphthalene	ND (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Phenanthrene	0.64 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Acenaphthylene	ND (0.25)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Anthracene	ND (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Benzo(a)anthracene	0.50 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Benzo(a)pyrene	0.61 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Benzo(b)fluoranthene	0.78 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Benzo(g,h,i)perylene	0.53 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Benzo(k)fluoranthene	ND (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Chrysene	0.56 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Dibenzo(a,h)Anthracene	ND (0.25)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Fluoranthene	1.20 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Fluorene	ND (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Indeno(1,2,3-cd)Pyrene	0.50 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618
Pyrene	1.02 (0.50)		EPH8270		1	VSC	01/27/16 21:48	CZA0275	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	61 %		40-140
Surrogate: 2-Bromonaphthalene	93 %		40-140
Surrogate: 2-Fluorobiphenyl	88 %		40-140
Surrogate: O-Terphenyl	69 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-9 2-4ft
Date Sampled: 01/22/16 09:28
Percent Solids: 70

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	9.96 (3.01)		6010C		1	KJK	01/28/16 20:16	2.38	100	CA62708
Barium	73.5 (3.01)		6010C		1	KJK	01/28/16 20:16	2.38	100	CA62708
Cadmium	ND (0.60)		6010C		1	KJK	01/28/16 20:16	2.38	100	CA62708
Chromium	13.8 (1.20)		6010C		1	KJK	01/28/16 20:16	2.38	100	CA62708
Lead	143 (6.01)		6010C		1	KJK	01/28/16 20:16	2.38	100	CA62708
Mercury	0.234 (0.046)		7471B		1	PJP	01/28/16 12:59	0.62	40	CA62710
Selenium	ND (3.01)		7010		5	KJK	01/29/16 3:16	2.38	100	CA62708
Silver	ND (0.60)		6010C		1	KJK	01/28/16 20:16	2.38	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-9 2-4ft
Date Sampled: 01/22/16 09:28
Percent Solids: 70
Initial Volume: 25.2
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-08
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (21.3)		MADEP-EPH		1	DPS	01/27/16 21:45	CZA0288	CA62618
C19-C36 Aliphatics1	ND (21.3)		MADEP-EPH		1	DPS	01/27/16 21:45	CZA0288	CA62618
C11-C22 Unadjusted Aromatics1	ND (21.3)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
C11-C22 Aromatics1,2	ND (21.3)		EPH8270			VSC	01/27/16 22:24		[CALC]
2-Methylnaphthalene	ND (0.28)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Acenaphthene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Naphthalene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Phenanthrene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Acenaphthylene	ND (0.28)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Anthracene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Benzo(a)anthracene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Benzo(a)pyrene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Benzo(b)fluoranthene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Benzo(g,h,i)perylene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Benzo(k)fluoranthene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Chrysene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Dibenzo(a,h)Anthracene	ND (0.28)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Fluoranthene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Fluorene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Indeno(1,2,3-cd)Pyrene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618
Pyrene	ND (0.57)		EPH8270		1	VSC	01/27/16 22:24	CZA0275	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	64 %		40-140
Surrogate: 2-Bromonaphthalene	95 %		40-140
Surrogate: 2-Fluorobiphenyl	90 %		40-140
Surrogate: O-Terphenyl	74 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-9 5-6ft
Date Sampled: 01/22/16 09:35
Percent Solids: 80

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	16.3 (2.61)		6010C		1	KJK	01/28/16 20:20	2.41	100	CA62708
Barium	287 (2.61)		6010C		1	KJK	01/28/16 20:20	2.41	100	CA62708
Cadmium	0.71 (0.52)		6010C		1	KJK	01/28/16 20:20	2.41	100	CA62708
Chromium	15.0 (1.04)		6010C		1	KJK	01/28/16 20:20	2.41	100	CA62708
Lead	2100 (5.21)		6010C		1	KJK	01/28/16 20:20	2.41	100	CA62708
Mercury	0.303 (0.040)		7471B		1	PJP	01/28/16 13:02	0.62	40	CA62710
Selenium	ND (2.61)		7010		5	KJK	01/29/16 3:22	2.41	100	CA62708
Silver	ND (0.52)		6010C		1	KJK	01/28/16 20:20	2.41	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-9 5-6ft
Date Sampled: 01/22/16 09:35
Percent Solids: 80
Initial Volume: 24.1
Final Volume: 3
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-09
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (58.6)		MADEP-EPH		1	ZLC	01/28/16 20:19	CZA0287	CA62618
C19-C36 Aliphatics1	158 (58.6)		MADEP-EPH		1	ZLC	01/28/16 20:19	CZA0287	CA62618
C11-C22 Unadjusted Aromatics1	902 (58.6)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
C11-C22 Aromatics1,2	388 (58.6)		EPH8270			JXS	02/01/16 12:39		[CALC]
2-Methylnaphthalene	ND (0.78)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Acenaphthene	ND (1.56)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Naphthalene	2.33 (1.56)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Phenanthrene	133 (25.0)		EPH8270		16	JXS	02/01/16 12:39	CZA0305	CA62618
Acenaphthylene	9.25 (0.78)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Anthracene	21.6 (6.25)		EPH8270		4	JXS	02/01/16 12:05	CZA0305	CA62618
Benzo(a)anthracene	31.8 (6.25)		EPH8270		4	JXS	02/01/16 12:05	CZA0305	CA62618
Benzo(a)pyrene	24.0 (6.25)		EPH8270		4	JXS	02/01/16 12:05	CZA0305	CA62618
Benzo(b)fluoranthene	32.5 (6.25)		EPH8270		4	JXS	02/01/16 12:05	CZA0305	CA62618
Benzo(g,h,i)perylene	14.2 (1.56)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Benzo(k)fluoranthene	7.08 (1.56)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Chrysene	27.2 (6.25)		EPH8270		4	JXS	02/01/16 12:05	CZA0305	CA62618
Dibenzo(a,h)Anthracene	2.96 (0.78)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Fluoranthene	102 (25.0)		EPH8270		16	JXS	02/01/16 12:39	CZA0305	CA62618
Fluorene	5.50 (1.56)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Indeno(1,2,3-cd)Pyrene	15.1 (1.56)		EPH8270		1	ZLC	01/28/16 17:21	CZA0305	CA62618
Pyrene	85.3 (25.0)		EPH8270		16	JXS	02/01/16 12:39	CZA0305	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	61 %		40-140
Surrogate: 2-Bromonaphthalene	85 %		40-140
Surrogate: 2-Fluorobiphenyl	83 %		40-140
Surrogate: O-Terphenyl	54 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-10 0-3ft
Date Sampled: 01/22/16 09:46
Percent Solids: 94

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	3.79 (2.51)		6010C		1	KJK	01/28/16 20:25	2.12	100	CA62708
Barium	32.3 (2.51)		6010C		1	KJK	01/28/16 20:25	2.12	100	CA62708
Cadmium	ND (0.50)		6010C		1	KJK	01/28/16 20:25	2.12	100	CA62708
Chromium	11.7 (1.01)		6010C		1	KJK	01/28/16 20:25	2.12	100	CA62708
Lead	10.7 (5.03)		6010C		1	KJK	01/28/16 20:25	2.12	100	CA62708
Mercury	ND (0.031)		7471B		1	PJP	01/28/16 13:04	0.67	40	CA62710
Selenium	ND (2.51)		7010		5	KJK	01/29/16 3:27	2.12	100	CA62708
Silver	ND (0.50)		6010C		1	KJK	01/28/16 20:25	2.12	100	CA62708



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: SB-10 0-3ft
Date Sampled: 01/22/16 09:46
Percent Solids: 94
Initial Volume: 25.9
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1601467
ESS Laboratory Sample ID: 1601467-10
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/26/16 17:07

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (15.4)		MADEP-EPH		1	ZLC	01/28/16 21:06	CZA0287	CA62618
C19-C36 Aliphatics1	ND (15.4)		MADEP-EPH		1	ZLC	01/28/16 21:06	CZA0287	CA62618
C11-C22 Unadjusted Aromatics1	ND (15.4)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
C11-C22 Aromatics1,2	ND (15.4)		EPH8270			ZLC	01/28/16 17:58		[CALC]
2-Methylnaphthalene	ND (0.21)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Acenaphthene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Naphthalene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Phenanthrene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Acenaphthylene	ND (0.21)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Anthracene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Benzo(a)anthracene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Benzo(a)pyrene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Benzo(b)fluoranthene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Benzo(g,h,i)perylene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Benzo(k)fluoranthene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Chrysene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Dibenzo(a,h)Anthracene	ND (0.21)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Fluoranthene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Fluorene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Indeno(1,2,3-cd)Pyrene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618
Pyrene	ND (0.41)		EPH8270		1	ZLC	01/28/16 17:58	CZA0305	CA62618

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1-Chlorooctadecane	75 %		40-140
Surrogate: 2-Bromonaphthalene	99 %		40-140
Surrogate: 2-Fluorobiphenyl	95 %		40-140
Surrogate: O-Terphenyl	78 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Total Metals

Batch CA62708 - 3050B

Blank

Arsenic	ND	2.50	mg/kg wet
Barium	ND	2.50	mg/kg wet
Cadmium	ND	0.50	mg/kg wet
Chromium	ND	1.00	mg/kg wet
Lead	ND	5.00	mg/kg wet
Selenium	ND	0.50	mg/kg wet
Silver	ND	0.50	mg/kg wet

LCS

Arsenic	152	8.20	mg/kg wet	161.0	94	80-120
Barium	366	8.20	mg/kg wet	351.0	104	80-120
Cadmium	173	1.64	mg/kg wet	190.0	91	80-120
Chromium	83.2	3.28	mg/kg wet	87.90	95	80-120
Lead	137	16.4	mg/kg wet	138.0	100	80-120
Selenium	317	41.0	mg/kg wet	305.0	104	80-120
Silver	56.1	1.64	mg/kg wet	58.00	97	80-120

LCS Dup

Arsenic	151	8.06	mg/kg wet	161.0	94	80-120	0.3	20
Barium	334	8.06	mg/kg wet	351.0	95	80-120	9	20
Cadmium	174	1.61	mg/kg wet	190.0	92	80-120	0.5	20
Chromium	83.6	3.23	mg/kg wet	87.90	95	80-120	0.4	20
Lead	138	16.1	mg/kg wet	138.0	100	80-120	0.2	20
Selenium	315	40.3	mg/kg wet	305.0	103	80-120	0.4	20
Silver	56.3	1.61	mg/kg wet	58.00	97	80-120	0.3	20

Batch CA62710 - 7471B

Blank

Mercury	ND	0.033	mg/kg wet
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LCS

Mercury	17.4	1.52	mg/kg wet	15.90	110	80-120
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LCS Dup

Mercury	17.7	1.52	mg/kg wet	15.90	111	80-120	2	20
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Reference

Mercury	0.0337	0.033	mg/kg wet	0.03333	101	0-200
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Reference

Mercury	0.0146	0.033	mg/kg wet	0.01667	88	0-200
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5035/8260B Volatile Organic Compounds / Methanol

Batch CA62847 - 5035

Blank

1,1,1,2-Tetrachloroethane	ND	0.200	mg/kg wet
1,1,1-Trichloroethane	ND	0.200	mg/kg wet
1,1,2,2-Tetrachloroethane	ND	0.200	mg/kg wet
1,1,2-Trichloroethane	ND	0.200	mg/kg wet



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Methanol

Batch CA62847 - 5035

1,1-Dichloroethane	ND	0.200	mg/kg wet
1,1-Dichloroethene	ND	0.200	mg/kg wet
1,1-Dichloropropene	ND	0.200	mg/kg wet
1,2,3-Trichlorobenzene	ND	0.200	mg/kg wet
1,2,3-Trichloropropane	ND	0.200	mg/kg wet
1,2,4-Trichlorobenzene	ND	0.200	mg/kg wet
1,2,4-Trimethylbenzene	ND	0.200	mg/kg wet
1,2-Dibromo-3-Chloropropane	ND	1.00	mg/kg wet
1,2-Dibromoethane	ND	0.200	mg/kg wet
1,2-Dichlorobenzene	ND	0.200	mg/kg wet
1,2-Dichloroethane	ND	0.200	mg/kg wet
1,2-Dichloropropane	ND	0.200	mg/kg wet
1,3,5-Trimethylbenzene	ND	0.200	mg/kg wet
1,3-Dichlorobenzene	ND	0.200	mg/kg wet
1,3-Dichloropropane	ND	0.200	mg/kg wet
1,4-Dichlorobenzene	ND	0.200	mg/kg wet
1,4-Dioxane - Screen	ND	40.0	mg/kg wet
2,2-Dichloropropane	ND	0.200	mg/kg wet
2-Butanone	ND	1.00	mg/kg wet
2-Chlorotoluene	ND	0.200	mg/kg wet
2-Hexanone	ND	1.00	mg/kg wet
4-Chlorotoluene	ND	0.200	mg/kg wet
4-Isopropyltoluene	ND	0.200	mg/kg wet
4-Methyl-2-Pentanone	ND	1.00	mg/kg wet
Acetone	ND	1.00	mg/kg wet
Benzene	ND	0.200	mg/kg wet
Bromobenzene	ND	0.200	mg/kg wet
Bromochloromethane	ND	0.200	mg/kg wet
Bromodichloromethane	ND	0.200	mg/kg wet
Bromoform	ND	0.200	mg/kg wet
Bromomethane	ND	0.200	mg/kg wet
Carbon Disulfide	ND	0.200	mg/kg wet
Carbon Tetrachloride	ND	0.200	mg/kg wet
Chlorobenzene	ND	0.200	mg/kg wet
Chloroethane	ND	0.200	mg/kg wet
Chloroform	ND	0.200	mg/kg wet
Chloromethane	ND	0.200	mg/kg wet
cis-1,2-Dichloroethene	ND	0.200	mg/kg wet
cis-1,3-Dichloropropene	ND	0.200	mg/kg wet
Dibromochloromethane	ND	0.200	mg/kg wet
Dibromomethane	ND	0.200	mg/kg wet
Dichlorodifluoromethane	ND	0.200	mg/kg wet
Diethyl Ether	ND	0.200	mg/kg wet
Di-isopropyl ether	ND	0.200	mg/kg wet
Ethyl tertiary-butyl ether	ND	0.200	mg/kg wet



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Methanol

Batch CA62847 - 5035

Ethylbenzene	ND	0.200	mg/kg wet							
Hexachlorobutadiene	ND	0.200	mg/kg wet							
Isopropylbenzene	ND	0.200	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.200	mg/kg wet							
Methylene Chloride	ND	0.400	mg/kg wet							
Naphthalene	ND	0.200	mg/kg wet							
n-Butylbenzene	ND	0.200	mg/kg wet							
n-Propylbenzene	ND	0.200	mg/kg wet							
sec-Butylbenzene	ND	0.200	mg/kg wet							
Styrene	ND	0.200	mg/kg wet							
tert-Butylbenzene	ND	0.200	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.200	mg/kg wet							
Tetrachloroethene	ND	0.200	mg/kg wet							
Tetrahydrofuran	ND	1.00	mg/kg wet							
Toluene	ND	0.200	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.200	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.200	mg/kg wet							
Trichloroethene	ND	0.200	mg/kg wet							
Trichlorofluoromethane	ND	0.200	mg/kg wet							
Vinyl Chloride	ND	0.200	mg/kg wet							
Xylene O	ND	0.200	mg/kg wet							
Xylene P,M	ND	0.400	mg/kg wet							
Xylenes (Total)	ND	0.400	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	4.82		mg/kg wet	5.000		96	70-130			
Surrogate: 4-Bromofluorobenzene	5.04		mg/kg wet	5.000		101	70-130			
Surrogate: Dibromofluoromethane	4.63		mg/kg wet	5.000		93	70-130			
Surrogate: Toluene-d8	5.18		mg/kg wet	5.000		104	70-130			

LCS

1,1,1,2-Tetrachloroethane	2.12	0.200	mg/kg wet	2.000		106	70-130			
1,1,1-Trichloroethane	2.03	0.200	mg/kg wet	2.000		101	70-130			
1,1,2,2-Tetrachloroethane	1.86	0.200	mg/kg wet	2.000		93	70-130			
1,1,2-Trichloroethane	1.81	0.200	mg/kg wet	2.000		91	70-130			
1,1-Dichloroethane	1.92	0.200	mg/kg wet	2.000		96	70-130			
1,1-Dichloroethene	2.00	0.200	mg/kg wet	2.000		100	70-130			
1,1-Dichloropropene	1.94	0.200	mg/kg wet	2.000		97	70-130			
1,2,3-Trichlorobenzene	2.33	0.200	mg/kg wet	2.000		117	70-130			
1,2,3-Trichloropropane	1.96	0.200	mg/kg wet	2.000		98	70-130			
1,2,4-Trichlorobenzene	2.19	0.200	mg/kg wet	2.000		109	70-130			
1,2,4-Trimethylbenzene	1.97	0.200	mg/kg wet	2.000		99	70-130			
1,2-Dibromo-3-Chloropropane	2.08	1.00	mg/kg wet	2.000		104	70-130			
1,2-Dibromoethane	1.98	0.200	mg/kg wet	2.000		99	70-130			
1,2-Dichlorobenzene	2.05	0.200	mg/kg wet	2.000		103	70-130			
1,2-Dichloroethane	2.11	0.200	mg/kg wet	2.000		106	70-130			
1,2-Dichloropropane	1.79	0.200	mg/kg wet	2.000		90	70-130			
1,3,5-Trimethylbenzene	1.98	0.200	mg/kg wet	2.000		99	70-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Methanol

