Contract Documents and Technical Specifications

for

City of Portsmouth, NH

PORTSMOUTH MULTI-PURPOSE RECREATION FIELD LIGHTING PROJECT

November 2021

Prepared for:
City of Portsmouth, NH
1 Junkins Avenue
Portsmouth, NH 03801
Bid #11-22

Karen Conard, City Manager

Prepared By:

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SPECIAL CONDITIONS

The SPECIAL CONDITIONS summarize selected project requirements for the Contractor's easy reference. It is not intended to provide all requirements. Refer to Technical Specifications and Drawings for details.

1. CONSTRUCTION INTENT

The project consists of the installation of athletic field lighting at the Portsmouth Multi-Purpose Recreation field and an electrical service connection from Community Campus Drive to the field.

Sport Field Lighting: Includes Sport Field Lighting Posts and Fixtures, typical of four locations; lighting controls; and electrical service infrastructure from Community Campus Road, including conduit, manholes and transformer pad. The City of Portsmouth will be responsible for all normal charges from Eversource relating to the Utilities' cost of pulling of power supply cables, providing transformers, meters etc.

2. CONTRACT TIME

Since time is of the essence, work must be substantially complete by May 15, 2022. Final Completion must be achieved within 30 days of substantial completion. The CONTRACTOR should note that liquidated damages in the amount of $500/day will be levied for every calendar day in excess of the specified contract time.

The Work shall be completed Monday through Friday during daylight hours (7 AM to 5 PM) unless specifically noted otherwise. Requests to perform nighttime or weekend operations must be approved by the City at least 2 weeks prior to the anticipated construction operations. Additional costs associated with nighttime or weekend operations will be at the Contractor's expense.

If contractor is delayed in the performance or progress of the work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of the owner, or other causes not the fault of and beyond control of owner and contractor, then contractor shall be entitled to an equitable adjustment in contract times, if such adjustment is essential to contractors ability to complete the work within the contract times. Such an adjustment shall be the contractor's soul and exclusive remedy for the delays.

3. SUBSTANTIAL COMPLETION

Prior to the issuance of a Certificate of Substantial Completion all Work must be complete and tested except minor site cleanup.

4. HIERARCHY OF DOCUMENTS

1. Plans will govern Technical Specifications;
2. Technical Specifications and Plans will govern Supplementary Conditions and General Conditions;
3. Supplementary Conditions shall govern General Conditions;
4. Special Conditions will govern Technical Specifications, Plans, Supplementary Conditions, and Modified General Conditions;
5. The Agreement supersedes all other Contract Documents.

5. SEQUENCING OF WORK

The CONTRACTOR shall be prepared to commence work no later than the date on the Notice to Proceed. Any work required to meet this sequencing, including winter demobilization and spring mobilization is incidental to the contract.

Prior to the start of any work, the Contractor shall submit for approval a proposed work schedule. Schedule updates or alterations should be presented at regular progress meetings.

6. TRAFFIC CONTROL

A Traffic Control Plan (TCP) for work in Campus Drive shall be submitted to the Engineer for review and will require approval by the City of Portsmouth prior to construction. Road detours (except for local traffic) are anticipated. Construction warning signs must conform to MUTCD standards, as applicable. A flagging permit will be required from the City of Portsmouth DPW.

The Trenches will be backfilled and roads shall be re-opened to provide safe vehicular and pedestrian traffic at the end of each working day. The Plan shall also include the anticipated number of flaggers to be used for a given work area.

7. CONSTRUCTION LAYOUT

Work is to be generally constructed as shown on the drawings. The Contractor will be responsible for all construction layouts. A list of horizontal control points (and coordinates) and TBM's will be provided by the Engineer and confirmed by the Contractor, for reference throughout the project. The Engineer and/or Owner's Representative, together with the Project Superintendent will review utility corridors, giving consideration to dig-safe markings and Contractor's work plan. The Contractor will advise the Engineer, in advance, of potential conflicts concerning execution of his work. It will be the responsibility of the Contractor to protect and maintain TBM's, layout and control points provided by the Engineer. The Engineer will provide an electronic copy of plans and coordinates to the Contractor upon request to facilitate the Contractor's layout, providing the Contractor executes a release concerning the information transmitted.