Batch CA62847 - 5035

1,3-Dichlorobenzene	2.07	0.200	mg/kg wet	2.000		103	70-130			
1,3-Dichloropropane	1.96	0.200	mg/kg wet	2.000		98	70-130			
1,4-Dichlorobenzene	2.08	0.200	mg/kg wet	2.000		104	70-130			
1,4-Dioxane - Screen	51.5	40.0	mg/kg wet	40.00		129	44-241			
2,2-Dichloropropane	2.13	0.200	mg/kg wet	2.000		107	70-130			
2-Butanone	8.39	1.00	mg/kg wet	10.00		84	70-130			
2-Chlorotoluene	1.97	0.200	mg/kg wet	2.000		99	70-130			
2-Hexanone	9.29	1.00	mg/kg wet	10.00		93	70-130			
4-Chlorotoluene	1.99	0.200	mg/kg wet	2.000		99	70-130			
4-Isopropyltoluene	2.21	0.200	mg/kg wet	2.000		110	70-130			
4-Methyl-2-Pentanone	8.73	1.00	mg/kg wet	10.00		87	70-130			
Acetone	9.24	1.00	mg/kg wet	10.00		92	70-130			
Benzene	1.86	0.200	mg/kg wet	2.000		93	70-130			
Bromobenzene	2.00	0.200	mg/kg wet	2.000		100	70-130			
Bromochloromethane	2.00	0.200	mg/kg wet	2.000		100	70-130			
Bromodichloromethane	2.01	0.200	mg/kg wet	2.000		100	70-130			
Bromoform	1.96	0.200	mg/kg wet	2.000		98	70-130			
Bromomethane	1.96	0.200	mg/kg wet	2.000		98	70-130			
Carbon Disulfide	1.74	0.200	mg/kg wet	2.000		87	70-130			
Carbon Tetrachloride	2.12	0.200	mg/kg wet	2.000		106	70-130			
Chlorobenzene	2.06	0.200	mg/kg wet	2.000		103	70-130			
Chloroethane	1.55	0.200	mg/kg wet	2.000		77	70-130			
Chloroform	1.97	0.200	mg/kg wet	2.000		99	70-130			
Chloromethane	2.13	0.200	mg/kg wet	2.000		107	70-130			
cis-1,2-Dichloroethene	2.06	0.200	mg/kg wet	2.000		103	70-130			
cis-1,3-Dichloropropene	1.94	0.200	mg/kg wet	2.000		97	70-130			
Dibromochloromethane	2.01	0.200	mg/kg wet	2.000		101	70-130			
Dibromomethane	1.95	0.200	mg/kg wet	2.000		98	70-130			
Dichlorodifluoromethane	1.76	0.200	mg/kg wet	2.000		88	70-130			
Diethyl Ether	1.77	0.200	mg/kg wet	2.000		89	70-130			
Di-isopropyl ether	1.89	0.200	mg/kg wet	2.000		94	70-130			
Ethyl tertiary-butyl ether	1.95	0.200	mg/kg wet	2.000		98	70-130			
Ethylbenzene	1.99	0.200	mg/kg wet	2.000		100	70-130			
Hexachlorobutadiene	2.42	0.200	mg/kg wet	2.000		121	70-130			
Isopropylbenzene	1.98	0.200	mg/kg wet	2.000		99	70-130			
Methyl tert-Butyl Ether	1.96	0.200	mg/kg wet	2.000		98	70-130			
Methylene Chloride	2.00	0.400	mg/kg wet	2.000		100	70-130			
Naphthalene	2.07	0.200	mg/kg wet	2.000		103	70-130			
n-Butylbenzene	2.23	0.200	mg/kg wet	2.000		112	70-130			
n-Propylbenzene	1.96	0.200	mg/kg wet	2.000		98	70-130			
sec-Butylbenzene	2.21	0.200	mg/kg wet	2.000		111	70-130			
Styrene	1.97	0.200	mg/kg wet	2.000		98	70-130			
tert-Butylbenzene	2.27	0.200	mg/kg wet	2.000		113	70-130			
Tertiary-amyl methyl ether	1.88	0.200	mg/kg wet	2.000		94	70-130			
Tetrachloroethene	1.57	0.200	mg/kg wet	2.000		78	70-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Methanol

Batch CA62847 - 5035

Tetrahydrofuran	2.16	1.00	mg/kg wet	2.000		108	70-130			
Toluene	1.88	0.200	mg/kg wet	2.000		94	70-130			
trans-1,2-Dichloroethene	2.02	0.200	mg/kg wet	2.000		101	70-130			
trans-1,3-Dichloropropene	1.94	0.200	mg/kg wet	2.000		97	70-130			
Trichloroethene	1.93	0.200	mg/kg wet	2.000		97	70-130			
Trichlorofluoromethane	1.85	0.200	mg/kg wet	2.000		93	70-130			
Vinyl Chloride	1.75	0.200	mg/kg wet	2.000		88	70-130			
Xylene O	2.02	0.200	mg/kg wet	2.000		101	70-130			
Xylene P,M	3.96	0.400	mg/kg wet	4.000		99	70-130			
Xylenes (Total)	5.97	0.400	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	5.07		mg/kg wet	5.000		101	70-130			
Surrogate: 4-Bromofluorobenzene	4.77		mg/kg wet	5.000		95	70-130			
Surrogate: Dibromofluoromethane	5.02		mg/kg wet	5.000		100	70-130			
Surrogate: Toluene-d8	4.75		mg/kg wet	5.000		95	70-130			

LCS Dup

1,1,1,2-Tetrachloroethane	2.04	0.200	mg/kg wet	2.000		102	70-130	4	25	
1,1,1-Trichloroethane	2.01	0.200	mg/kg wet	2.000		101	70-130	0.6	25	
1,1,2,2-Tetrachloroethane	1.89	0.200	mg/kg wet	2.000		95	70-130	2	25	
1,1,2-Trichloroethane	1.75	0.200	mg/kg wet	2.000		87	70-130	4	25	
1,1-Dichloroethane	1.81	0.200	mg/kg wet	2.000		91	70-130	6	25	
1,1-Dichloroethene	1.96	0.200	mg/kg wet	2.000		98	70-130	2	25	
1,1-Dichloropropene	1.93	0.200	mg/kg wet	2.000		96	70-130	0.6	25	
1,2,3-Trichlorobenzene	2.14	0.200	mg/kg wet	2.000		107	70-130	9	25	
1,2,3-Trichloropropane	1.70	0.200	mg/kg wet	2.000		85	70-130	14	25	
1,2,4-Trichlorobenzene	2.04	0.200	mg/kg wet	2.000		102	70-130	7	25	
1,2,4-Trimethylbenzene	1.96	0.200	mg/kg wet	2.000		98	70-130	0.8	25	
1,2-Dibromo-3-Chloropropane	1.91	1.00	mg/kg wet	2.000		96	70-130	9	25	
1,2-Dibromoethane	1.96	0.200	mg/kg wet	2.000		98	70-130	1	25	
1,2-Dichlorobenzene	2.04	0.200	mg/kg wet	2.000		102	70-130	0.7	25	
1,2-Dichloroethane	2.01	0.200	mg/kg wet	2.000		101	70-130	5	25	
1,2-Dichloropropane	1.75	0.200	mg/kg wet	2.000		88	70-130	2	25	
1,3,5-Trimethylbenzene	2.01	0.200	mg/kg wet	2.000		100	70-130	2	25	
1,3-Dichlorobenzene	2.00	0.200	mg/kg wet	2.000		100	70-130	3	25	
1,3-Dichloropropane	1.93	0.200	mg/kg wet	2.000		96	70-130	2	25	
1,4-Dichlorobenzene	1.98	0.200	mg/kg wet	2.000		99	70-130	5	25	
1,4-Dioxane - Screen	ND	40.0	mg/kg wet	40.00			44-241	200	200	B-
2,2-Dichloropropane	1.99	0.200	mg/kg wet	2.000		100	70-130	7	25	
2-Butanone	8.35	1.00	mg/kg wet	10.00		83	70-130	0.5	25	
2-Chlorotoluene	1.94	0.200	mg/kg wet	2.000		97	70-130	2	25	
2-Hexanone	9.84	1.00	mg/kg wet	10.00		98	70-130	6	25	
4-Chlorotoluene	1.92	0.200	mg/kg wet	2.000		96	70-130	4	25	
4-Isopropyltoluene	2.10	0.200	mg/kg wet	2.000		105	70-130	5	25	
4-Methyl-2-Pentanone	9.03	1.00	mg/kg wet	10.00		90	70-130	3	25	
Acetone	10.2	1.00	mg/kg wet	10.00		102	70-130	10	25	
Benzene	1.82	0.200	mg/kg wet	2.000		91	70-130	2	25	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Methanol										
Batch CA62847 - 5035										
Bromobenzene	1.99	0.200	mg/kg wet	2.000		99	70-130	0.5	25	
Bromochloromethane	1.94	0.200	mg/kg wet	2.000		97	70-130	3	25	
Bromodichloromethane	1.92	0.200	mg/kg wet	2.000		96	70-130	4	25	
Bromoform	1.97	0.200	mg/kg wet	2.000		98	70-130	0.3	25	
Bromomethane	1.91	0.200	mg/kg wet	2.000		96	70-130	2	25	
Carbon Disulfide	1.82	0.200	mg/kg wet	2.000		91	70-130	4	25	
Carbon Tetrachloride	2.07	0.200	mg/kg wet	2.000		103	70-130	3	25	
Chlorobenzene	1.97	0.200	mg/kg wet	2.000		99	70-130	4	25	
Chloroethane	1.45	0.200	mg/kg wet	2.000		73	70-130	6	25	
Chloroform	1.87	0.200	mg/kg wet	2.000		94	70-130	5	25	
Chloromethane	2.39	0.200	mg/kg wet	2.000		119	70-130	11	25	
cis-1,2-Dichloroethene	1.92	0.200	mg/kg wet	2.000		96	70-130	7	25	
cis-1,3-Dichloropropene	1.85	0.200	mg/kg wet	2.000		92	70-130	5	25	
Dibromochloromethane	2.02	0.200	mg/kg wet	2.000		101	70-130	0.3	25	
Dibromomethane	1.82	0.200	mg/kg wet	2.000		91	70-130	7	25	
Dichlorodifluoromethane	1.83	0.200	mg/kg wet	2.000		91	70-130	4	25	
Diethyl Ether	1.69	0.200	mg/kg wet	2.000		84	70-130	5	25	
Di-isopropyl ether	1.78	0.200	mg/kg wet	2.000		89	70-130	6	25	
Ethyl tertiary-butyl ether	1.89	0.200	mg/kg wet	2.000		94	70-130	4	25	
Ethylbenzene	1.92	0.200	mg/kg wet	2.000		96	70-130	4	25	
Hexachlorobutadiene	2.33	0.200	mg/kg wet	2.000		116	70-130	4	25	
Isopropylbenzene	1.98	0.200	mg/kg wet	2.000		99	70-130	0.3	25	
Methyl tert-Butyl Ether	1.84	0.200	mg/kg wet	2.000		92	70-130	6	25	
Methylene Chloride	1.86	0.400	mg/kg wet	2.000		93	70-130	7	25	
Naphthalene	1.98	0.200	mg/kg wet	2.000		99	70-130	4	25	
n-Butylbenzene	2.04	0.200	mg/kg wet	2.000		102	70-130	9	25	
n-Propylbenzene	1.97	0.200	mg/kg wet	2.000		99	70-130	0.5	25	
sec-Butylbenzene	2.11	0.200	mg/kg wet	2.000		105	70-130	5	25	
Styrene	1.98	0.200	mg/kg wet	2.000		99	70-130	0.3	25	
tert-Butylbenzene	2.14	0.200	mg/kg wet	2.000		107	70-130	6	25	
Tertiary-amyl methyl ether	1.87	0.200	mg/kg wet	2.000		93	70-130	0.9	25	
Tetrachloroethene	1.64	0.200	mg/kg wet	2.000		82	70-130	5	25	
Tetrahydrofuran	1.82	1.00	mg/kg wet	2.000		91	70-130	17	25	
Toluene	1.84	0.200	mg/kg wet	2.000		92	70-130	2	25	
trans-1,2-Dichloroethene	2.00	0.200	mg/kg wet	2.000		100	70-130	1	25	
trans-1,3-Dichloropropene	1.89	0.200	mg/kg wet	2.000		94	70-130	3	25	
Trichloroethene	1.93	0.200	mg/kg wet	2.000		97	70-130	0	25	
Trichlorofluoromethane	1.90	0.200	mg/kg wet	2.000		95	70-130	3	25	
Vinyl Chloride	1.76	0.200	mg/kg wet	2.000		88	70-130	0.6	25	
Xylene O	2.01	0.200	mg/kg wet	2.000		100	70-130	0.3	25	
Xylene P,M	4.02	0.400	mg/kg wet	4.000		100	70-130	2	25	
Xylenes (Total)	6.03	0.400	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	4.88		mg/kg wet	5.000		98	70-130			
Surrogate: 4-Bromofluorobenzene	4.79		mg/kg wet	5.000		96	70-130			
Surrogate: Dibromofluoromethane	4.82		mg/kg wet	5.000		96	70-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
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ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Methanol

Batch CA62847 - 5035

Surrogate: Toluene-d8 4.80 mg/kg wet 5.000 96 70-130

8081B Organochlorine Pesticides

Batch CA62619 - 3546

Blank

4,4'-DDD	ND	0.0025	mg/kg wet
4,4'-DDD [2C]	ND	0.0025	mg/kg wet
4,4'-DDE	ND	0.0025	mg/kg wet
4,4'-DDE [2C]	ND	0.0025	mg/kg wet
4,4'-DDT	ND	0.0025	mg/kg wet
4,4'-DDT [2C]	ND	0.0025	mg/kg wet
Aldrin	ND	0.0025	mg/kg wet
Aldrin [2C]	ND	0.0025	mg/kg wet
alpha-BHC	ND	0.0025	mg/kg wet
alpha-BHC [2C]	ND	0.0025	mg/kg wet
alpha-Chlordane	ND	0.0025	mg/kg wet
alpha-Chlordane [2C]	ND	0.0025	mg/kg wet
beta-BHC	ND	0.0025	mg/kg wet
beta-BHC [2C]	ND	0.0025	mg/kg wet
Chlordane (Total)	ND	0.0200	mg/kg wet
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet
delta-BHC	ND	0.0025	mg/kg wet
delta-BHC [2C]	ND	0.0025	mg/kg wet
Dieldrin	ND	0.0025	mg/kg wet
Dieldrin [2C]	ND	0.0025	mg/kg wet
Endosulfan I	ND	0.0025	mg/kg wet
Endosulfan I [2C]	ND	0.0025	mg/kg wet
Endosulfan II	ND	0.0025	mg/kg wet
Endosulfan II [2C]	ND	0.0025	mg/kg wet
Endosulfan Sulfate	ND	0.0025	mg/kg wet
Endosulfan Sulfate [2C]	ND	0.0025	mg/kg wet
Endrin	ND	0.0025	mg/kg wet
Endrin [2C]	ND	0.0025	mg/kg wet
Endrin Ketone	ND	0.0025	mg/kg wet
Endrin Ketone [2C]	ND	0.0025	mg/kg wet
gamma-BHC (Lindane)	ND	0.0015	mg/kg wet
gamma-BHC (Lindane) [2C]	ND	0.0015	mg/kg wet
gamma-Chlordane	ND	0.0025	mg/kg wet
gamma-Chlordane [2C]	ND	0.0025	mg/kg wet
Heptachlor	ND	0.0025	mg/kg wet
Heptachlor [2C]	ND	0.0025	mg/kg wet
Heptachlor Epoxide	ND	0.0025	mg/kg wet
Heptachlor Epoxide [2C]	ND	0.0025	mg/kg wet
Hexachlorobenzene	ND	0.0025	mg/kg wet



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CA62619 - 3546										
Hexachlorobenzene [2C]	ND	0.0025	mg/kg wet							
Methoxychlor	ND	0.0025	mg/kg wet							
Methoxychlor [2C]	ND	0.0025	mg/kg wet							
Toxaphene	ND	0.125	mg/kg wet							
Toxaphene [2C]	ND	0.125	mg/kg wet							
Surrogate: Decachlorobiphenyl	0.0132		mg/kg wet	0.01250		106	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0130		mg/kg wet	0.01250		104	30-150			
Surrogate: Tetrachloro-m-xylene	0.0120		mg/kg wet	0.01250		96	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0110		mg/kg wet	0.01250		88	30-150			
LCS										
4,4'-DDD	0.0128	0.0025	mg/kg wet	0.01250		103	40-140			
4,4'-DDD [2C]	0.0118	0.0025	mg/kg wet	0.01250		95	40-140			
4,4'-DDE	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
4,4'-DDE [2C]	0.0119	0.0025	mg/kg wet	0.01250		95	40-140			
4,4'-DDT	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
4,4'-DDT [2C]	0.0118	0.0025	mg/kg wet	0.01250		95	40-140			
Aldrin	0.0122	0.0025	mg/kg wet	0.01250		98	40-140			
Aldrin [2C]	0.0119	0.0025	mg/kg wet	0.01250		95	40-140			
alpha-BHC	0.0124	0.0025	mg/kg wet	0.01250		100	40-140			
alpha-BHC [2C]	0.0117	0.0025	mg/kg wet	0.01250		94	40-140			
alpha-Chlordane	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
alpha-Chlordane [2C]	0.0121	0.0025	mg/kg wet	0.01250		96	40-140			
beta-BHC	0.0118	0.0025	mg/kg wet	0.01250		95	40-140			
beta-BHC [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140			
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet				0-200			
delta-BHC	0.0128	0.0025	mg/kg wet	0.01250		102	40-140			
delta-BHC [2C]	0.0124	0.0025	mg/kg wet	0.01250		99	40-140			
Dieldrin	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
Dieldrin [2C]	0.0125	0.0025	mg/kg wet	0.01250		100	40-140			
Endosulfan I	0.0119	0.0025	mg/kg wet	0.01250		95	40-140			
Endosulfan I [2C]	0.0121	0.0025	mg/kg wet	0.01250		97	40-140			
Endosulfan II	0.0121	0.0025	mg/kg wet	0.01250		97	40-140			
Endosulfan II [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
Endosulfan Sulfate	0.0131	0.0025	mg/kg wet	0.01250		104	40-140			
Endosulfan Sulfate [2C]	0.0130	0.0025	mg/kg wet	0.01250		104	40-140			
Endrin	0.0135	0.0025	mg/kg wet	0.01250		108	40-140			
Endrin [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Endrin Ketone	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
Endrin Ketone [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140			
gamma-BHC (Lindane)	0.0124	0.0015	mg/kg wet	0.01250		99	40-140			
gamma-BHC (Lindane) [2C]	0.0119	0.0015	mg/kg wet	0.01250		95	40-140			
gamma-Chlordane	0.0123	0.0025	mg/kg wet	0.01250		98	40-140			
gamma-Chlordane [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
Heptachlor	0.0125	0.0025	mg/kg wet	0.01250		100	40-140			