8. COORDINATION OF WORK WITH OTHER SUBCONTRACTORS

The Contractor is to fully coordinate the work of the Utility provider (Eversource) and all subcontractors having a direct contract with the Contractor for performance of work associated with this Contract, including without limitation, surveyors, material suppliers, and equipment suppliers.

The Contractor must coordinate schedules, delivery dates, staging area, trades and all other work according to these Specifications and the Construction Schedule.

9. COORDINATION WITH OTHER PROJECTS

The Owner reserves the right at any time to Contract for and perform other or additional work on or near the Work covered by the Contract.

When separate Contracts are let within the limits of any one project or on adjacent projects, each Contractor shall conduct the Work without interfering or hindering the progress or completion of the work by other Contractors. Contractors working on the same project or adjacent projects shall cooperate with each other in a manner to serve the best interest of the City. In case of any unavoidable interference, the Engineer will determine priorities.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with the Contract and shall protect and save harmless the Owner from damages or claims that may arise

because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange the Work and place and dispose of materials being used without interfering with operations of the other Contractors within the limits of the same project or on adjacent projects. The Work shall be coordinated with the work and sequence of other Contractors.

10. CONFLICTS AND COORDINATION WITH EXISTING UTILITIES

It will be the Contractor's responsibility to coordinate with the utility companies for identification and re-location, if necessary, of any utilities that are interfering or conflicting with the work shown on the drawings. Loss of production or crew downtime relating to utility work by others will not be considered for additional payment.

11. OTHER BURIED UTILITIES AND SERVICE PIPES

The Contractor is expected to coordinate utility markings through Dig Safe, Unitil and the City of Portsmouth Water and Sewer Department before proceeding with this project. Utility Markings for sewer and water are based on information on file and should be considered approximate. Repairs to damaged utilities either shown on the plans, or through markings on the ground, will not be measured for payment. Direct conflicts with utilities resulting in the need for relocation of utilities will be measured for payment, utilizing contract unit items, as deemed appropriate by the Engineer. Additional compensation beyond unit items for loss of production, delays or downtime will not be considered.

Company: Eversource
Contact: Nick Kosko
Phone: (603) 332-4227 (x-5555334)
Mobile: (603) 345-0387
Email: nickolai.kosko@eversource.com

Company: Consolidated Communications
Contact: Kevin Mackenzie
Phone: (603) 427-5525
Mobile: (603) 703-9424
Email: kevin.Mackenzie@consolidated.com

Company: City of Portsmouth
Address: 680 Peverly Hill Road
Portsmouth, NH 03801
Contact: Dave Desfosses.
Director of Public Works
Phone: 603-766-1411
Email: djdesfos@cityofportsmouth.com

Company: Unitil
Address: 325 West Road
Portsmouth, NH 03801
Contact: Tim Patterson
Phone: 603-294-5191
Mobile: 603-944-2454
Email: pattersont@unitil.com

12. MEETINGS

Project Meetings (Also, see Section 01200):
It is anticipated that regular scheduled meetings will be held with Owner's Representatives, Contractor, sub-contractors and regulatory at a minimum frequency of twice monthly, unless weekly meetings are considered necessary by the Contractor, Owner or Engineer.

Coordination Meetings (Also, see Section 01200)
Informal weekly meetings are anticipated between the Contractor's Superintendent, Owner, and Resident Project Representative to review progress/schedule, sequence and other day to day issues.

13. TEMPORARY EROSION CONTROL

The Contractor's attention is directed to the provisions of Sections 02540 and 02402 of the Specifications. The Contractor shall exercise caution to minimize the intrusion of any spillage, sediment, turbidity, or pollution into the waterways or adjacent properties around the project area, as this watershed drains to waters of the state. Sediment and erosion controls shall be operational prior to commencing trench de-watering operations.

Appropriate measures shall be implemented to prevent sedimentation migration resulting from the Contractor's construction operations.

14. CONSTRUCTION DEWATERING (Also, refer to Section 02402)

This project requires excavations below normal surface water and groundwater elevations. The Contractor is responsible for all costs associated with dewatering the construction site. Dewatering is subsidiary to the Contractor's work and will not be measured for payment. The Contractor shall comply with the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Dewatering before proceeding with the work.

This NPDES general permit covers construction dewatering discharges defined as pumped, or drained, discharges of groundwater and/or storm water from excavations, or other points of accumulation, associated with a construction activity.

Appropriate sediment and erosion controls shall be operational prior to commencing trench dewatering operations. Construction dewatering is incidental. See specification Sections 02402 and 02650 for additional information.

15. GEOTECHNICAL INFORMATION (refer to Appendix A)

To assist the Contractor in preparing a bid, borings logs, groundwater readings, and a geotechnical report are included in Appendix A of the Specifications. Fluctuations in groundwater may exist.

16. DUST CONTROL (refer to Section 01562)

Water and/or Calcium Chloride are required on unpaved surfaces to control dust. The City will enforce a strict dust control policy for this project as described in the above referenced section.

17. STAGING AREA

The Contractor is required to locate and secure all staging and material storage areas. All staging areas to be secured by the Contractor must be approved in advance by the City. Contractor shall provide a Hold Harmless Release to the City prior to start of use of the staging area. At the completion of work, the Contractor shall receive a release from the property owners of the staging area(s) and a copy of each release shall be provided to the City prior to final acceptance of the project.

Private property shall not be used for storage purposes without written permission of the property owner. If requested, copies of such written permission shall be furnished to the Owner and Engineer.

With City approval, the Contractor may use the side of the roadway for staging of pipe and structures (manholes) providing the following conditions are met (unless approved otherwise by the City).

A. Structures are placed no sooner than one (1) week preceding installation.
B. Driveways are unimpeded and a minimum of 20 feet of roadway is maintained as a smooth traveling surface for vehicular traffic.

C. The Contractor will relocate structures upon notification by the City, if deemed necessary to maintain public relations and/or public safety.

18. PRECONSTRUCTION VIDEO

Preconstruction digital photographs or video of the entire construction site including all areas within the scope of work and access roads leading to construction areas, shall be completed or recorded and provided by the Contractor to the Owner two weeks prior to start of work. Photographs shall be provided as electronic photo digital images. The video shall be supplied in standard digital format (DVD) as approved by Engineer. Three copies of the digital photo log or video shall be prepared and provided one each to the Owner, Engineer and Contractor.

19. SAMPLES AND TESTING

The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction. No materials will be placed without review by the Engineer. All material testing will be paid for by the Contractor, except as noted.

20. SALVAGE OF MATERIALS (Refer to Section 01611)

All items selected by the City for salvage shall be delivered to a location specified by the City. The City has the right to salvage additional materials as requested. Contractor is to coordinate delivery of materials within the City.

21. VIBRATION MONITORING

Vibration Monitoring in addition to the vibration monitoring for blasting, required by state and local ordinances, will be provided by the Contractor upon request, if deemed necessary to monitor vibration resulting from the Contractor's equipment, compaction efforts or operations. Vibration monitoring for blasting operations is provided at the Contractors own expense.

22. PROTECTION OF TREES

The Contractor will endeavor to prevent damage to all trees that are designated to remain. Tree limbs that impede normal construction operations shall be trimmed, with approval from the Engineer. Trees to be removed are shown on the drawings. Additional limb or tree removal is subject to Owner approval. A penalty will be assessed to the Contractor for damage to trees designated to remain as follows:

- Limbs damaged following trimming (Paragraph 29): $100/limb (in addition limbs will require further trimming by Contractor as directed)
- Tree bark or surface scarring: $10/sq. in. of impact area ($100 MIN. and $1000 MAX.)

In addition, Contractor shall remove trees that were designated to remain but are, in the opinion of the Owner, significantly altered, cosmetically impaired, or terminally damaged.

23. NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service has listed the northern long-eared bat as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. To ensure compliance under the ESA, the Contractor must comply with tree cutting provisions:

Tree Cutting and Clearing Restriction

Tree cutting/ clearing of trees greater than 3-inches DBH is prohibited from June 1 through July 31 of each year. The Contractor shall ensure tree removal is limited to that specified in project plans. Prior to tree removal the Contractor shall demarcate the clearing limits in the field (e.g. with bright orange flagging/fencing or another marking method) to ensure all tree cutting staff know and work within the tree clearing limits.

24. PERMITS

The Contractor must apply for and obtain all required permits including local building/code permits, excavation and flagging permits. The Contractor shall prepare all permit applications and obtain the permit after the contract is awarded, bearing all expenses. The City will waive all municipal fees.

25. TURF PROTECTION MATTING:

Turf Protection matting shall be Matrax 4x4 Composite Event & Turf Protection as manufactured by Matrax, Inc. – www.matrax.com, or approved equal.