CERTIFICATE OF ANALYSIS

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CA62619 - 3546										
Heptachlor [2C]	0.0122	0.0025	mg/kg wet	0.01250		97	40-140			
Heptachlor Epoxide	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
Heptachlor Epoxide [2C]	0.0122	0.0025	mg/kg wet	0.01250		98	40-140			
Hexachlorobenzene	0.0122	0.0025	mg/kg wet	0.01250		98	40-140			
Hexachlorobenzene [2C]	0.0123	0.0025	mg/kg wet	0.01250		98	40-140			
Methoxychlor	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
Methoxychlor [2C]	0.0123	0.0025	mg/kg wet	0.01250		98	40-140			
<i>Surrogate: Decachlorobiphenyl</i>	<i>0.0135</i>		mg/kg wet	<i>0.01250</i>		<i>108</i>	<i>30-150</i>			
<i>Surrogate: Decachlorobiphenyl [2C]</i>	<i>0.0132</i>		mg/kg wet	<i>0.01250</i>		<i>105</i>	<i>30-150</i>			
<i>Surrogate: Tetrachloro-m-xylene</i>	<i>0.0124</i>		mg/kg wet	<i>0.01250</i>		<i>99</i>	<i>30-150</i>			
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	<i>0.0113</i>		mg/kg wet	<i>0.01250</i>		<i>90</i>	<i>30-150</i>			
LCS Dup										
4,4'-DDD	0.0127	0.0025	mg/kg wet	0.01250		101	40-140	1	30	
4,4'-DDD [2C]	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	0.9	30	
4,4'-DDE	0.0123	0.0025	mg/kg wet	0.01250		99	40-140	2	30	
4,4'-DDE [2C]	0.0116	0.0025	mg/kg wet	0.01250		93	40-140	2	30	
4,4'-DDT	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	2	30	
4,4'-DDT [2C]	0.0117	0.0025	mg/kg wet	0.01250		93	40-140	1	30	
Aldrin	0.0118	0.0025	mg/kg wet	0.01250		95	40-140	3	30	
Aldrin [2C]	0.0114	0.0025	mg/kg wet	0.01250		91	40-140	4	30	
alpha-BHC	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	4	30	
alpha-BHC [2C]	0.0113	0.0025	mg/kg wet	0.01250		90	40-140	4	30	
alpha-Chlordane	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	3	30	
alpha-Chlordane [2C]	0.0117	0.0025	mg/kg wet	0.01250		93	40-140	3	30	
beta-BHC	0.0114	0.0025	mg/kg wet	0.01250		91	40-140	4	30	
beta-BHC [2C]	0.0114	0.0025	mg/kg wet	0.01250		91	40-140	4	30	
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet				0-200		200	
delta-BHC	0.0124	0.0025	mg/kg wet	0.01250		99	40-140	3	30	
delta-BHC [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	3	30	
Dieldrin	0.0123	0.0025	mg/kg wet	0.01250		99	40-140	2	30	
Dieldrin [2C]	0.0122	0.0025	mg/kg wet	0.01250		97	40-140	3	30	
Endosulfan I	0.0116	0.0025	mg/kg wet	0.01250		93	40-140	2	30	
Endosulfan I [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140	3	30	
Endosulfan II	0.0119	0.0025	mg/kg wet	0.01250		95	40-140	2	30	
Endosulfan II [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140	1	30	
Endosulfan Sulfate	0.0130	0.0025	mg/kg wet	0.01250		104	40-140	0.5	30	
Endosulfan Sulfate [2C]	0.0128	0.0025	mg/kg wet	0.01250		102	40-140	2	30	
Endrin	0.0132	0.0025	mg/kg wet	0.01250		106	40-140	2	30	
Endrin [2C]	0.0128	0.0025	mg/kg wet	0.01250		102	40-140	3	30	
Endrin Ketone	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	2	30	
Endrin Ketone [2C]	0.0117	0.0025	mg/kg wet	0.01250		93	40-140	0.6	30	
gamma-BHC (Lindane)	0.0120	0.0015	mg/kg wet	0.01250		96	40-140	3	30	
gamma-BHC (Lindane) [2C]	0.0115	0.0015	mg/kg wet	0.01250		92	40-140	3	30	
gamma-Chlordane	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	3	30	



CERTIFICATE OF ANALYSIS

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CA62619 - 3546										
gamma-Chlordane [2C]	0.0116	0.0025	mg/kg wet	0.01250		93	40-140	3	30	
Heptachlor	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	4	30	
Heptachlor [2C]	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	4	30	
Heptachlor Epoxide	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	3	30	
Heptachlor Epoxide [2C]	0.0118	0.0025	mg/kg wet	0.01250		95	40-140	3	30	
Hexachlorobenzene	0.0118	0.0025	mg/kg wet	0.01250		94	40-140	3	30	
Hexachlorobenzene [2C]	0.0118	0.0025	mg/kg wet	0.01250		95	40-140	3	30	
Methoxychlor	0.0125	0.0025	mg/kg wet	0.01250		100	40-140	0.7	30	
Methoxychlor [2C]	0.0121	0.0025	mg/kg wet	0.01250		97	40-140	1	30	
Surrogate: Decachlorobiphenyl	0.0127		mg/kg wet	0.01250		102	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0126		mg/kg wet	0.01250		101	30-150			
Surrogate: Tetrachloro-m-xylene	0.0117		mg/kg wet	0.01250		93	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0106		mg/kg wet	0.01250		85	30-150			

8082A Polychlorinated Biphenyls (PCB)

Batch CA62538 - 3540										
Blank										
Aroclor 1016	ND	0.0500	mg/kg wet							
Aroclor 1221	ND	0.0500	mg/kg wet							
Aroclor 1232	ND	0.0500	mg/kg wet							
Aroclor 1242	ND	0.0500	mg/kg wet							
Aroclor 1248	ND	0.0500	mg/kg wet							
Aroclor 1254	ND	0.0500	mg/kg wet							
Aroclor 1260	ND	0.0500	mg/kg wet							
Aroclor 1262	ND	0.0500	mg/kg wet							
Aroclor 1268	ND	0.0500	mg/kg wet							
Surrogate: Decachlorobiphenyl	0.0231		mg/kg wet	0.02500		92	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0282		mg/kg wet	0.02500		113	30-150			
Surrogate: Tetrachloro-m-xylene	0.0235		mg/kg wet	0.02500		94	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0237		mg/kg wet	0.02500		95	30-150			
LCS										
Aroclor 1016	0.474	0.0500	mg/kg wet	0.5000		95	40-140			
Aroclor 1260	0.494	0.0500	mg/kg wet	0.5000		99	40-140			
Surrogate: Decachlorobiphenyl	0.0218		mg/kg wet	0.02500		87	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0268		mg/kg wet	0.02500		107	30-150			
Surrogate: Tetrachloro-m-xylene	0.0225		mg/kg wet	0.02500		90	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0241		mg/kg wet	0.02500		96	30-150			
LCS Dup										
Aroclor 1016	0.495	0.0500	mg/kg wet	0.5000		99	40-140	4	30	
Aroclor 1260	0.518	0.0500	mg/kg wet	0.5000		104	40-140	5	30	
Surrogate: Decachlorobiphenyl	0.0229		mg/kg wet	0.02500		92	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0280		mg/kg wet	0.02500		112	30-150			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
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ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8082A Polychlorinated Biphenyls (PCB)

Batch CA62538 - 3540

Surrogate: Tetrachloro-m-xylene	0.0230		mg/kg wet	0.02500		92	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0243		mg/kg wet	0.02500		97	30-150			

Batch CA62613 - 3540C

Blank

Aroclor 1016	ND	0.0500	mg/kg wet							
Aroclor 1221	ND	0.0500	mg/kg wet							
Aroclor 1232	ND	0.0500	mg/kg wet							
Aroclor 1242	ND	0.0500	mg/kg wet							
Aroclor 1248	ND	0.0500	mg/kg wet							
Aroclor 1254	ND	0.0500	mg/kg wet							
Aroclor 1260	ND	0.0500	mg/kg wet							
Aroclor 1262	ND	0.0500	mg/kg wet							
Aroclor 1268	ND	0.0500	mg/kg wet							

Surrogate: Decachlorobiphenyl	0.0222		mg/kg wet	0.02500		89	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0262		mg/kg wet	0.02500		105	30-150			
Surrogate: Tetrachloro-m-xylene	0.0242		mg/kg wet	0.02500		97	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0247		mg/kg wet	0.02500		99	30-150			

LCS

Aroclor 1016	0.533	0.0500	mg/kg wet	0.5000		107	40-140			
Aroclor 1260	0.549	0.0500	mg/kg wet	0.5000		110	40-140			

Surrogate: Decachlorobiphenyl	0.0235		mg/kg wet	0.02500		94	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0276		mg/kg wet	0.02500		110	30-150			
Surrogate: Tetrachloro-m-xylene	0.0252		mg/kg wet	0.02500		101	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0264		mg/kg wet	0.02500		106	30-150			

LCS Dup

Aroclor 1016	0.504	0.0500	mg/kg wet	0.5000		101	40-140	6	30	
Aroclor 1260	0.552	0.0500	mg/kg wet	0.5000		110	40-140	0.6	30	

Surrogate: Decachlorobiphenyl	0.0239		mg/kg wet	0.02500		96	30-150			
Surrogate: Decachlorobiphenyl [2C]	0.0281		mg/kg wet	0.02500		113	30-150			
Surrogate: Tetrachloro-m-xylene	0.0226		mg/kg wet	0.02500		90	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.0239		mg/kg wet	0.02500		96	30-150			

MADEP-EPH Extractable Petroleum Hydrocarbons

Batch CA62618 - 3546

Blank

C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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MADEP-EPH Extractable Petroleum Hydrocarbons

Batch CA62618 - 3546

Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							

Surrogate: 1-Chlorooctadecane 1.31 mg/kg wet 2.000 65 40-140

Blank

2-Methylnaphthalene	ND	0.20	mg/kg wet							
Acenaphthene	ND	0.40	mg/kg wet							
Acenaphthylene	ND	0.20	mg/kg wet							
Anthracene	ND	0.40	mg/kg wet							
Benzo(a)anthracene	ND	0.40	mg/kg wet							
Benzo(a)pyrene	ND	0.40	mg/kg wet							
Benzo(b)fluoranthene	ND	0.40	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.40	mg/kg wet							
Benzo(k)fluoranthene	ND	0.40	mg/kg wet							
C11-C22 Aromatics1,2	ND	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
Chrysene	ND	0.40	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.20	mg/kg wet							
Fluoranthene	ND	0.40	mg/kg wet							
Fluorene	ND	0.40	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.40	mg/kg wet							
Naphthalene	ND	0.40	mg/kg wet							
Phenanthrene	ND	0.40	mg/kg wet							
Pyrene	ND	0.40	mg/kg wet							

Surrogate: 2-Bromonaphthalene 1.79 mg/kg wet 2.000 90 40-140

Surrogate: 2-Fluorobiphenyl 1.81 mg/kg wet 2.000 90 40-140

Surrogate: O-Terphenyl 1.65 mg/kg wet 2.000 83 40-140

LCS

C19-C36 Aliphatics1	16.1	15.0	mg/kg wet	16.00		101	40-140
C9-C18 Aliphatics1	12.1	15.0	mg/kg wet	12.00		101	40-140
Decane (C10)	1.2	0.5	mg/kg wet	2.000		61	40-140
Docosane (C22)	1.6	0.5	mg/kg wet	2.000		82	40-140
Dodecane (C12)	1.3	0.5	mg/kg wet	2.000		64	40-140
Eicosane (C20)	1.6	0.5	mg/kg wet	2.000		82	40-140
Hexacosane (C26)	1.7	0.5	mg/kg wet	2.000		83	40-140
Hexadecane (C16)	1.6	0.5	mg/kg wet	2.000		80	40-140
Hexatriacontane (C36)	1.4	0.5	mg/kg wet	2.000		69	40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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MADEP-EPH Extractable Petroleum Hydrocarbons

Batch CA62618 - 3546

Nonadecane (C19)	1.7	0.5	mg/kg wet	2.000		83	40-140			
Nonane (C9)	1.0	0.5	mg/kg wet	2.000		49	30-140			
Octacosane (C28)	1.6	0.5	mg/kg wet	2.000		80	40-140			
Octadecane (C18)	1.6	0.5	mg/kg wet	2.000		81	40-140			
Tetracosane (C24)	1.5	0.5	mg/kg wet	2.000		77	40-140			
Tetradecane (C14)	1.5	0.5	mg/kg wet	2.000		73	40-140			
Triacotane (C30)	1.5	0.5	mg/kg wet	2.000		77	40-140			

Surrogate: 1-Chlorooctadecane 1.51 mg/kg wet 2.000 76 40-140

LCS

2-Methylnaphthalene	1.62	0.20	mg/kg wet	2.000		81	40-140			
Acenaphthene	1.60	0.40	mg/kg wet	2.000		80	40-140			
Acenaphthylene	1.70	0.20	mg/kg wet	2.000		85	40-140			
Anthracene	1.79	0.40	mg/kg wet	2.000		90	40-140			
Benzo(a)anthracene	1.82	0.40	mg/kg wet	2.000		91	40-140			
Benzo(a)pyrene	1.88	0.40	mg/kg wet	2.000		94	40-140			
Benzo(b)fluoranthene	1.85	0.40	mg/kg wet	2.000		93	40-140			
Benzo(g,h,i)perylene	1.93	0.40	mg/kg wet	2.000		97	40-140			
Benzo(k)fluoranthene	1.90	0.40	mg/kg wet	2.000		95	40-140			
C11-C22 Aromatics1,2	5.19	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	35.7	15.0	mg/kg wet	34.00		105	40-140			
Chrysene	1.87	0.40	mg/kg wet	2.000		94	40-140			
Dibenzo(a,h)Anthracene	1.97	0.20	mg/kg wet	2.000		98	40-140			
Fluoranthene	1.84	0.40	mg/kg wet	2.000		92	40-140			
Fluorene	1.70	0.40	mg/kg wet	2.000		85	40-140			
Indeno(1,2,3-cd)Pyrene	1.91	0.40	mg/kg wet	2.000		96	40-140			
Naphthalene	1.54	0.40	mg/kg wet	2.000		77	40-140			
Phenanthrene	1.79	0.40	mg/kg wet	2.000		89	40-140			
Pyrene	1.83	0.40	mg/kg wet	2.000		92	40-140			
<i>Surrogate: 2-Bromonaphthalene</i>	1.78		mg/kg wet	2.000		89	40-140			
<i>Surrogate: 2-Fluorobiphenyl</i>	1.82		mg/kg wet	2.000		91	40-140			
<i>Surrogate: O-Terphenyl</i>	1.70		mg/kg wet	2.000		85	40-140			

LCS

2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			

LCS Dup

C19-C36 Aliphatics1	15.4	15.0	mg/kg wet	16.00		96	40-140	4	25	
C9-C18 Aliphatics1	10.9	15.0	mg/kg wet	12.00		91	40-140	10	25	
Decane (C10)	1.0	0.5	mg/kg wet	2.000		51	40-140	19	25	
Docosane (C22)	1.5	0.5	mg/kg wet	2.000		77	40-140	7	25	
Dodecane (C12)	1.1	0.5	mg/kg wet	2.000		53	40-140	20	25	
Eicosane (C20)	1.5	0.5	mg/kg wet	2.000		77	40-140	6	25	
Hexacosane (C26)	1.6	0.5	mg/kg wet	2.000		78	40-140	7	25	
Hexadecane (C16)	1.5	0.5	mg/kg wet	2.000		75	40-140	6	25	
Hexatriacontane (C36)	1.3	0.5	mg/kg wet	2.000		63	40-140	9	25	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CA62618 - 3546										
Nonadecane (C19)	1.6	0.5	mg/kg wet	2.000		79	40-140	6	25	
Nonane (C9)	0.8	0.5	mg/kg wet	2.000		41	30-140	18	25	
Octacosane (C28)	1.5	0.5	mg/kg wet	2.000		74	40-140	7	25	
Octadecane (C18)	1.5	0.5	mg/kg wet	2.000		77	40-140	5	25	
Tetracosane (C24)	1.5	0.5	mg/kg wet	2.000		73	40-140	6	25	
Tetradecane (C14)	1.3	0.5	mg/kg wet	2.000		63	40-140	15	25	
Triacotane (C30)	1.4	0.5	mg/kg wet	2.000		71	40-140	8	25	
<i>Surrogate: 1-Chlorooctadecane</i>	<i>1.39</i>		mg/kg wet	<i>2.000</i>		<i>69</i>	<i>40-140</i>			
LCS Dup										
2-Methylnaphthalene	1.64	0.20	mg/kg wet	2.000		82	40-140	1	30	
Acenaphthene	1.62	0.40	mg/kg wet	2.000		81	40-140	1	30	
Acenaphthylene	1.67	0.20	mg/kg wet	2.000		83	40-140	2	30	
Anthracene	1.71	0.40	mg/kg wet	2.000		85	40-140	5	30	
Benzo(a)anthracene	1.70	0.40	mg/kg wet	2.000		85	40-140	7	30	
Benzo(a)pyrene	1.76	0.40	mg/kg wet	2.000		88	40-140	7	30	
Benzo(b)fluoranthene	1.73	0.40	mg/kg wet	2.000		87	40-140	7	30	
Benzo(g,h,i)perylene	1.88	0.40	mg/kg wet	2.000		94	40-140	3	30	
Benzo(k)fluoranthene	1.83	0.40	mg/kg wet	2.000		92	40-140	4	30	
C11-C22 Aromatics1,2	ND	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	34.3	15.0	mg/kg wet	34.00		101	40-140	4	30	
Chrysene	1.73	0.40	mg/kg wet	2.000		86	40-140	8	30	
Dibenzo(a,h)Anthracene	1.88	0.20	mg/kg wet	2.000		94	40-140	5	30	
Fluoranthene	1.74	0.40	mg/kg wet	2.000		87	40-140	6	30	
Fluorene	1.68	0.40	mg/kg wet	2.000		84	40-140	0.9	30	
Indeno(1,2,3-cd)Pyrene	1.82	0.40	mg/kg wet	2.000		91	40-140	5	30	
Naphthalene	1.61	0.40	mg/kg wet	2.000		80	40-140	5	30	
Phenanthrene	1.73	0.40	mg/kg wet	2.000		87	40-140	3	30	
Pyrene	1.74	0.40	mg/kg wet	2.000		87	40-140	5	30	
<i>Surrogate: 2-Bromonaphthalene</i>	<i>1.71</i>		mg/kg wet	<i>2.000</i>		<i>85</i>	<i>40-140</i>			
<i>Surrogate: 2-Fluorobiphenyl</i>	<i>1.73</i>		mg/kg wet	<i>2.000</i>		<i>86</i>	<i>40-140</i>			
<i>Surrogate: O-Terphenyl</i>	<i>1.59</i>		mg/kg wet	<i>2.000</i>		<i>79</i>	<i>40-140</i>			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