4 x 4 panels are engineered thermoplastic products designed for use as temporary flooring, walkways and roadways for pedestrians and rubber-tired vehicles. The 4x4 composite matting system protects the natural and man-made turf it is installed over and provides a stable and uniform flooring surface. Textured interlocking mats and durable lightweight materials create a versatile and reusable flooring surface. For proper use and care read all instruction and handling precautions to ensure a safe and successful installation.

Install the turf protection matting in conformance with the manufacturers installation requirements. Turf protection matting may be relocated throughout the site as needed during construction

26. COVID-19 SAFETY PROTOCOLS

The Contractor shall implement safety procedures in compliance with governmental orders and CDC guidance relative to COVID-19, as applicable during the term of the Contract. Representatives of Contractor and Owner shall, during the preconstruction meeting, which shall be held virtually if still required, discuss compliance with any effective orders and guidance and coordination. The Contractor shall instruct employees, subcontractors, vendors, of the required health and safety practices required for operation at the construction site.

END OF SECTION

Section A

BID DOCUMENTS

ADVERTISEMENT FOR BIDS

INFORMATION FOR BIDDERS

BID PROPOSAL

BID BOND

A-1.1

ADVERTISEMENT FOR BIDS 11-22
Multi-purpose Recreation Field Lighting Project

Sealed BIDS for the construction of: Multi-purpose Recreation Field Lighting Project will be accepted by the City of Portsmouth Finance Department, 1 Junkins Ave, Portsmouth, NH 03801 until 2:00 PM, December 22, 2021, and then publicly opened and read aloud. Bid results will be posted on the City's purchasing webpage under the project heading (https://www.cityofportsmouth.com/finance/purchasing-bids-and-proposals).

The project consists of the installation of electrical service conduit, transformer pads, pull boxes, controls and athletic field lighting at the Portsmouth Multi-purpose Recreation Field on Campus Drive including all other ancillary tasks.

1. Work must be substantially complete by May 15, 2022. Final Completion must be achieved within 30 days of substantial completion.

2. The General Contractor must have a minimum of five years' experience with the installation of athletic facility lighting of similar size and type that include the installation of athletic field lighting. No award will be made to any bidder who cannot satisfy the OWNER that he has sufficient ability and experience in this class of work and sufficient capital and plant to enable him to prosecute and complete the work successfully within the time named. The OWNER's decision or judgment on these matters will be final, conclusive, and binding to the fullest extent permitted by law.

3. All electrical work on this project, including conduit, will be installed under the supervision of a New Hampshire Licensed Electrician. An electrical permit is required prior to any project work being completed.

4. Turf restoration work must be performed by a turf specialist with a minimum of five years' experience with the successful construction or restoration of artificial turf athletic fields.

5. Liquidated damages for this project will be in accordance with the following schedule:
   $500.00 for each day of delay from the date established for Substantial Completion.
   $500.00 for each calendar day of delay from the date established for Contract Completion.

6. Each General Bid shall be accompanied by a bid security in the amount of 5% of the Total Bid Price.

7. The successful bidder must furnish 100% Performance and Payment Bonds and will be required to execute the Contract Agreement within 10 days following notification of the acceptance of his bid.

8. No Bidder may withdraw a Bid within 60 days after the actual date of opening thereof.

9. The owner reserves the right to reject any and all bids, to accept any bid, to waive any informality on bids received, and to omit any item or items as it may deem to be in the best interest of the Owner.

10. All questions regarding bid documents, plans, and specifications for this project should be emailed to Philip Corbett, Project Manager, at pcorbett@cmaengineers.com. Questions will be accepted until 11:30 AM EST on Friday, December 17, 2021.

11. Specifications can be obtained from the City's website at http://www.cityofportsmouth.com/finance/purchasing.htm.

12. Bidders may contact the Purchasing Coordinator at (603) 610-7227 or by email purchasing@cityofportsmouth.com with any procedural questions.

13. Addenda to this bid document, if any, including written answers to questions, will be posted by close of business on Monday, December 20, 2021 on the City of Portsmouth website at http://www.cityofportsmouth.com/finance/purchasing.htm, under the project heading.