Notes and Definitions

U	Analyte included in the analysis, but not detected
S+	Surrogate recovery(ies) above upper control limit (S+).
D	Diluted.
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
B-	Blank Spike recovery is below lower control limit (B-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1601467

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179

<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutOfStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002

<http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/documents/AllLabs.xls>

Massachusetts Potable and Non Potable Water: M-RI002

<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424

<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313

<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006

http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752

http://www.depweb.state.pa.us/portal/server.pt/community/labs/13780/laboratory_accreditation_program/590095

PESTICIDES BREAKDOWN CHECK SUMMARY

Data File Name GI053970.D
 Data File Path Q:\SVOA\GC7_GI\DATA\GI0116\GI012516\
 Date Acquired 1-27-2016 02:08:24 PM
 Sample Name **CZA0345-PEM5**
 Instrument Name SVOAGC7

# Name	Ret Time 1	Ret Time 2	Response 1	Response 2
1) Tetrachloro-m-xylene	8.10	8.98	3584089532	686020052.8
13) 4,4'-DDE	13.54	14.81	20433219.3	8028701.423
16) Endrin	14.50	15.72	8783511193	2965180000
17) 4,4'-DDD	14.62	15.86	199973385.5	83197203.2
19) 4,4'-DDT	15.12	16.43	7790772629	2533870904
20) Endrin Aldehyde	15.65	16.70	67759017.8	13263042.15
23) Endrin Ketone	16.93	18.22	182747544.9	63702423
29) Decachlorobiphenyl	18.80	21.03	2270596431	1059228516

Breakdown Column 1

Endrin: 2.77 %
 4,4'-DDT: 2.75 %
 Total: 5.52 %

Breakdown Column 2

Endrin: 2.53 %
 4,4'-DDT: 3.48 %
 Total: 6.01 %

Passing Criteria (for each column):
 Individual breakdown is not to exceed 15.0%

PESTICIDES BREAKDOWN CHECK SUMMARY

Data File Name GI053996.D
 Data File Path Q:\SVOA\GC7_GI\DATA\GI0116\GI012716\
 Date Acquired 1-28-2016 03:45:47 AM
 Sample Name **CZA0245-PEM6**
 Instrument Name SVOAGC7

# Name	Ret Time 1	Ret Time 2	Response 1	Response 2
1) Tetrachloro-m-xylene	8.10	8.98	3729027610	717610900
13) 4,4'-DDE	13.54	14.81	30489266.33	8597176.041
16) Endrin	14.49	15.72	9181341641	3165347404
17) 4,4'-DDD	14.62	15.86	313537895.3	88921115.51
19) 4,4'-DDT	15.12	16.43	8179927373	2733999012
20) Endrin Aldehyde	15.65	16.70	82190769.96	19789813.38
23) Endrin Ketone	16.93	18.22	212715308.4	74301609
29) Decachlorobiphenyl	18.80	21.03	2427527168	1140727703

Breakdown Column 1

Endrin: 3.11 %
 4,4'-DDT: 4.04 %
 Total: 7.15 %

Breakdown Column 2

Endrin: 2.89 %
 4,4'-DDT: 3.44 %
 Total: 6.33 %

Passing Criteria (for each column):
 Individual breakdown is not to exceed 15.0%

PESTICIDES BREAKDOWN CHECK SUMMARY

Data File Name GI054020.D
 Data File Path Q:\SVOA\GC7_GI\DATA\GI0116\GI012716\
 Date Acquired 1-28-2016 04:21:04 PM
 Sample Name **CZA0245-PEM7**
 Instrument Name SVOAGC7

# Name	Ret Time 1	Ret Time 2	Response 1	Response 2
1) Tetrachloro-m-xylene	8.10	8.98	3806616334	715488340.8
13) 4,4'-DDE	13.54	14.81	22773300.8	8668398.295
16) Endrin	14.50	15.72	9349351657	3182463613
17) 4,4'-DDD	14.62	15.86	294096282.8	92407403.81
19) 4,4'-DDT	15.12	16.43	8202702693	2697751241
20) Endrin Aldehyde	15.65	16.70	60403550.41	15132570.94
23) Endrin Ketone	16.93	18.22	171635124	61319164.5
29) Decachlorobiphenyl	18.80	21.03	2321043737	1083180178

Breakdown Column 1

Endrin: 2.42 %
 4,4'-DDT: 3.72 %
 Total: 6.14 %

Breakdown Column 2

Endrin: 2.35 %
 4,4'-DDT: 3.61 %
 Total: 5.96 %

Passing Criteria (for each column):
 Individual breakdown is not to exceed 15.0%

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1601467

Date Received: 1/25/2016

Shipped/Delivered Via: ESS Courier

Project Due Date: 2/1/2016

Days for Project: 5 Day

1. Air bill manifest present? ☒ Yes

Air No.: NA

2. Were custody seals present? ☒ No

3. Is radiation count <100 CPM? ☒ Yes

4. Is a Cooler Present? ☒ Yes

Temp: 1.6 Iced with: Ice

5. Was COC signed and dated by client? ☒ Yes

6. Does COC match bottles? ☒ Yes

7. Is COC complete and correct? ☒ Yes

8. Were samples received intact? ☒ Yes

9. Were labs informed about short holds & rushes? Yes / No / ☒ NA

10. Were any analyses received outside of hold time? Yes / ☒ No

11. Any Subcontracting needed? Yes / ☒ No

ESS Sample IDs: _____

Analysis: _____

TAT: _____

12. Were VOAs received? ☒ Yes / No

a. Air bubbles in aqueous VOAs? Yes / No

b. Does methanol cover soil completely? ☒ Yes / No / NA

13. Are the samples properly preserved? ☒ Yes / No

a. If metals preserved in SR: Date: _____

b. Low Level VOAs brought to freezer: Date: _____

Time: _____ By: _____

Time: _____ By: _____

Sample Receiving Notes:

Was there a need to contact the client? Yes / No

Who was contacted? _____ Date: _____

Time: _____ By: _____

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	4530	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
1	4568	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
2	4532	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
3	4533	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
3	4541	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
3	4569	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
3	4570	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
4	4540	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
5	4539	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
5	4542	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
5	4571	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
5	4572	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
6	4538	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
6	4573	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
7	4537	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
8	4536	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
9	4535	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
10	4534	Yes	NA	Yes	8 oz. Jar - Unpres	NP	

2nd Review

Are barcode labels on correct containers? ☒ Yes / No

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1601467

Date Received: 1/25/2016

Completed By: [Signature]

Date & Time: 1-25-16 1536

Reviewed By: [Signature]

Date & Time: 1/25/16 1552

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston RI 02910-2211

Tel. (401)461-7181 Fax (401)461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time ☒ Standard ☐ Other _____

Regulatory State: MA RI CT NH NJ NY ME Other _____

Is this project for any of the following: (please circle)
☒ MA-MCP ☐ Navy ☐ USACE ☐ CT DEP ☐ Other _____

Co. Name Tyler + Bond Project Name McGraw Park

Contact Person Todd Kirtum Proj. Location Salem, MA

Address 446 Main St City, State Worcester, MA Zip 01608

Tel. (401) 572-3222 email: TDKirtum@Tylerbond.com

ESS Lab ID	Date	Collection Time	Grab-G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis
1	11/22/16	10:15	6	S	SB-8 (0-3')	NP	2	AG		
2		10:45	6	S	SB-4 (2-5')	NP	1	AG		
3		10:25	6	S	SB-5 (2-4')	NP/M	4	AGU		
4		10:30	6	S	SB-5 (8-9')	NP	1	AG		
5		11:15	6	S	SB-7 (2-5')	NP/M	4	AGU		
6		8:36	6	S	SB-1 (0-2')	NP	2	AG		
7		9:15	6	S	SB-3 (0-3')	NP	1	AG		

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAc2, 9-_____

Sampled by: KLU

Cooler Present ☒ Yes ☐ No ☐ NA: _____

Seals Intact ☒ Yes ☐ No ☐ NA: _____

Cooler Temperature: 1.6 ice 1/25/16 ☐ Technician _____

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16

Relinquished by: (Signature, Date & Time) [Signature] 10:57

Relinquished by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 15:01

Comments: *Contingent upon results, please hold samples for possible microscopic analyses for ash, coal or other historic fill presence.

Received by: (Signature, Date & Time) [Signature] 1/25/16

Received by: (Signature, Date & Time) [Signature] 15:01

Received by: (Signature, Date & Time) [Signature] 15:01

Received by: (Signature, Date & Time) [Signature] 15:01

By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA

Please fax to the laboratory all changes to Chain of Custody

Report Method Blank & Laboratory Control Sample Results

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston RI 02910-2211

Tel. (401)461-7181 Fax (401)461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time Standard Other _____

Regulatory State MA RI CT NH NJ NY ME Other _____

Is this project for any of the following: (please circle)

(MA-MCP) Navy USACE CT DEP Other _____

Project #

S-1758

Project Name

McGlew Park

Proj. Location

Salem, MA

City, State

Worcester, MA

email: TDK@iron@highland.com

Zip

01608

PO #

ESS Lab ID

8

Date

1/22/16

Collection Time

928

Grab - G

6

Matrix

S

Sample ID

SB-9 (2-4')

Pres Code

AP

Type of Container

A6

Vol of Container

1

Analysis

FPH / target PPH

Electronic Deliverables

*Excel Access (PDE)

Reporting Limits - RCS-1

ESS Lab # 1001467

2062

Cooler Present ☒ Yes ☐ No Internal Use Only

Seals Intact ☐ Yes ☐ No NA: ☒ Pickup

Cooler Temperature: 1.6 ice ^{R3} 1/25/16 [] Technician _____

Relinquished by: (Signature, Date & Time)

[Signature] 1/25/16

Relinquished by: (Signature, Date & Time)

[Signature] 10:57

Relinquished by: (Signature, Date & Time)

[Signature] 1/25/16

Relinquished by: (Signature, Date & Time)

[Signature] 15:01

Relinquished by: (Signature, Date & Time)

[Signature] 1/25/16

Relinquished by: (Signature, Date & Time)

[Signature] 15:01

Received by: (Signature, Date & Time)

[Signature] 1/25/16

Received by: (Signature, Date & Time)

[Signature] 1535

Please fax to the laboratory all changes to Chain of Custody

Report Method Blank & Laboratory Control Sample Results

* By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA



CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: McGlew Park (S-1758)

ESS Laboratory Work Order Number: 1602180

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED

By mpagliarini at 5:35 pm, Feb 16, 2016

Analytical Summary

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with NELAC Standards, A2LA and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

Microvision Laboratories, Inc. - Chelmsford, MA Coal/Wood Ash Determination



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1602180

SAMPLE RECEIPT

The following samples were received on February 08, 2016 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has performed and reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Data Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

These samples were originally received on January 25, 2016 as ESS Laboratory Sample IDs 1601467-03 and 1601467-09.

Lab Number	Sample Name	Matrix	Analysis
1602180-01	SB-5 2-4ft	Soil	§
1602180-02	SB-9 5-6ft	Soil	§



ESS Laboratory
Division of Thielsch Engineering, Inc.

BAL Laboratory

*The Microbiology Division
of Thielsch Engineering, Inc.*



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1602180

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

[Definitions of Quality Control Parameters](#)

[Semivolatile Organics Internal Standard Information](#)

[Semivolatile Organics Surrogate Information](#)

[Volatile Organics Internal Standard Information](#)

[Volatile Organics Surrogate Information](#)

[EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1602180

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015D - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



ESS Laboratory

Division of Thielsch Engineering, Inc.

BAL Laboratory

*The Microbiology Division
of Thielsch Engineering, Inc.*



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1602180

Classical Chemistry

Client Sample ID: SB-5 2-4ft
Date Sampled: 01/22/16 10:25

ESS Laboratory Sample ID: 1602180-01
Sample Matrix: Soil

<u>Analyte</u>	<u>Results</u>	<u>Units</u>	<u>MRL</u>	<u>Method</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>
Coal/Wood Ash Determination	See Attached						

Client Sample ID: SB-9 5-6ft
Date Sampled: 01/22/16 09:35

ESS Laboratory Sample ID: 1602180-02
Sample Matrix: Soil

<u>Analyte</u>	<u>Results</u>	<u>Units</u>	<u>MRL</u>	<u>Method</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>
Coal/Wood Ash Determination	See Attached						



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1602180

Notes and Definitions

Z-08	See Attached
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1602180

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179

<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutOfStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002

<http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/documents/AllLabs.xls>

Massachusetts Potable and Non Potable Water: M-RI002

<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424

<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313

<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006

http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752

http://www.depweb.state.pa.us/portal/server.pt/community/labs/13780/laboratory_accreditation_program/590095



ESS Laboratory

MicroVision Labs Coal Ash Report, Job # 9426
Client Project #: 1602180

Scope of Work:

This report covers the methods and findings of the Coal/Coal Ash analysis that MicroVision Laboratories, Inc. conducted on two (2) soil samples submitted for testing from project number 16021820. The purpose of this analysis was to detect and document any coal, coal ash or wood ash that may be present in the submitted soil samples by use of a combination of microscopy techniques including SEM/EDS, PLM, and macroscopic inspection.

Methods:

The samples were dried and examined by eye and under the stereomicroscope for any suspect dark components to the soil. Dark suspect particles were separated from the soil samples and prepared for examination by Polarized Light Microscopy (PLM) and Scanning Electron Microscopy with Energy Dispersive X-Ray Spectroscopy (SEM/EDS).

For the PLM examination, the suspect particle types detected in the samples were ground in a mortar and pestle, mounted on glass slides in immersion oil ($n=1.515$) and covered with glass cover slips. These sample particles were then examined at various magnifications and digital images were taken.

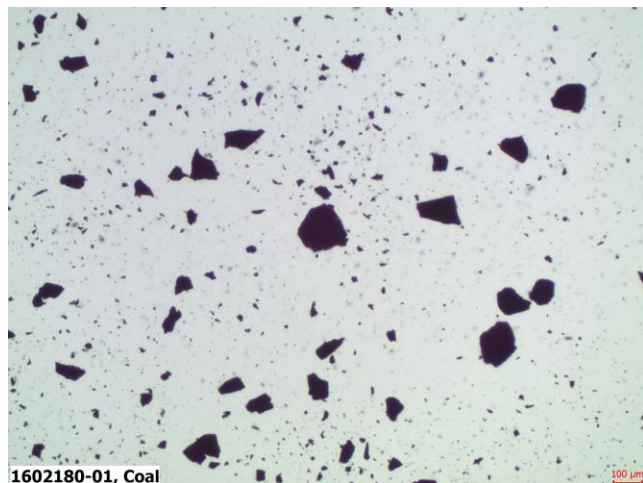
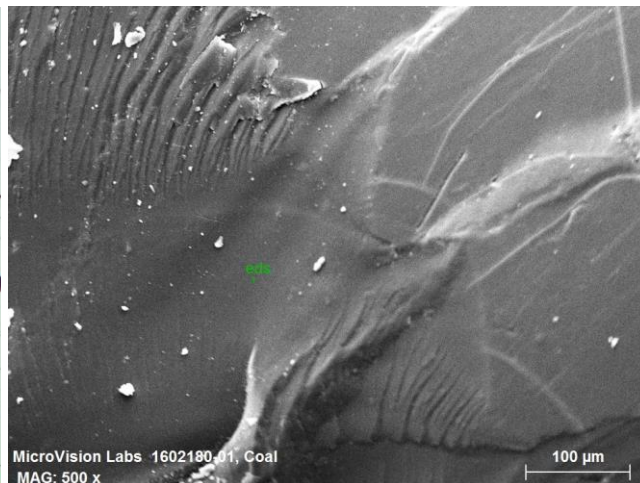
For the SEM examination, the suspect particle types were mounted on an aluminum analysis stub with double sided adhesive tape, coated with evaporated graphite and examined under the SEM by EDS to obtain elemental data in the form of EDS spectra. Digital images were taken of the sample particles at various magnifications with the SEM.