INFORMATION FOR BIDDERS

BIDS will be received by (herein called the "OWNER"), at City of Portsmouth, New Hampshire
City of Portsmouth Finance Department,
1 Junkins Ave, Portsmouth, New Hampshire 03801

until 2:00 PM on December 22, 2021 and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to:

City of Portsmouth at Portsmouth Finance Department
1 Junkins Ave
Portsmouth, New Hampshire 03801

Each sealed envelope containing a BID must be plainly marked on the outside as BID

for Multi-purpose Recreation Field Lighting Project Bid #11-22 and the envelope should bear on the outside the BIDDER's name, address, and license number if applicable and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at City of Portsmouth Finance Department, 1 Junkins Ave, Portsmouth, NH 03801

Bid results will be posted on the City's purchasing webpage under the project heading (https://www.cityofportsmouth.com/finance/purchasing-bids-and-proposals).

The Bid Opening will be held at the City of Portsmouth Finance Department located at 1 Junkins Ave, Portsmouth, NH 03801.

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

Addenda to this bid document, if any, including written answers to questions, will be posted by Monday, December 20, 2021 on the City of Portsmouth website at http://www.cityofportsmouth.com/finance/purchasing.htm under the project heading. Addenda and updates will NOT be sent directly to firms. Contractors submitting a bid should check the web site daily for addenda and updates after the release date. Firms should print out, sign and return addenda with the proposal. Failure to do so may result in disqualification.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within 60 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

The OWNER reserves the right to reject any and all bids, to accept any bid, to waive any informality on bids received, and to omit any item or items as it may deem to be in the best interest of the Owner.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID Schedule by examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID bond payable to the OWNER for five (5%) percent of the total amount of the BID. As soon as the BID prices have been compared, the OWNER will upon request, return the BONDS of all except the three lowest responsible BIDDERS. When the Agreement is executed, the bonds of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will upon request, be retained until the payment BOND and performance BOND have been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A performance BOND and a payment BOND, each in the amount of 100 percent of the CONTRACT PRICE, in a form and with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign BID BONDS or payment BONDS and performance BONDS must file with each BOND a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the performance BOND and payment BOND and proof of insurance within ten calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary Agreement and BOND forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may at his option consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within ten (10) days of receipt of acceptable performance BOND, payment BOND, proof of insurance and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by WRITTEN NOTICE withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO

PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as deemed necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the lowest responsive and responsible BIDDER. A Responsible bidder is one who can satisfy the Qualifications set forth herein.

Only one Contract will be awarded for all the work called for in the plans and specifications.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to its BID.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER.

MANUFACTURERS EXPERIENCE

Wherever it may be written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide a bond or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

NON-DISCRIMINATION IN EMPLOYMENT

Contracts for work under this proposal will obligate the contractors and sub-contractors not to discriminate in employment practices

SAFETY AND HEALTH REGULATIONS

This project is subject to all of the Safety and Health Regulations (CFR 29 Part 1926 and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974. Contractors are urged to become familiar with the requirements of these regulations.

COPIES OF THE CONTRACT

There shall be at least three executed copies of the Contract to be distributed as follows: one copy each to the Owner, Contractor, and Engineer.

NON-RESIDENT CONTRACTORS

The successful bidder, if a corporation established under laws other than the State of New Hampshire, shall file, at the time of the execution of the contract, with the Owner, notice of the name of its resident attorney, appointed as required by the laws of the State of New Hampshire.

The successful bidder, if not a resident of New Hampshire, and not a corporation, shall file, at the time of execution of the contract, with the Owner a written appointment of a resident of the state of New Hampshire, having an office or place of business therein, to be his true and lawful attorney upon whom all lawful processes in any actions or proceedings against him may be served; and in such writing, which shall set forth said attorney's place of residence, shall agree that any lawful process against him which is served on said attorney shall be of the same legal force and validity as if served on him and that the authority shall continue in force so long as any liability remains outstanding against him in New Hampshire. The power of attorney shall be filed in the office of the Secretary of State if required, and copies certified by the Secretary shall be sufficient evidence thereof. Such appointment shall continue in force until revoked by an instrument in writing, designating in a like manner some other person upon whom such processes may be served, which instrument shall be filed in the manner provided herein for the original appointment.

A Non-resident Contractor shall be deemed to be:

a) A person who is not a resident of the State of New Hampshire.
b) Any partnership that has no member thereof resident of the State of New Hampshire.
c) Any corporation established under laws other than those of the State of New Hampshire.