Findings:

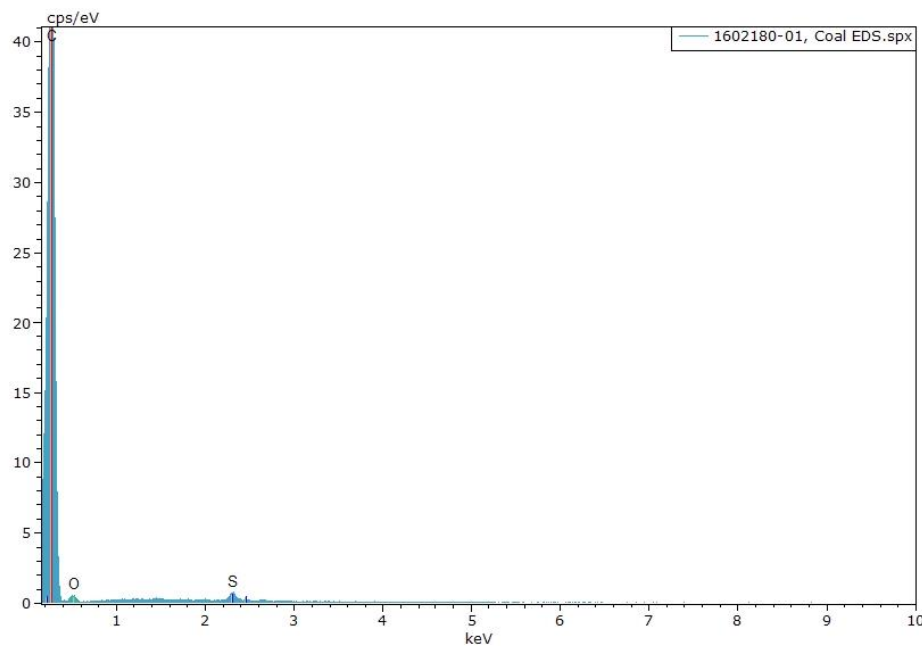
The following pages display the data for each particle type detected in the samples for this project. Each page contains a PLM image, SEM image, and EDS spectrum for the particle types detected for these samples as well as particle type descriptions and observations.

Sample: 1602180-01**Number of Suspect Particle Types: Three (3)**

Coal: This particle type consisted of over fifty (50+) shiny, black grains approximately 1-20mm in diameter. The PLM examination indicated this particle type to be consistent with coal. The PLM and SEM images of this particle type show the angular edges and typical conchoidal fractures found in coal.

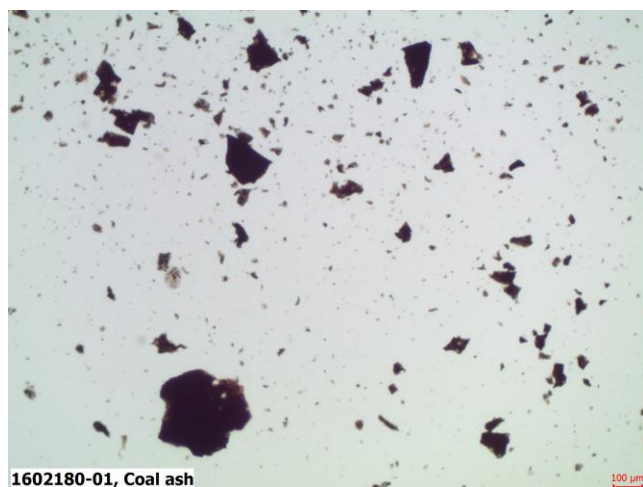
**PLM Image****SEM Image**

The EDS spectrum, shown below, confirms that this particle type is coal. The analysis for this particle shows concentrations of carbon, oxygen and sulfur.

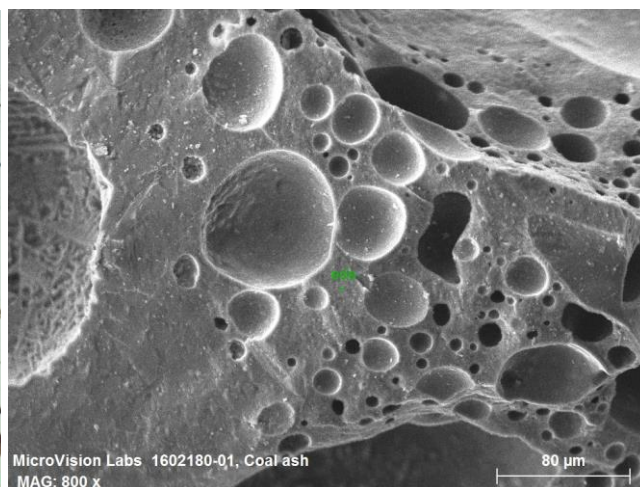


MicroVision Laboratories, Inc. 187 Billerica Road, Chelmsford, MA 01824
Phone: (978) 250-9909 Fax: (978) 250-9901 Email: Sales@MicroVisionLabs.com
www.MicroVisionLabs.com

Coal Ash: This particle type consisted of six to eight (6-8) dark, porous grains approximately 1-5mm in diameter. The PLM examination indicated this particle type to be consistent with coal ash. The PLM and SEM images show the spherical gas voids that formed during combustion.

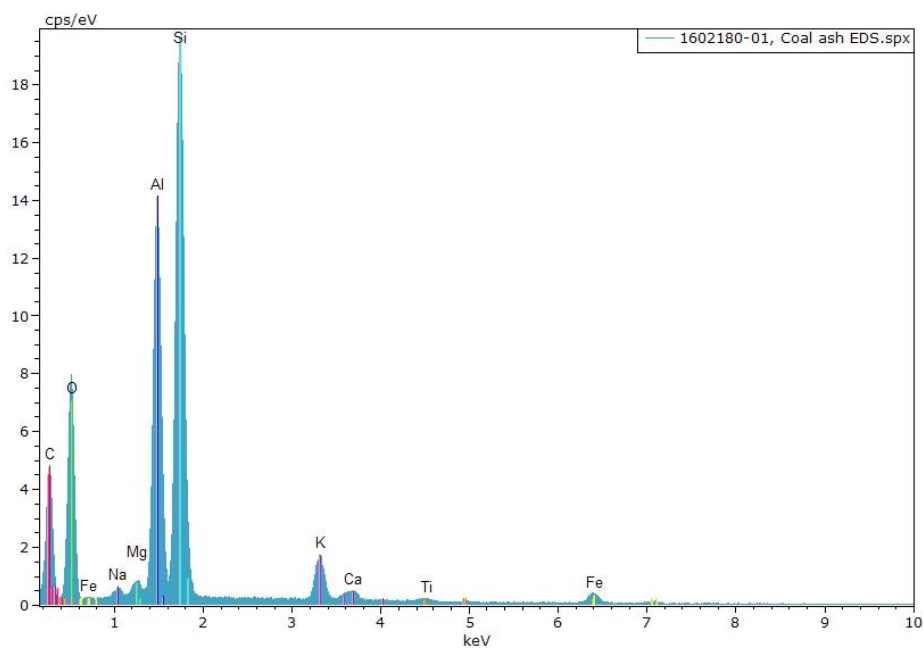


PLM Image

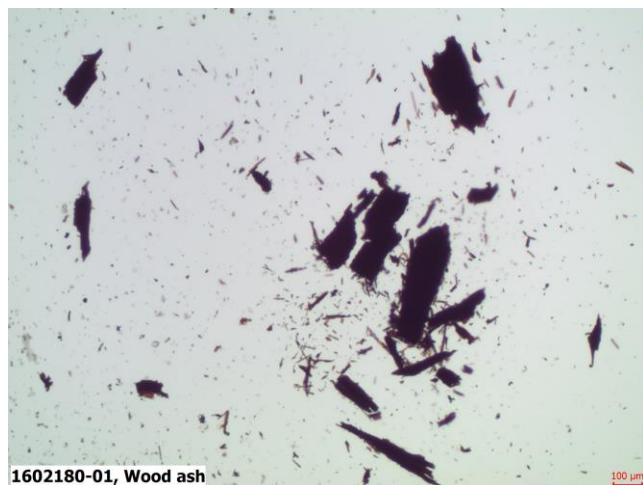


SEM Image

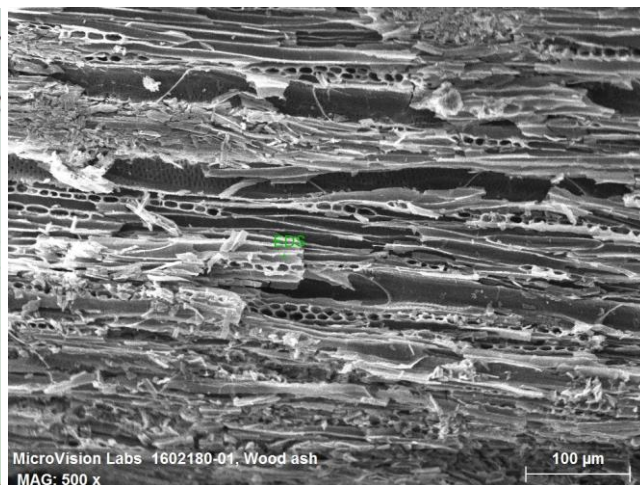
The EDS spectrum, shown below, indicates this particle type is coal ash. The analysis for this particle shows concentrations of carbon, oxygen, sodium, magnesium, aluminum, silicon, potassium, calcium, titanium, and iron.



Wood Ash: This particle type consisted of three (3) friable, black grains approximately 1-4m in length. The PLM examination indicated this particle type to be consistent with wood ash. The PLM and SEM photos show the cellular structure typical of wood still present in these grains.

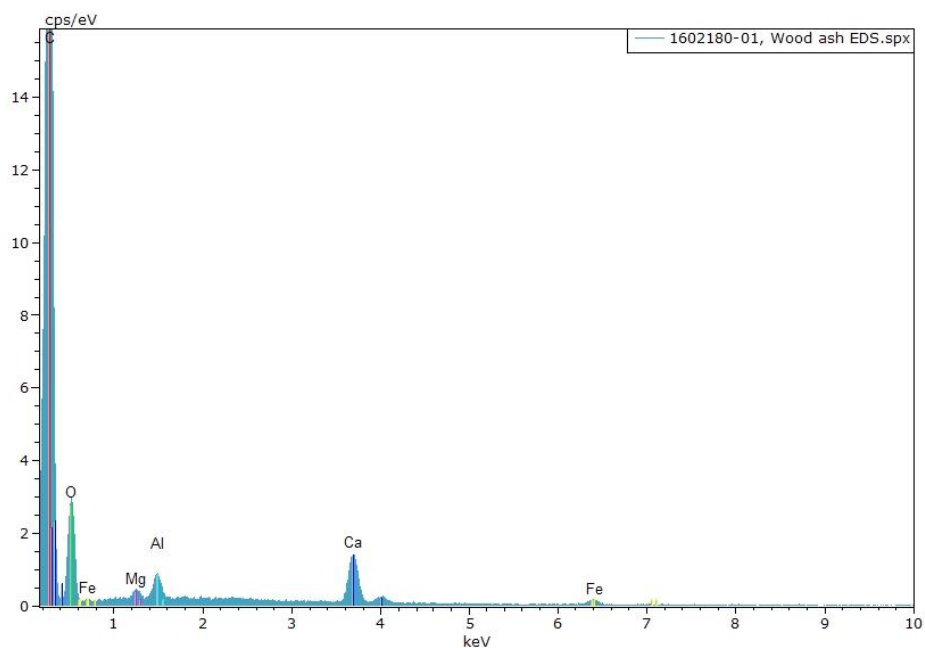


PLM Image



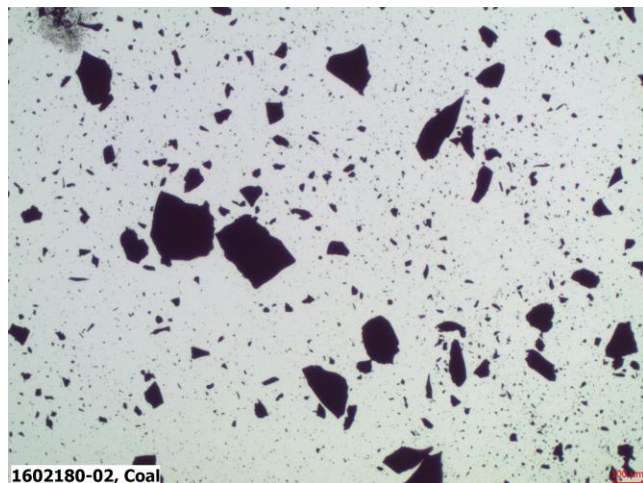
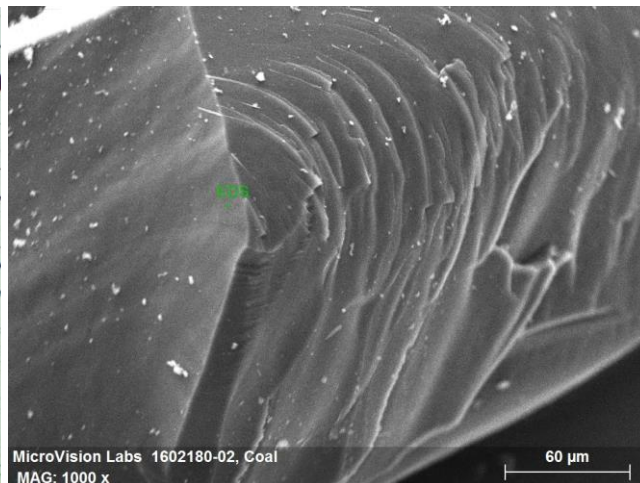
SEM Image

The EDS spectrum, shown below, indicates this particle type is wood ash. The analysis for this particle shows concentrations of carbon, oxygen, magnesium, aluminum, calcium and iron.

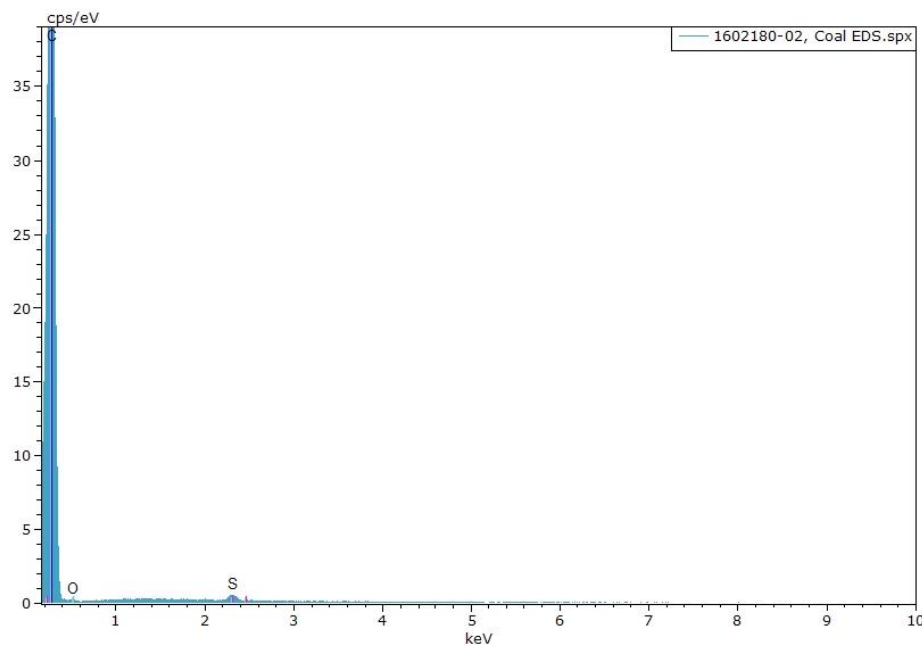


Sample: 1602180-02**Number of Suspect Particle Types: Two (2)**

Coal: This particle type consisted of over fifty (50+) shiny, black grains approximately 1-40mm in diameter. The PLM examination indicated this particle type to be consistent with coal. The PLM and SEM images of this particle type show the angular edges and typical conchoidal fractures found in coal.

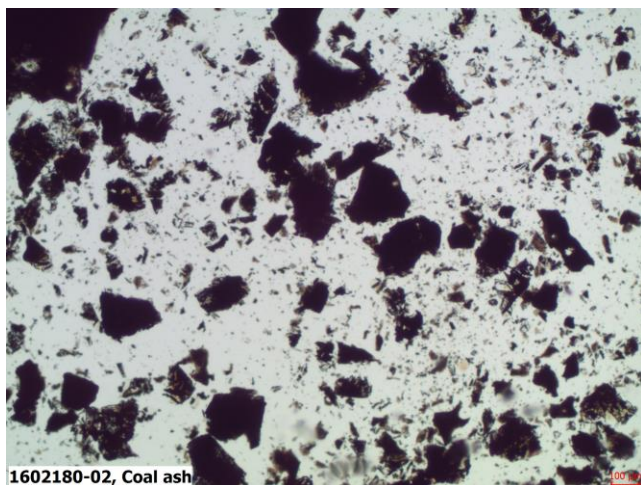
**PLM Image****SEM Image**

The EDS spectrum, shown below, confirms that this particle type is coal. The analysis for this particle shows concentrations of carbon, oxygen and sulfur.

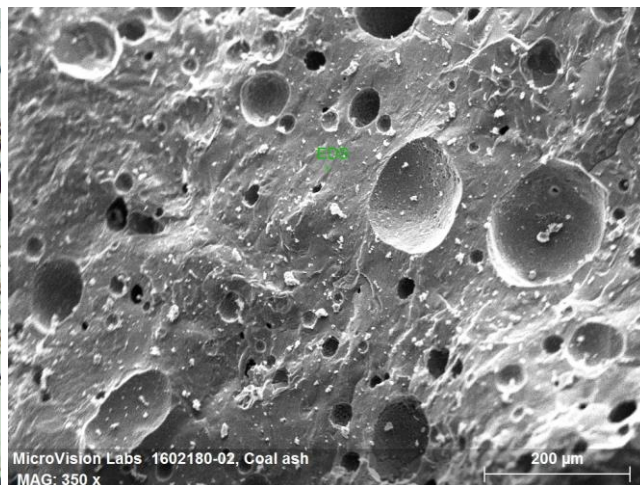


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www.MicroVisionLabs.com

Coal Ash: This particle type consisted of ten to fifteen (10-15) dark, porous grains approximately 1-18mm in diameter. The PLM examination indicated this particle type to be consistent with coal ash. The PLM and SEM images show the spherical gas voids that formed during combustion.

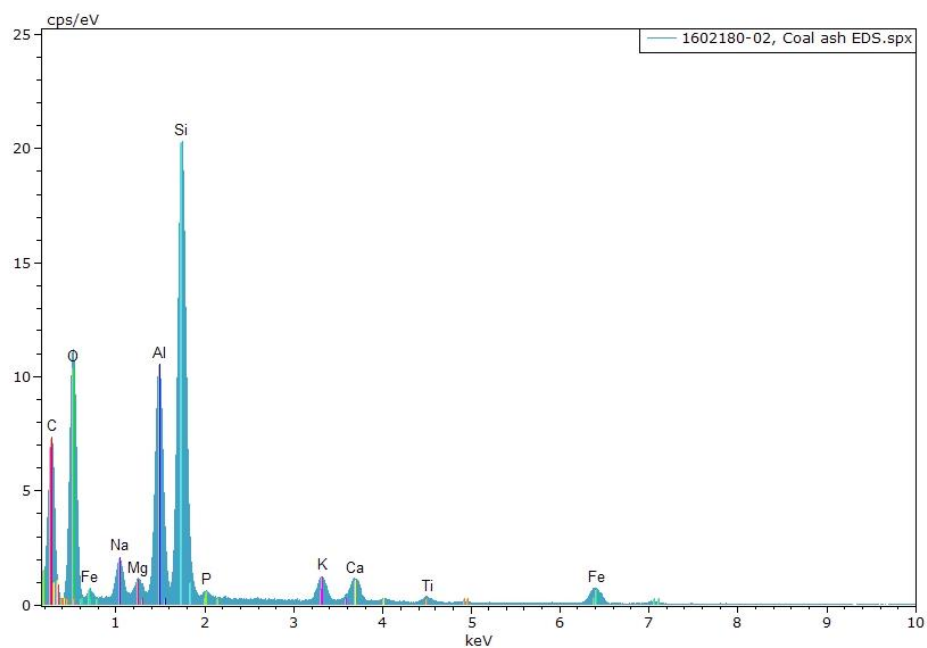


PLM Image



SEM Image

The EDS spectrum, shown below, indicates this particle type is coal ash. The analysis for this particle shows concentrations of carbon, oxygen, sodium, magnesium, aluminum, silicon, phosphorus, potassium, calcium, titanium, and iron.



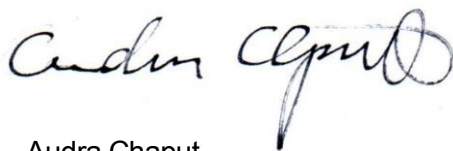
Results Summary Table:

Sample Name	Material Detected
1602180-01	Coal (heavy), Coal Ash (light), Wood Ash (light)
1602180-02	Coal (heavy), Coal Ash (light)

The concentrations of the particle types detected in this sample are listed in parenthesis in the table above and are based on the number of particles found and the relative difficulty in finding them. The concentration information is listed for informational purposes only and has no bearing on exemption status.

Please let us know if you have any questions about this analysis or if there is anything else we can do for you.

Sincerely,



Audra Chaput
Analytical Microscopist

9426

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston RI 02910-2211

Tel. (401)461-7181 Fax (401)461-4486

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CHAIN OF CUSTODY

Turn Time ☒ Standard Other _____
 Regulatory State: MA RI CT NH NJ NY ME Other _____
 Is this project for any of the following: (please circle)
 (MA-MCP) Navy USACE CT DEP Other _____

Project # S-1758
 Project Name McGraw Park
 City, State Salem, MA

Address 446 Main St
 City, State Worcester, MA
 Zip 01608
 PO # _____

Tel. (401) 572-3222
 email: TDKirtan@ThielschEngineering.com

ESS Lab ID	Date	Collection Time	Grab - G Composite - C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis
1	10/21/16	10:15	6	S	SB-8 (0-3)	MP	2	AG	AG	Coal/Wood Ash
2	10/21/16	10:45	6	S	SB-4 (0-5)	MP	1	AG	AG	Coal/Wood Ash
3	10/21/16	10:25	6	S	SB-5 (2-4)	MP	4	AG	AG	Coal/Wood Ash
4	10/21/16	10:30	6	S	SB-5 (0-5)	MP	1	AG	AG	Coal/Wood Ash
5	11/15	11:15	6	S	SB-7 (0-5)	MP	1	AG	AG	Coal/Wood Ash
6	8:36	8:36	6	S	SB-1 (0-2)	MP	2	AG	AG	Coal/Wood Ash
7	9:15	9:15	6	S	SB-3 (0-3)	MP	1	AG	AG	Coal/Wood Ash

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA
 Matrix: S-Solid SD-Solid SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ☒ Yes ☐ No No NA: _____
 Seals Intact ☒ Yes ☐ No No NA: _____

Internal Use Only ☒ Pickup
 Sampled by: KU

Cooler Temperature: 1.6 ice 1/25/16
 Comments: * Contingent upon results, please hold samples for possible microscopic analyses for ash, coal or other historic fill presence.

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 1/25/16

Relinquished by: (Signature, Date & Time) [Signature] 10:57
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

Relinquished by: (Signature, Date & Time) [Signature] 1/25/16
 Received by: (Signature, Date & Time) [Signature] 15:01

* By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA

Please fax to the laboratory all changes to Chain of Custody

Report Method Blank & Laboratory Control Sample Results

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston RI 02910-2211

Tel. (401)461-7181 Fax (401)461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time ☒ Standard Other ☐

Regulatory State (MA) RI CT NH NJ NY ME Other ☐

Is this project for any of the following: (please circle)

(MA-MCP) Navy USACE CT DEP Other ☐

Project Name

Project # S-1758

Proj. Location

Salem, MA

City, State

Worcester, MA

email: TDKirtan@thielsch.com

Zip

01608

PO #

ESS Lab #

1602180 2062

Reporting Limits -

RCS-1

Electronic Deliverables (Excel) Access (PDF)

Coal Wood Ash

Backlog

Fast/High

Analysis

Vol of Container

Type of Container

of Containers

Pres Code

Sample ID

Matrix

Grab-G Composite-C

Collection Time

Date

ESS Lab ID

1/22/16 988

1/22/16 935

1/22/16 946

28

10

SB-1 (2-11)

SB-9 (5-6)

SB-10 (0-3)

MP

MP

MP

AB

AB

AB

AB

AB

AB

AB

AB

AB

AB

AB

AB

AB

AB

Internal Use Only

[X] Pickup

[] Technician

Comments:

Sampled by: KLL

Received by: (Signature, Date & Time)

1/25/16 10:57

Relinquished by: (Signature, Date & Time)

1/25/16 15:01

Relinquished by: (Signature, Date & Time)

1/25/16 15:35

Relinquished by: (Signature, Date & Time)

1/25/16 15:35

Relinquished by: (Signature, Date & Time)

1/25/16 15:35

Relinquished by: (Signature, Date & Time)

Please fax to the laboratory all changes to Chain of Custody

Report Method Blank & Laboratory Control Sample Results

* By circling MA-MCP, client acknowledges samples were

collected in accordance with MADEP CAM VIIA



CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: McGlew Park (S-1758)
ESS Laboratory Work Order Number: 1603751

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED

By ESS Laboratory at 4:59 pm, Apr 06, 2016

Analytical Summary

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with NELAC Standards, A2LA and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

SAMPLE RECEIPT

The following samples were received on March 30, 2016 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has performed and reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Data Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals and SVOA were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1603751-01	Ex-TP1 0-2ft	Soil	2580, 6010C, 7196A, 9045
1603751-02	Ex-TP1 2-4ft	Soil	2580, 6010C, 7196A, 9045
1603751-03	Ex-TP1 4-6ft	Soil	2580, 6010C, 7196A, 9045
1603751-04	Ex-TP7 2-4ft	Soil	2580, 6010C, 7196A, 9045
1603751-05	Ex-TP7 0-1ft	Soil	7471B
1603751-06	Ex-TP8 0-1ft	Soil	7471B
1603751-07	Ex-TP6 0-1ft	Soil	7471B
1603751-08	Ex-TP6 2-4ft	Soil	7471B
1603751-09	Ex-TP7 2-4ft	Soil	7471B
1603751-10	Ex-TP6 4-6ft	Soil	7471B
1603751-11	Ex-TP7 4-6ft	Soil	7471B
1603751-12	Ex-TP6 6-8ft	Soil	7471B
1603751-13	Ex-TP2 0-2ft	Soil	7471B
1603751-14	Ex-TP4 0-2ft	Soil	7471B
1603751-15	Ex-TP5 0-2ft	Soil	6010C, 8270D
1603751-16	Ex-TP5 2-4ft	Soil	6010C, 8270D
1603751-17	Ex-TP4 2-4ft	Soil	6010C, 8270D
1603751-18	Ex-TP4 4-6ft	Soil	6010C, 8270D
1603751-19	Ex-TP7 0-1ft	Soil	6010C, 8270D
1603751-20	Ex-TP6 2-4ft	Soil	6010C, 8270D



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

[Definitions of Quality Control Parameters](#)
[Semivolatile Organics Internal Standard Information](#)
[Semivolatile Organics Surrogate Information](#)
[Volatile Organics Internal Standard Information](#)
[Volatile Organics Surrogate Information](#)
[EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015D - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1603751-01 through 1603751-20**

Matrices: ☐ Ground Water/Surface Water ☒ Soil/Sediment ☐ Drinking Water ☐ Air ☐ Other: _____

CAM Protocol (check all that apply below):

<input type="checkbox"/> 8260 VOC CAM II A	<input checked="" type="checkbox"/> 7470/7471 Hg CAM III B	<input type="checkbox"/> MassDEP VPH CAM IV A	<input type="checkbox"/> 8081 Pesticides CAM V B	<input checked="" type="checkbox"/> 7196 Hex Cr CAM VI B	<input type="checkbox"/> MassDEP APH CAM IX A
<input checked="" type="checkbox"/> 8270 SVOC CAM II B	<input type="checkbox"/> 7010 Metals CAM III C	<input type="checkbox"/> MassDEP EPH CAM IV B	<input type="checkbox"/> 8151 Herbicides CAM V C	<input type="checkbox"/> 8330 Explosives CAM VIII A	<input type="checkbox"/> TO-15 VOC CAM IX B
<input checked="" type="checkbox"/> 6010 Metals CAM III A	<input type="checkbox"/> 6020 Metals CAM III D	<input type="checkbox"/> 8082 PCB CAM V A	<input type="checkbox"/> 6860 Perchlorate CAM VIII B	<input type="checkbox"/> 9014 Total Cyanide/PAC CAM VI A	

Affirmative responses to questions A through F are required for Presumptive Certainty's status

A	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?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
E	a. VPH, EPH, APH and TO-15 only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes <input type="checkbox"/> No <input type="checkbox"/>
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes <input type="checkbox"/> No <input type="checkbox"/>
F	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)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Responses to Questions G, H and I below are required for Presumptive Certainty's status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? Data User Note: Data that achieve Presumptive Certainty's status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> *
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> *
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> *

*All negative responses must be addressed in an attached laboratory 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: Laurel Stoddard
Printed Name: Laurel Stoddard

Date: April 06, 2016
Position: Laboratory Director



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP1 0-2ft
Date Sampled: 03/30/16 08:13
Percent Solids: 86

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Chromium	17.4 (0.94)		6010C		1	KJK	04/01/16 2:54	2.48	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP1 0-2ft
Date Sampled: 03/30/16 08:13
Percent Solids: 86

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-01
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Corrosivity (pH)	6.90 (N/A)		9045		1	JLK	03/30/16 22:25	S.U.	CC63047
Corrosivity (pH) Sample Temp	Soil pH measured in water at 20.1 °C.								
Eh (ORP)	WL 374 (N/A)		2580		1	JLK	03/30/16 22:25	mv	CC63048
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	04/04/16 20:07	mg/kg dry	CD60432



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP1 2-4ft
Date Sampled: 03/30/16 08:30
Percent Solids: 85

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Chromium	5.60 (2.31)		6010C		2	KJK	04/01/16 14:08	2.04	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP1 2-4ft
Date Sampled: 03/30/16 08:30
Percent Solids: 85

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-02
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Corrosivity (pH)	6.84 (N/A)		9045		1	JLK	03/30/16 22:25	S.U.	CC63047
Corrosivity (pH) Sample Temp	Soil pH measured in water at 20.1 °C.								
Eh (ORP)	WL 388 (N/A)		2580		1	JLK	03/30/16 22:25	mv	CC63048
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	04/04/16 20:07	mg/kg dry	CD60432



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP1 4-6ft
Date Sampled: 03/30/16 08:37
Percent Solids: 92

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Chromium	5.72 (2.07)		6010C		2	KJK	04/01/16 14:11	2.1	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP1 4-6ft
Date Sampled: 03/30/16 08:37
Percent Solids: 92

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-03
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Corrosivity (pH)	7.01 (N/A)		9045		1	JLK	03/30/16 22:25	S.U.	CC63047
Corrosivity (pH) Sample Temp	Soil pH measured in water at 20.1 °C.								
Eh (ORP)	WL 386 (N/A)		2580		1	JLK	03/30/16 22:25	mv	CC63048
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	04/04/16 20:07	mg/kg dry	CD60432



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 2-4ft
Date Sampled: 03/30/16 11:15
Percent Solids: 71

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Chromium	19.6 (1.26)		6010C		1	KJK	04/01/16 3:06	2.22	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 2-4ft
Date Sampled: 03/30/16 11:15
Percent Solids: 71

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-04
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Corrosivity (pH)	6.99 (N/A)		9045		1	JLK	03/30/16 22:25	S.U.	CC63047
Corrosivity (pH) Sample Temp	Soil pH measured in water at 20.2 °C.								
Eh (ORP)	WL 401 (N/A)		2580		1	JLK	03/30/16 22:25	mv	CC63048
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	04/04/16 20:07	mg/kg dry	CD60432



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 0-1ft
Date Sampled: 03/30/16 11:10
Percent Solids: 72

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	2.21 (0.380)		7471B		10	BJV	04/01/16 14:08	0.72	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP8 0-1ft
Date Sampled: 03/30/16 11:42
Percent Solids: 72

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	8.30 (2.21)		7471B		50	BJV	04/01/16 14:11	0.62	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP6 0-1ft
Date Sampled: 03/30/16 12:30
Percent Solids: 76

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.822 (0.200)		7471B		5	BJV	04/01/16 14:13	0.65	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP6 2-4ft
Date Sampled: 03/30/16 12:45
Percent Solids: 63

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.198 (0.045)		7471B		1	BJV	04/01/16 13:02	0.69	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 2-4ft
Date Sampled: 03/30/16 11:15
Percent Solids: 73

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.646 (0.045)		7471B		1	BJV	04/01/16 13:10	0.61	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP6 4-6ft
Date Sampled: 03/30/16 12:50
Percent Solids: 72

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.845 (0.045)		7471B		1	BJV	04/01/16 13:21	0.61	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 4-6ft
Date Sampled: 03/30/16 11:21
Percent Solids: 70

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-11
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.500 (0.047)		7471B		1	BJV	04/01/16 13:24	0.6	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP6 6-8ft
Date Sampled: 03/30/16 13:00
Percent Solids: 62

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-12
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.359 (0.050)		7471B		1	BJV	04/01/16 13:26	0.63	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP2 0-2ft
Date Sampled: 03/30/16 13:15
Percent Solids: 71

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-13
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.218 (0.044)		7471B		1	BJV	04/01/16 13:29	0.64	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP4 0-2ft
Date Sampled: 03/30/16 10:15
Percent Solids: 76

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-14
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 7471B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Mercury	0.316 (0.040)		7471B		1	BJV	04/01/16 13:31	0.65	40	CC63113



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP5 0-2ft
Date Sampled: 03/30/16 09:11
Percent Solids: 77

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-15
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	30600 (123)		6010C		20	KJK	04/01/16 14:15	2.12	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP5 0-2ft
Date Sampled: 03/30/16 09:11
Percent Solids: 77
Initial Volume: 14.8
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-15
Sample Matrix: Soil
Units: mg/kg dry
Analyst: IBM
Prepared: 3/31/16 11:27

8270D Polynuclear Aromatic Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
2-Methylnaphthalene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Acenaphthene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Acenaphthylene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Anthracene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Benzo(a)anthracene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Benzo(a)pyrene	0.244 (0.221)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Benzo(b)fluoranthene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Benzo(g,h,i)perylene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Benzo(k)fluoranthene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Chrysene	0.307 (0.221)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Dibenzo(a,h)Anthracene	ND (0.221)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Fluoranthene	0.531 (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Fluorene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Indeno(1,2,3-cd)Pyrene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Naphthalene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Phenanthrene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118
Pyrene	ND (0.440)		8270D		1	04/01/16 4:56	CZC0567	CC63118

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1,2-Dichlorobenzene-d4	68 %		30-130
Surrogate: 2-Fluorobiphenyl	71 %		30-130
Surrogate: Nitrobenzene-d5	67 %		30-130
Surrogate: p-Terphenyl-d14	72 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP5 2-4ft
Date Sampled: 03/30/16 09:16
Percent Solids: 65

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-16
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	1880 (7.16)		6010C		1	KJK	04/01/16 14:33	2.16	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP5 2-4ft
Date Sampled: 03/30/16 09:16
Percent Solids: 65
Initial Volume: 15
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-16
Sample Matrix: Soil
Units: mg/kg dry
Analyst: IBM
Prepared: 3/31/16 11:27

8270D Polynuclear Aromatic Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
2-Methylnaphthalene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Acenaphthene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Acenaphthylene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Anthracene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Benzo(a)anthracene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Benzo(a)pyrene	ND (0.258)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Benzo(b)fluoranthene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Benzo(g,h,i)perylene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Benzo(k)fluoranthene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Chrysene	ND (0.258)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Dibenzo(a,h)Anthracene	ND (0.258)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Fluoranthene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Fluorene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Indeno(1,2,3-cd)Pyrene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Naphthalene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Phenanthrene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118
Pyrene	ND (0.515)		8270D		1	03/31/16 22:27	CZC0545	CC63118

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1,2-Dichlorobenzene-d4	68 %		30-130
Surrogate: 2-Fluorobiphenyl	68 %		30-130
Surrogate: Nitrobenzene-d5	66 %		30-130
Surrogate: p-Terphenyl-d14	67 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP4 2-4ft
Date Sampled: 03/30/16 10:20
Percent Solids: 65