BIDDER DISQUALIFICATION

Any or all of the following reasons may be deemed by Owner in its sole discretion as being sufficient for the disqualification of a bidder and the rejection of his proposal:

a) More than one proposal for the same work from an individual, firm, or corporation under the same or different name;
b) Evidence of collusion among bidders;
c) Failure to submit all required information requested in the bid specifications;
d) If the Contractor is not listed with the New Hampshire Department of Transportation as a pre-qualified contractor under the classification of Site Work;
e) Lack of competency or of adequate machinery, plant or other equipment, as revealed by the statement of bidders qualification or otherwise;
f) Uncompleted work which, in the judgment of the owner, might hinder or prevent the prompt completion of additional work if awarded;
g) Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts;
h) Default or unsatisfactory performance on previous contracts; or
i) Such disqualification would be in the best interests of the wner.

NON-CONFORMING BIDS

Proposals will be considered nonconforming and may be rejected in the Owner's sole discretion for any of the following reasons:

a) If the proposal is on a form other than that furnished by the Owner, or if the form is altered or any portion thereof is detached.

b) If there are unauthorized additions, conditional or altered bids, or irregularities of any kind which may tend to make the proposal or any portion thereof incomplete, indefinite or ambiguous as to its meaning.
c) If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
d) Failure to identify the ASBA certified builder and provide documentation of their credentials.
e) If the proposal does not contain a unit price for each pay item listed except in the case of authorized alter pay items.

WITHDRAWAL OF BIDS

Prior to the date and time for the opening of Bids, a Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

PROPOSAL FORM

COMMUNITY FIELDS LIGHTING

CITY OF PORTSMOUTH, N.H.

To the City of Portsmouth, New Hampshire, herein called the Owner.

The undersigned, as Bidder, herein referred to as singular and masculine declares as follows:

1. All interested in the Bid as Principals are named herein.

2. This bid is not made jointly, or in conjunction, cooperation or collusion with any other person, firm, corporation, or other legal entity;

3. No officer, agent or employee of the Owner is directly or indirectly interested in this Bid.

4. The bidder has carefully examined the site of the proposed work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this Bid, and the bidder has carefully read and examined the Drawings, Agreement, Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;

5. The bidder understands that the quantities of work calculated in the Bid or indicated on the Drawings or in the Specifications or other Contract Documents are approximate and are subject to increase or decrease or deletion as deemed necessary by the Director of Public Works. Any such changes will not result in or be justification for any penalty or increase in contract prices; and agrees that, if the Bid is accepted the bidder will contract with the Owner, as provided in the Contract Documents, this Bid Form being part of said Contract Documents, and that the bidder will supply or perform all labor, services, plant, machinery, apparatus, appliances, tools, supplies and all other activities required by the Contract Documents in the manner and within the time therein set forth, and that the bidder will take in full payment therefore the following item prices, to wit:

BASE PROPOSAL: Bidder agrees to perform all of the work as awarded described in the specification and shown on the plans in within the timeframe indicated for the lump sum as indicated below.

TOTAL FOR PROJECT AND BASIS OF AWARD

$_____

Amount Written in Numbers

$_____

Amount Written in Words

To Bidder:

The City reserves the right, after bid opening and prior to award of the contract, to modify the amount of the work in the event that bids exceed budgeted amounts and/or easements and agreements from one or more impacted property owners are not received.

It is the intention of this contract that the items listed above describe completely and thoroughly the entirety of the work as shown on the plans and as described in the specifications. All other items required to accomplish the above items are considered to be subsidiary work, unless shown as a pay item.

ADJUSTMENT CLASSES: Should certain additional work be required or certain work be omitted or should the quantities of certain classes of work be increased or decreased by written order or approval of the Engineer from those on which the Bid is to be based, the undersigned agrees that the following supplemental unit prices shall be the basis of payment to it or credit to the Owner for such additions, omissions, increases, or decreases in work.

CLASS ITEM #	UNIT	ITEM DESCRPTION & UNIT PRICE IN WORDS	UNIT PRICE IN FIGURES
1	L.F.	Encasement of conduits in concrete from R.O.W. at Community Drive to new pad mount utility transformer	

The undersigned agrees that for extra work, if any, performed in accordance with the terms and provisions of the Contract Documents, the bidder will accept compensation as stipulated therein.

Date:

_____ By:_____

Company Signature

_____ Title:_____

Business Address

_____

City, State, Zip Code Telephone:_____

The Bidder has received and acknowledged Addenda No._____through_____.