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-17
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	465 (7.06)		6010C		1	KJK	04/01/16 14:37	2.17	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP4 2-4ft
Date Sampled: 03/30/16 10:20
Percent Solids: 65
Initial Volume: 14.7
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-17
Sample Matrix: Soil
Units: mg/kg dry
Analyst: IBM
Prepared: 3/31/16 11:27

8270D Polynuclear Aromatic Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
2-Methylnaphthalene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Acenaphthene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Acenaphthylene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Anthracene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Benzo(a)anthracene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Benzo(a)pyrene	ND (0.261)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Benzo(b)fluoranthene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Benzo(g,h,i)perylene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Benzo(k)fluoranthene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Chrysene	ND (0.261)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Dibenzo(a,h)Anthracene	ND (0.261)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Fluoranthene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Fluorene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Indeno(1,2,3-cd)Pyrene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Naphthalene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Phenanthrene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118
Pyrene	ND (0.520)		8270D		1	04/04/16 19:47	CZD0033	CC63118

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	65 %		30-130
<i>Surrogate: 2-Fluorobiphenyl</i>	67 %		30-130
<i>Surrogate: Nitrobenzene-d5</i>	62 %		30-130
<i>Surrogate: p-Terphenyl-d14</i>	71 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP4 4-6ft
Date Sampled: 03/30/16 10:40
Percent Solids: 62

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-18
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	962 (6.74)		6010C		1	KJK	04/01/16 14:41	2.39	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP4 4-6ft
Date Sampled: 03/30/16 10:40
Percent Solids: 62
Initial Volume: 14.1
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-18
Sample Matrix: Soil
Units: mg/kg dry
Analyst: IBM
Prepared: 3/31/16 11:27

8270D Polynuclear Aromatic Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
2-Methylnaphthalene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Acenaphthene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Acenaphthylene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Anthracene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Benzo(a)anthracene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Benzo(a)pyrene	ND (0.286)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Benzo(b)fluoranthene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Benzo(g,h,i)perylene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Benzo(k)fluoranthene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Chrysene	ND (0.286)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Dibenzo(a,h)Anthracene	ND (0.286)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Fluoranthene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Fluorene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Indeno(1,2,3-cd)Pyrene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Naphthalene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Phenanthrene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118
Pyrene	ND (0.570)		8270D		1	03/31/16 23:04	CZC0545	CC63118

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	65 %		30-130
<i>Surrogate: 2-Fluorobiphenyl</i>	67 %		30-130
<i>Surrogate: Nitrobenzene-d5</i>	67 %		30-130
<i>Surrogate: p-Terphenyl-d14</i>	63 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 0-1ft
Date Sampled: 03/30/16 11:10
Percent Solids: 74

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-19
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	835 (6.07)		6010C		1	KJK	04/01/16 14:47	2.21	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP7 0-1ft
Date Sampled: 03/30/16 11:10
Percent Solids: 74
Initial Volume: 14
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-19
Sample Matrix: Soil
Units: mg/kg dry
Analyst: IBM
Prepared: 3/31/16 11:27

8270D Polynuclear Aromatic Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
2-Methylnaphthalene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Acenaphthene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Acenaphthylene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Anthracene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Benzo(a)anthracene	0.482 (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Benzo(a)pyrene	0.468 (0.240)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Benzo(b)fluoranthene	0.678 (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Benzo(g,h,i)perylene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Benzo(k)fluoranthene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Chrysene	0.564 (0.240)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Dibenzo(a,h)Anthracene	ND (0.240)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Fluoranthene	1.12 (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Fluorene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Indeno(1,2,3-cd)Pyrene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Naphthalene	ND (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Phenanthrene	0.497 (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118
Pyrene	0.724 (0.479)		8270D		1	03/31/16 23:41	CZC0545	CC63118

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: 1,2-Dichlorobenzene-d4	76 %		30-130
Surrogate: 2-Fluorobiphenyl	76 %		30-130
Surrogate: Nitrobenzene-d5	77 %		30-130
Surrogate: p-Terphenyl-d14	74 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP6 2-4ft
Date Sampled: 03/30/16 12:45
Percent Solids: 64

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-20
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	338 (6.89)		6010C		1	KJK	04/01/16 14:51	2.27	100	CC63108



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park
Client Sample ID: Ex-TP6 2-4ft
Date Sampled: 03/30/16 12:45
Percent Solids: 64
Initial Volume: 14.3
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 1603751
ESS Laboratory Sample ID: 1603751-20
Sample Matrix: Soil
Units: mg/kg dry
Analyst: IBM
Prepared: 3/31/16 11:27

8270D Polynuclear Aromatic Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
2-Methylnaphthalene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Acenaphthene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Acenaphthylene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Anthracene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Benzo(a)anthracene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Benzo(a)pyrene	ND (0.274)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Benzo(b)fluoranthene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Benzo(g,h,i)perylene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Benzo(k)fluoranthene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Chrysene	ND (0.274)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Dibenzo(a,h)Anthracene	ND (0.274)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Fluoranthene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Fluorene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Indeno(1,2,3-cd)Pyrene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Naphthalene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Phenanthrene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118
Pyrene	ND (0.546)		8270D		1	03/31/16 21:51	CZC0545	CC63118

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	70 %		30-130
<i>Surrogate: 2-Fluorobiphenyl</i>	73 %		30-130
<i>Surrogate: Nitrobenzene-d5</i>	72 %		30-130
<i>Surrogate: p-Terphenyl-d14</i>	68 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Total Metals

Batch CC63108 - 30508

Blank

Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							

LCS

Chromium	82.3	3.57	mg/kg wet	87.90		94	80-120			
Lead	131	17.9	mg/kg wet	138.0		95	80-120			

LCS

Chromium	167	4.00	mg/kg wet	182.0		92	80-120			
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LCS Dup

Chromium	79.4	3.85	mg/kg wet	87.90		90	80-120	4	20	
Lead	130	19.2	mg/kg wet	138.0		94	80-120	0.8	20	

LCS Dup

Chromium	171	3.85	mg/kg wet	182.0		94	80-120	2	20	
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Batch CC63113 - 74718

Blank

Mercury	ND	0.033	mg/kg wet							
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LCS

Mercury	17.4	1.90	mg/kg wet	15.90		109	80-120			
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LCS Dup

Mercury	16.9	1.48	mg/kg wet	15.90		106	80-120	3	20	
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8270D Polynuclear Aromatic Hydrocarbons

Batch CC63118 - 3546

Blank

2-Methylnaphthalene	ND	0.333	mg/kg wet							
Acenaphthene	ND	0.333	mg/kg wet							
Acenaphthylene	ND	0.333	mg/kg wet							
Anthracene	ND	0.333	mg/kg wet							
Benzo(a)anthracene	ND	0.333	mg/kg wet							
Benzo(a)pyrene	ND	0.167	mg/kg wet							
Benzo(b)fluoranthene	ND	0.333	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.333	mg/kg wet							
Benzo(k)fluoranthene	ND	0.333	mg/kg wet							
Chrysene	ND	0.167	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.167	mg/kg wet							
Fluoranthene	ND	0.333	mg/kg wet							
Fluorene	ND	0.333	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.333	mg/kg wet							
Naphthalene	ND	0.333	mg/kg wet							
Phenanthrene	ND	0.333	mg/kg wet							
Pyrene	ND	0.333	mg/kg wet							
Surrogate: 1,2-Dichlorobenzene-d4	1.93		mg/kg wet	3.333		58	30-130			
Surrogate: 2-Fluorobiphenyl	1.92		mg/kg wet	3.333		57	30-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8270D Polynuclear Aromatic Hydrocarbons

Batch CC63118 - 3546

Surrogate: Nitrobenzene-d5	1.87		mg/kg wet	3.333		56	30-130			
Surrogate: p-Terphenyl-d14	2.42		mg/kg wet	3.333		72	30-130			

LCS

2-Methylnaphthalene	2.11	0.333	mg/kg wet	3.333		63	40-140			
Acenaphthene	2.21	0.333	mg/kg wet	3.333		66	40-140			
Acenaphthylene	2.37	0.333	mg/kg wet	3.333		71	40-140			
Anthracene	2.49	0.333	mg/kg wet	3.333		75	40-140			
Benzo(a)anthracene	2.45	0.333	mg/kg wet	3.333		74	40-140			
Benzo(a)pyrene	2.50	0.167	mg/kg wet	3.333		75	40-140			
Benzo(b)fluoranthene	2.48	0.333	mg/kg wet	3.333		74	40-140			
Benzo(g,h,i)perylene	2.43	0.333	mg/kg wet	3.333		73	40-140			
Benzo(k)fluoranthene	2.41	0.333	mg/kg wet	3.333		72	40-140			
Chrysene	2.41	0.167	mg/kg wet	3.333		72	40-140			
Dibenzo(a,h)Anthracene	2.52	0.167	mg/kg wet	3.333		75	40-140			
Fluoranthene	2.46	0.333	mg/kg wet	3.333		74	40-140			
Fluorene	2.27	0.333	mg/kg wet	3.333		68	40-140			
Indeno(1,2,3-cd)Pyrene	2.51	0.333	mg/kg wet	3.333		75	40-140			
Naphthalene	2.16	0.333	mg/kg wet	3.333		65	40-140			
Phenanthrene	2.36	0.333	mg/kg wet	3.333		71	40-140			
Pyrene	2.03	0.333	mg/kg wet	3.333		61	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	2.05		mg/kg wet	3.333		61	30-130			
Surrogate: 2-Fluorobiphenyl	2.21		mg/kg wet	3.333		66	30-130			
Surrogate: Nitrobenzene-d5	2.10		mg/kg wet	3.333		63	30-130			
Surrogate: p-Terphenyl-d14	2.27		mg/kg wet	3.333		68	30-130			

LCS Dup

2-Methylnaphthalene	2.16	0.333	mg/kg wet	3.333		65	40-140	2	30	
Acenaphthene	2.28	0.333	mg/kg wet	3.333		68	40-140	3	30	
Acenaphthylene	2.45	0.333	mg/kg wet	3.333		73	40-140	3	30	
Anthracene	2.48	0.333	mg/kg wet	3.333		74	40-140	0.4	30	
Benzo(a)anthracene	2.34	0.333	mg/kg wet	3.333		70	40-140	4	30	
Benzo(a)pyrene	2.42	0.167	mg/kg wet	3.333		73	40-140	3	30	
Benzo(b)fluoranthene	2.38	0.333	mg/kg wet	3.333		71	40-140	4	30	
Benzo(g,h,i)perylene	2.34	0.333	mg/kg wet	3.333		70	40-140	4	30	
Benzo(k)fluoranthene	2.35	0.333	mg/kg wet	3.333		70	40-140	3	30	
Chrysene	2.36	0.167	mg/kg wet	3.333		71	40-140	2	30	
Dibenzo(a,h)Anthracene	2.44	0.167	mg/kg wet	3.333		73	40-140	3	30	
Fluoranthene	2.74	0.333	mg/kg wet	3.333		82	40-140	11	30	
Fluorene	2.38	0.333	mg/kg wet	3.333		71	40-140	5	30	
Indeno(1,2,3-cd)Pyrene	2.43	0.333	mg/kg wet	3.333		73	40-140	4	30	
Naphthalene	2.31	0.333	mg/kg wet	3.333		69	40-140	7	30	
Phenanthrene	2.33	0.333	mg/kg wet	3.333		70	40-140	1	30	
Pyrene	2.23	0.333	mg/kg wet	3.333		67	40-140	9	30	
Surrogate: 1,2-Dichlorobenzene-d4	2.13		mg/kg wet	3.333		64	30-130			
Surrogate: 2-Fluorobiphenyl	2.22		mg/kg wet	3.333		67	30-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8270D Polynuclear Aromatic Hydrocarbons

Batch CC63118 - 3546

Surrogate: Nitrobenzene-d5	2.19		mg/kg wet	3.333		66	30-130			
Surrogate: p-Terphenyl-d14	2.40		mg/kg wet	3.333		72	30-130			

Classical Chemistry

Batch CD60432 - General Preparation

Blank

Hexavalent Chromium	ND	0.7	mg/kg wet							
---------------------	----	-----	-----------	--	--	--	--	--	--	--

LCS

Hexavalent Chromium	32.5	0.7	mg/kg wet	33.32		98	80-120			
---------------------	------	-----	-----------	-------	--	----	--------	--	--	--

LCS Dup

Hexavalent Chromium	32.5	0.7	mg/kg wet	33.32		97	80-120	0.1	20	
---------------------	------	-----	-----------	-------	--	----	--------	-----	----	--

Reference

Hexavalent Chromium	101	2.0	mg/kg wet	125.0		81	61-139			
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CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

Notes and Definitions

Z-10a	Soil pH measured in water at 20.2 °C.
Z-10	Soil pH measured in water at 20.1 °C.
WL	Results obtained from a deionized water leach of the sample.
U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: McGlew Park

ESS Laboratory Work Order: 1603751

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179

<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutOfStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002

<http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/documents/AllLabs.xls>

Massachusetts Potable and Non Potable Water: M-RI002

<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424

<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313

<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006

http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752

http://www.depweb.state.pa.us/portal/server.pt/community/labs/13780/laboratory_accreditation_program/590095

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1603751

Shipped/Delivered Via: ESS Courier

Date Received: 3/30/2016

Project Due Date: 4/6/2016

Days for Project: 5 Day

1. Air bill manifest present? ☐ No

Air No.: NA

6. Does COC match bottles? ☐ Yes

2. Were custody seals present? ☐ No

7. Is COC complete and correct? ☐ Yes

3. Is radiation count <100 CPM? ☐ Yes

8. Were samples received intact? ☐ Yes

4. Is a Cooler Present? ☐ Yes

Temp: 0.8 Iced with: Ice

9. Were labs informed about short holds & rushes? ☒ Yes / No / NA

5. Was COC signed and dated by client? ☐ Yes

10. Were any analyses received outside of hold time? Yes / ☒ No

11. Any Subcontracting needed? Yes / ☒ No

ESS Sample IDs:

Analysis: _____

TAT: _____

12. Were VOAs received? Yes / ☒ No

a. Air bubbles in aqueous VOAs?

Yes / No

b. Does methanol cover soil completely?

Yes / No / ☒ NA

13. Are the samples properly preserved? ☒ Yes / No

a. If metals preserved upon receipt:

Date: _____

Time: _____

By: _____

b. Low Level VOAs brought to freezer:

Date: _____

Time: _____

By: _____

Sample Receiving Notes:

COC WRITTEN IN PENCIL @ 3:30 PM

14. Was there a need to contact Project Manager? Yes / ☒ No

a. Was there a need to contact the client? Yes / No

Yes / No

Who was contacted? _____

Date: _____

Time: _____

By: _____

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	21521	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	21522	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	21523	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	21518	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	21519	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	21520	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	21515	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	21516	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	21517	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	21512	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	21513	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	21514	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	21529	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	21528	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	21527	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
08	21526	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
09	21525	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	21524	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
11	21533	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
12	21532	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
13	21531	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
14	21530	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
15	21544	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1603751
Date Received: 3/30/2016

15	21545	Yes	NA	Yes	4 oz. Jar - Unpres	NP
16	21542	Yes	NA	Yes	4 oz. Jar - Unpres	NP
16	21543	Yes	NA	Yes	4 oz. Jar - Unpres	NP
17	21540	Yes	NA	Yes	4 oz. Jar - Unpres	NP
17	21541	Yes	NA	Yes	4 oz. Jar - Unpres	NP
18	21538	Yes	NA	Yes	4 oz. Jar - Unpres	NP
18	21539	Yes	NA	Yes	4 oz. Jar - Unpres	NP
19	21536	Yes	NA	Yes	4 oz. Jar - Unpres	NP
19	21537	Yes	NA	Yes	4 oz. Jar - Unpres	NP
20	21534	Yes	NA	Yes	4 oz. Jar - Unpres	NP
20	21535	Yes	NA	Yes	4 oz. Jar - Unpres	NP

2nd Review

Are barcode labels on correct containers?

☒ Yes ☐ No

Completed

By: [Signature]

Date & Time: 3:30 PM 19B

Reviewed

By: [Signature]

Date & Time: 3/30/16 1924

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston, RI 02910-2211

Tel. (401) 461-7181 Fax (401) 461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time ☒ Standard ☐ Other

Regulatory State: MA RI CT NH NJ NY ME Other

Is this project for any of the following: (please circle)

MA-MCP Navy USACE CT DEP Other

Project # S-1758 Project Name McGlen park

Address 446 Main St Zip 01608 PO #

City Worcester State MA email: TD.Kirton@tygelbond.com

Tel. Fax

ESS Lab ID Date Collection Time Grab-G Composite-C Matrix Sample ID Pres Code # of Containers Type of Container Vol of Container Analysis

1 3/30/16 8:13 6 S EX-TP1 (0-2') NP 3 AG 402 Chromium

2 8:30 6 S EX-TP1 (2-4') NP 3 AG 402 Hx chrom

3 8:37 6 S EX-TP1 (4-6') NP 3 AG 402 Mercury

4 11:15 6 S EX-TP7 (2-4') NP 3 AG 402

5 11:10 6 S EX-TP7 (0-1') NP 1 AG 402

6 11:42 6 S EX-TP8 (0-1') NP 1 AG 402

7 12:30 6 S EX-TP6 (0-1') NP 1 AG 402

8 12:43 6 S EX-TP6 (2-4') NP 1 AG 402

9 11:15 6 S EX-TP7 (2-4') NP 1 AG 402

10 12:50 6 S EX-TP6 (4-6') NP 1 AG 402

Container Type: P-Poly G-Glass AG-Ambig Glass S-Sterile V-VOA Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ☒ Yes ☐ No No NA: ☒ Pickup

Seals Intact ☒ Yes ☐ No No NA: ☒ Technician

Cooler Temperature: 0.8 Ice Kit

Received by: (Signature, Date & Time)

Relinquished by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Relinquished by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Relinquished by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

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Received by: (Signature, Date & Time)

Relinquished by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

1062

ESS Lab # 1603751

Reporting Limits - RGS-1

Electronic Deliverables Excel Access PDF

Analysis

Vol of Container

402

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Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Received by: (Signature, Date & Time)

Please fax to the laboratory all changes to Chain of Custody

1 (White) Lab Copy

2 (Yellow) Client Receipt

* By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIIa

20f2

ESS Laboratory

Division of Thielsch Engineering, Inc.

185 Frances Avenue, Cranston, RI 02910-2211

Tel. (401) 461-7181 Fax (401) 461-4486

www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time ☒ Standard ☐ Other _____

Regulatory State: MA-RI CT NH NJ NY ME Other _____

Is this project for any of the following: (please circle)

MA-MCP Navy USACE CT DEP Other _____

Co. Name	<u>Tighe + Bond</u>	Project Name	<u>McGlow Park</u>
Contact Person	<u>Todd Kirtan</u>	Address	<u>446 Main St</u>
City	<u>Worcester</u>	State	<u>MA</u>
Tel.		Zip	<u>01608</u>
		PO #	<u>01608</u>
		email:	<u>TPKirtan@tighebond.com</u>

ESS Lab ID	Date	Collection Time	Grab-G Composite-C	Matrix	Sample ID	Pres Code	# of Containers	Type of Container	Vol of Container	Analysis	100	PAHs	Mercury						
11	3/30/16	11:21	6	S	EX-TP7(4-6')	NP	1	AG	402	X									
12	3/30/16	1300	6	S	EX-TP6(6-8')	NP	1	AG	402	X									
13	3/30/16	1315	6	S	EX-TP2(0-2')	NP	1	AG	402	X									
14	3/30/16	1015	6	S	EX-TP4(6-2')	NP	1	AG	402	X									
15	3/30/16	9:11	6	S	EX-TP5(0-2')	NP	2	AG	402	X									
16	3/30/16	9:16	6	S	EX-TP5(2-4')	NP	2	AG	402	X									
17	3/30/16	1020	6	S	EX-TP4(2-4')	NP	2	AG	402	X									
18	3/30/16	1040	6	S	EX-TP4(4-6')	NP	2	AG	402	X									
19	3/30/16	11:10	6	S	EX-TP7(0-1')	NP	2	AG	402	X									
20	3/30/16	1245	6	S	EX-TP6(2-4')	NP	2	AG	402	X									

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ☒ Yes ☐ No Internal Use Only ☒ ☐ Pickup Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Seals Intact ☒ Yes ☐ No NA: _____ Sampled by: Ku

Cooler Temperature: 0.8 Iceket Comments: _____

Relinquished by: (Signature, Date & Time) [Signature] 3/30/16 1508 Relinquished by: (Signature, Date & Time) [Signature] 3/30/16 1815

Relinquished by: (Signature, Date & Time) [Signature] 3/30/16 1508 Relinquished by: (Signature, Date & Time) [Signature] 3/30/16 1815

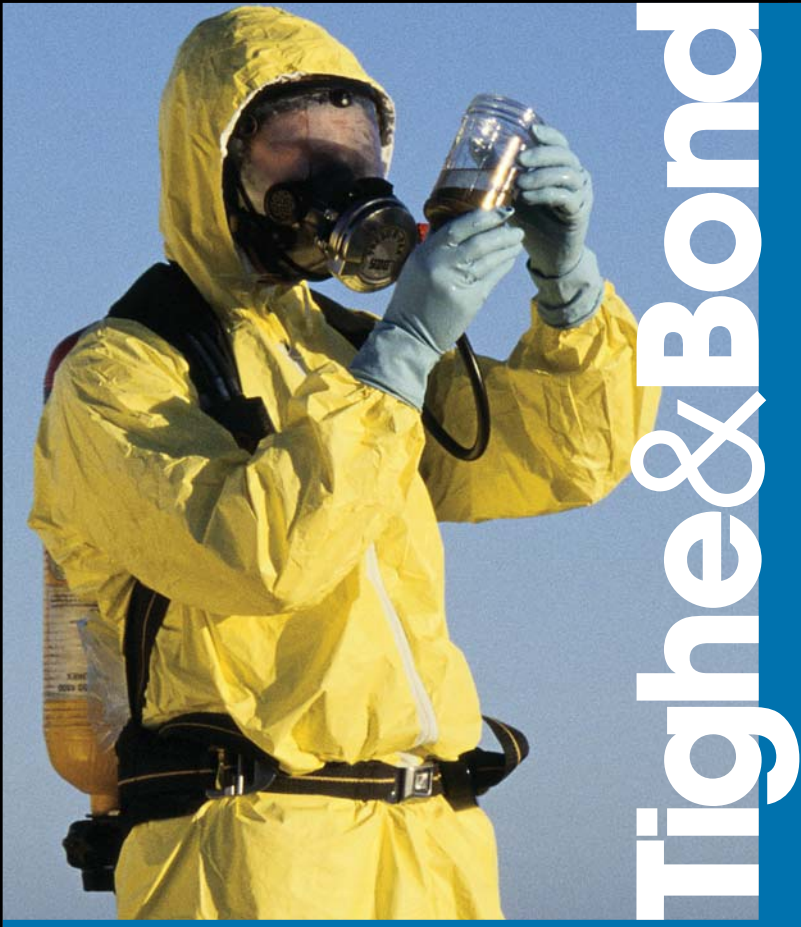
Relinquished by: (Signature, Date & Time) _____ Relinquished by: (Signature, Date & Time) _____

By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VIIA

Please fax to the laboratory all changes to Chain of Custody

1 (White) Lab Copy

2 (Yellow) Client Receipt



Tighe & Bond

TABLE 1
Summary of Soil Results
McGlew Park off North Street
Salem, Massachusetts

ANALYTES	MCP	MassDEP	MCP Method 1 Risk Standards			MCP	Program/Date	Boring Program / 01-22-2016									
	Reportable	Background				Method 3	Boring/Test Pit No.	SB-01	SB-03	SB-04	SB-05	SB-05	SB-07	SB-08	SB-09	SB-09	SB-10
	RCS-1	Levels in Soils Containing Fill ⁽¹⁾	S-1/GW-3	S-2/GW-3	S-3/GW-3	UCLs	Sample Depth:	0-2 Feet	0-3 Feet	2-5 Feet	2-4 Feet	8-9 Feet	2-5 Feet	0-3 Feet	2-4 Feet	5-6 Feet	0-3 Feet
EPH carbon ranges																	
C9-C18 ALIPHATICS	1,000	-	1,000	3,000	5,000	20,000		ND (18.1)	ND (18.8)	-	ND (21.4)	ND (18.1)	ND (20.8)	-	ND (21.3)	ND (58.6)	ND (15.4)
C19-C36 ALIPHATICS	3,000	-	3,000	5,000	5,000	20,000		44.7	ND (18.8)	-	ND (21.4)	ND (18.1)	21.1	-	ND (21.3)	158	ND (15.4)
C11-C22 AROMATICS	1,000	-	1,000	3,000	5,000	10,000		26.7	23.3	-	ND (94.2)	ND (18.1)	24.8	-	ND (21.3)	388	ND (15.4)
Target PAHs																	
ACENAPHTHENE	4	2	1,000	3,000	5,000	10,000		ND (0.48)	ND (0.5)	-	ND (0.57)	ND (0.48)	ND (0.55)	-	ND (0.57)	ND (1.56)	ND (0.41)
ACENAPHTHYLENE	1	1	10	10	10	10,000		ND (0.24)	ND (0.25)	-	ND (0.29)	ND (0.24)	ND (0.28)	-	ND (0.28)	9.25	ND (0.21)
ANTHRACENE	1,000	4	1,000	3,000	5,000	10,000		ND (0.48)	ND (0.5)	-	1.16	ND (0.48)	ND (0.55)	-	ND (0.57)	21.6	ND (0.41)
BENZO(A)ANTHRACENE	7	9	7	40	300	3,000		ND (0.48)	0.5	-	4.42	ND (0.48)	ND (0.55)	-	ND (0.57)	31.8	ND (0.41)
BENZO(A)PYRENE	2	7	2	7	30	300		ND (0.48)	0.61	-	4.07	ND (0.48)	ND (0.55)	-	ND (0.57)	24	ND (0.41)
BENZO(B)FLUORANTHENE	7	8	7	40	300	3,000		ND (0.48)	0.78	-	5.15	ND (0.48)	ND (0.55)	-	ND (0.57)	32.5	ND (0.41)
BENZO(G,H,I)PERYLENE	1,000	3	1,000	3,000	5,000	10,000		ND (0.48)	0.53	-	2.89	ND (0.48)	ND (0.55)	-	ND (0.57)	14.2	ND (0.41)
BENZO(K)FLUORANTHENE	70	4	70	400	3,000	10,000		ND (0.48)	ND (0.5)	-	1.57	ND (0.48)	ND (0.55)	-	ND (0.57)	7.08	ND (0.41)
CHRYSENE	70	7	70	400	3,000	10,000		ND (0.48)	0.56	-	4.18	ND (0.48)	ND (0.55)	-	ND (0.57)	27.2	ND (0.41)
DIBENZ(A,H)ANTHRACENE	0.7	1	0.7	4	30	300		ND (0.24)	ND (0.25)	-	0.63	ND (0.24)	ND (0.28)	-	ND (0.28)	2.96	ND (0.21)
FLUORANTHENE	1,000	10	1,000	3,000	5,000	10,000		0.63	1.2	-	8.69	ND (0.48)	0.64	-	ND (0.57)	102	ND (0.41)
FLUORENE	1,000	2	1,000	3,000	5,000	10,000		ND (0.48)	ND (0.5)	-	ND (0.57)	ND (0.48)	ND (0.55)	-	ND (0.57)	5.5	ND (0.41)
INDENO(1,2,3-CD)PYRENE	7	3	7	40	300	3,000		ND (0.48)	0.5	-	2.79	ND (0.48)	ND (0.55)	-	ND (0.57)	15.1	ND (0.41)
2-METHYLNAPHTHALENE	0.7	1	300	500	500	5,000		ND (0.24)	ND (0.25)	-	ND (0.29)	ND (0.24)	ND (0.28)	-	ND (0.28)	ND (0.78)	ND (0.21)
NAPHTHALENE	4	1	500	1,000	3,000	10,000		ND (0.48)	ND (0.5)	-	ND (0.57)	ND (0.48)	ND (0.55)	-	ND (0.57)	2.33	ND (0.41)
PHENANTHRENE	10	20	500	1,000	3,000	10,000		ND (0.48)	0.64	-	5.68	ND (0.48)	ND (0.55)	-	ND (0.57)	133	ND (0.41)
PYRENE	1,000	20	1,000	3,000	5,000	10,000		0.6	1.02	-	7.7	ND (0.48)	ND (0.55)	-	ND (0.57)	85.3	ND (0.41)
Metals																	
ARSENIC	20	20	20	20	50	500		10.2	10.3	-	14.8	13.3	14.9	-	9.96	16.3	3.79
BARIUM	1,000	50	1,000	3,000	5,000	10,000		126	85.8	-	169	189	470	-	73.5	287	32.3
CADMIUM	70	3	70	100	100	1,000		ND (0.42)	ND (0.62)	-	0.61	0.63	1.1	-	ND (0.6)	0.71	ND (0.5)
CHROMIUM (Total)	100	40	100	200	200	2,000		109	9.66	-	9.54	7.78	18.8	-	13.8	15	11.7
HEXAVALENT CHROMIUM	100	-	100	200	200	2,000		-	-	-	-	-	-	-	-	-	-
[calculated Cr ³⁺]	1,000	-	1,000	3,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-
LEAD	200	600	200	600	600	6,000		318	114	-	356	769	1,340	-	143	2,100	10.7
MERCURY	20	1	20	30	30	300		0.254	0.139	-	0.097	0.208	282	-	0.234	0.303	-
SELENIUM	400	1	400	700	700	7,000		ND (2.08)	ND (3.09)	-	ND (3.01)	ND (2.59)	ND (2.96)	-	ND (2.51)	ND (2.61)	ND (3.01)
SILVER	100	5	100	200	200	2,000		ND (0.42)	ND (0.62)	-	ND (0.6)	ND (4.04)	ND (0.59)	-	ND (0.6)	ND (0.52)	ND (0.5)
PCBs																	
All PCB Arochlors	1	-	1					ND	-	-	ND	-	ND	ND	-	-	-
VOCs																	
ALL ANALYTES	CS	-	CS	CS	CS	CS		-	-	-	ND	-	ND	-	-	-	-
Pesticides																	
ALL ANALYTES	CS	-	CS	CS	CS	CS		-	-	ND	-	-	-	ND	-	-	-
Microscopic Analysis																	
	-	-	-	-	-	-		-	-	-	Coal (heavy), Coal Ash (light), Wood Ash (light)	-	-	-	-	Coal (heavy), Coal Ash (light)	-

NOTES:
⁽¹⁾ MassDEP identified background levels in soils containing coal ash or wood ash associated with fill material, as referenced in MassDEP's Technical Update to Section 2.3 of the Guidance for Disposal Site Risk Characterization.
* Sample Ex-TP-5 was re-analyzed for lead, as further discussed in the PSS report.
Bold boxed values indicates exceedance of MCP Reportable Concentrations (RCS-1) and/or Method 1 standards.
ND indicates that the analyte was not detected above the referenced laboratory reporting limit in the sample.
CS Compound specific
- indicates sample not analyzed for respective analyte.

TABLE 1
Summary of Soil Results
McGlew Park off North Street
Salem, Massachusetts

	MCP Reportable RCS-1	MassDEP Background Levels in Soils Containing Fill ⁽¹⁾	MCP Method 1 Risk Standards			MCP Method 3 UCLs	Exploratory Test Pit Program / 03-30-2016																	
ANALYTES			S-1/GW-3	S-2/GW-3	S-3/GW-3		Ex-TP-1		Ex-TP-2	Ex-TP-4		Ex-TP-5			Ex-TP-6			Ex-TP-7		Ex-TP-8				
							0-2 Feet	2-4 Feet	4-6 Feet	0-2 Feet	0-2 Feet	2-4 Feet	4-6 Feet	0-2 Feet	0-2 Feet*	2-4 Feet	0-1 Feet	2-4 Feet	4-6 Feet	6-8 Feet	0-1 Feet	2-4 Feet	4-6 Feet	0-1 Feet
EPH carbon ranges																								
C9-C18 ALIPHATICS	1,000	-	1,000	3,000	5,000	20,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C19-C36 ALIPHATICS	3,000	-	3,000	5,000	5,000	20,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C11-C22 AROMATICS	1,000	-	1,000	3,000	5,000	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Target PAHs																								
ACENAPHTHENE	4	2	1,000	3,000	5,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
ACENAPHTHYLENE	1	1	10	10	10	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
ANTHRACENE	1,000	4	1,000	3,000	5,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
BENZO(A)ANTHRACENE	7	9	7	40	300	3,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
BENZO(A)PYRENE	2	7	2	7	30	300	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	0.482	-	-	-
BENZO(B)FLUORANTHENE	7	8	7	40	300	3,000	-	-	-	-	ND (0.261)	ND (0.286)	0.244	-	ND (0.258)	-	ND(0.274)	-	-	-	0.468	-	-	-
BENZO(G,H,I)PERYLENE	1,000	3	1,000	3,000	5,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	0.678	-	-	-
BENZO(K)FLUORANTHENE	70	4	70	400	3,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
CHRYSENE	70	7	70	400	3,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
DIBENZ(A,H)ANTHRACENE	0.7	1	0.7	4	30	300	-	-	-	-	ND (0.261)	ND (0.286)	0.307	-	ND (0.258)	-	ND(0.274)	-	-	-	0.564	-	-	-
FLUORANTHENE	1,000	10	1,000	3,000	5,000	10,000	-	-	-	-	ND (0.261)	ND (0.286)	ND (0.221)	-	ND (0.258)	-	ND(0.274)	-	-	-	ND (0.24)	-	-	-
FLUORENE	1,000	2	1,000	3,000	5,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	0.531	-	ND (0.515)	-	ND (0.546)	-	-	-	1.12	-	-	-
INDENO(1,2,3-CD)PYRENE	7	3	7	40	300	3,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
2-METHYLNAPHTHALENE	0.7	1	300	500	500	5,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
NAPHTHALENE	4	1	500	1,000	3,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	ND (0.479)	-	-	-
PHENANTHRENE	10	20	500	1,000	3,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	0.497	-	-	-
PYRENE	1,000	20	1,000	3,000	5,000	10,000	-	-	-	-	ND (0.52)	ND (0.57)	ND (0.44)	-	ND (0.515)	-	ND (0.546)	-	-	-	0.724	-	-	-
Metals																								
ARSENIC	20	20	20	20	50	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BARIUM	1,000	50	1,000	3,000	5,000	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADMIUM	70	3	70	100	100	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHROMIUM (Total)	100	40	100	200	200	2,000	17.4	5.6	5.72	-	-	-	-	-	-	-	-	-	-	-	-	19.6	-	-
HEXAVALENT CHROMIUM	100	-	100	200	200	2,000	ND (0.5)	ND (0.5)	ND (0.5)	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-
[calculated Cr ³⁺]	1,000	-	1,000	3,000	5,000	10,000	17.4	5.6	5.72	-	-	-	-	-	-	-	-	-	-	-	-	19.6	-	-
LEAD	200	600	200	600	600	6,000	-	-	-		465	962	30,600	572	1,880		338				835			
MERCURY	20	1	20	30	30	300	-	-	-	0.218	0.316						0.822	0.198	0.845	0.359	2.21	0.646	0.5	8.3
SELENIUM	400	1	400	700	700	7,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SILVER	100	5	100	200	200	2,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCBs																								
All PCB Arochlors	1	-	1				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VOCs																								
ALL ANALYTES	CS	-	CS	CS	CS	CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pesticides																								
ALL ANALYTES	CS	-	CS	CS	CS	CS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microscopic Analysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:
⁽¹⁾ MassDEP identified background levels in soils containing coal ash or wood ash associated with fill material, as referenced in MassDEP's Technica
* Sample Ex-TP-5 was re-analyzed for lead, as further discussed in the PSS report.
 Bold boxed values indicates exceedance of MCP Reportable Concentrations (RCS-1) and/or Method 1 standards.
ND indicates that the analyte was not detected above the referenced laboratory reporting limit in the sample.
CS Compound specific
- Indicates sample not analyzed for respective analyte.