All Bids are to be submitted on this form and in a sealed envelope, plainly marked on the outside

with the Bidder's name and address and the Project name as it appears at the top of the Proposal Form.

In order to follow the City's sustainability practices, future bid invitations/specifications may be sent electronically. Please provide an email address as to where I could email future bid invitations/specifications of this type. Thank you in advance for your cooperation.

Email Address:_____

BID SECURITY BOND

(This format provided for convenience, actual Bid Bond is acceptable in lieu of, if compatible.)

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned

_____, as Principal, and

_____, as Surety, are hereby

held and firmly bound unto _____

IN THE SUM OF _____

as liquidated damages for payment of which, well and truly to be made we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that whereas the Principal has submitted to the

_____ _____

A CERTAIN Bid attached hereto and hereby made a part hereof to enter into a contract in writing, hereinafter referred to as the "AGREEMENT" and or "CONTRACT", for

_____

_____

_____

NOW THEREFORE,

(a) If said Bid shall be rejected or withdrawn as provided in the INFORMATION FOR BIDDERS attached hereto or, in the alternative,

(b) If said Bid shall be accepted and the Principal shall duly execute and deliver the form of AGREEMENT attached hereto and shall furnish the specified bonds for the faithful performance of the AGREEMENT and/or CONTRACT and for the payment for labor and materials furnished for the performance of the AGREEMENT and or CONTRACT,

then this obligation shall be void , otherwise it shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder in no event shall exceed the amount of this obligation.

BID SECURITY BOND (continued)

The Surety, for value received, hereby agrees that the obligation of said surety and its bond shall be in no way impaired or affected by any extensions of the time within such BID may be accepted, and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the parties hereto have duly executed

this bond on the_____day of_____, 20 .

_____L.S.
(Name of Principal)

(SEAL)

BY _____

_____
(Name of Surety)

BY _____

STATEMENT OF BIDDER'S QUALIFICATIONS

Supply with Bid

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. Add separate sheets if necessary

1. Name of Bidder

2. Permanent Main Office Address

3. Form of Entity

4. When Organized

5. Where Organized

6. How many years have you been engaged in the contracting business under your present name; also state names and dates of previous firm names, if any.

7. Contracts on hand; (schedule these, showing gross amount of each contract and the approximate anticipated dates of completion).

8. General character of work performed by your company.

9. Have you ever failed to complete any work awarded to you? _____(no)____(yes). If so, where and why?

10. Have you ever defaulted on a contract?
_____(no)_____(yes). If so, where and why?

11. Have you ever failed to complete a project in the time allotment according to the Contract Documents?
_____(no)_____(yes). If so, where and why?

12. List the most important contracts recently executed by your company, stating approximate cost for each, and the month and year completed.

13. List your major equipment available for this contract.

14. List your key personnel such as project superintendent and foremen available for this contract.

15. List subcontractors for the following categories whom you will use for the following (unless this work is to be done by your own organization, in which case please state).

    a. Landscaping & Restoration _____

    b. Electrical _____

The City reserves the right to disallow <u>any</u> subcontractor including work proposed to be completed by the General Contractor.

16. With what banks do you do business?

a. Do you grant the Owner permission to contact this/these institutions?
____(yes) _(no).

b. Latest Financial Statements, certified audited if available, prepared by an independent certified public accountant, may be requested by Owner. If requested, such statements must be provided within five (5) business days or the bid proposal will be rejected. Certified Audited Statements are preferred. Internal statements maybe attached only if independent statements were not prepared.

Dated at_____this_____day of_____, 20___.

_____
Name of Bidder

BY_____

TITLE_____

State of_____

County of_____

_____being duly sworn, deposes and

says that the bidder is_____of_____
(Name of Organization)

and answers to the foregoing questions and all statements contained therein are true and correct.

Sworn to before me this_____day of_____, 20 .

_____
Notary of Public
My Commission expires_____

BID SECURITY BOND

(This format provided for convenience, actual Bid Bond is acceptable in lieu of, if compatible.)

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned

_____, as Principal, and

_____, as Surety, are hereby

held and firmly bound unto _____

IN THE SUM OF _____

as liquidated damages for payment of which, well and truly to be made we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that whereas the Principal has submitted to the

_____ _____

A CERTAIN Bid attached hereto and hereby made a part hereof to enter into a contract in writing, hereinafter referred to as the "AGREEMENT" and or "CONTRACT", for

_____

_____

_____

NOW THEREFORE,

(a) If said Bid shall be rejected or withdrawn as provided in the INFORMATION FOR BIDDERS attached hereto or, in the alternative,

(b) If said Bid shall be accepted and the Principal shall duly execute and deliver the form of AGREEMENT attached hereto and shall furnish the specified bonds for the faithful performance of the AGREEMENT and/or CONTRACT and for the payment for labor and materials furnished for the performance of the AGREEMENT and or CONTRACT,

then this obligation shall be void , otherwise it shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder in no event shall exceed the amount of this obligation.

BID SECURITY BOND (continued)

The Surety, for value received, hereby agrees that the obligation of said surety and its bond shall be in no way impaired or affected by any extensions of the time within such BID may be accepted, and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the parties hereto have duly executed

this bond on the_____day of_____, 20 .

_____L.S.
(Name of Principal)

(SEAL)

BY _____

_____
(Name of Surety)

BY _____

Section B

CONTRACT DOCUMENTS

NOTICE OF AWARD

AGREEMENT

PAYMENT BOND

PERFORMANCE BOND

NOTICE TO PROCEED

CONTRACTOR'SAFFIDAVIT

CONTRACTOR'S FINAL RELEASE & LIEN WAVER

CERTIFICATE OF SUBSTANTIAL COMPLETION

CHANGE ORDER

CERTIFICATE OF FINAL COMPLETION

TEMPORARY UTILITIES

MEASUREMENT AND PAYMENT

B-1.1

NOTICE OF AWARD

Dated _____ , 2021

TO: _____
(BIDDER)

ADDRESS: _____

OWNER'S PROJECT NO: _____

PROJECT: Multi-purpose Recreation Field Lighting Project

OWNER'S CONTRACT NO: _____

CONTRACT FOR: Multi-purpose Recreation Field Lighting Project

(Insert name of contract as it appears in the Bid Documents)

You are notified that your Bid dated _____ for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for:

Installation of athletic field lighting at the Portsmouth Multi-Purpose Recreation field and an electrical service connection from Community Campus Drive to the field. The project includes Sport Field Lighting Posts and Fixtures, typ. of four locations: and an electrical service infrastructure including conduit, manholes and transformer pad.

(Indicate total Work, alternates or sections of Work awarded)

The Contract Price of your contract is _____

_____ Dollars ($ _____).

3 copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. The same number of sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within ten days of receiving this Notice of Award.

1. You must deliver to the OWNER all of the fully executed counterparts of the Agreement including all the Contract Documents. This includes the sets of Drawings. Each of the Contract Documents must bear your signature on the cover page.

2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Information for Bidders and General Conditions and proof of insurance.

3. (List other conditions precedent).

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within ten days after receipt of acceptable performance BOND, payment BOND, proof of insurance and agreement signed by the party to whom the Agreement was awarded, the OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

City of Portsmouth
(OWNER)

By _____
(AUTHORIZED SIGNATURE)

Judie Belanger
Finance Director
(TITLE)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By _____

The _____ day of _____ , 20 _

By _____

Title _____

Copy to ENGINEER
(Use Certified Mail, Return Receipt Requested)

B-1.1
AGREEMENT

THIS AGREEMENT, made this _____ day of _____ , 2021 by

and between City of Portsmouth, New Hampshire , hereinafter called "OWNER"
(Name of Owner)

and _____ doing business as (an individual,) or (a

partnership,) or (a corporation) hereinafter called "CONTRACTOR" .

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the construction of

Multi-purpose Recreation Field Lighting Project
(Project)

2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS within 10 calendar days after the date of the NOTICE TO PROCEED unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS. Completion time for the project will be calculated as calendar days from the date specified in the NOTICE TO PROCEED as follows:
Work must be substantially complete by May 15, 2022. Final Completion must be achieved within 30 days of substantial completion.

Liquidated damages for this project will be in accordance with the following schedule:

a. $500.00 for each day of delay from the date established for Substantial Completion.
b. $500.00 for each calendar day of delay from the date established for Final Completion.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of _____ or as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

(A) ADVERTISEMENT FOR BIDS

(B) INFORMATION FOR BIDDERS

(C) BID

(D) BID BOND

(E) AGREEMENT

(F) GENERAL CONDITIONS

(G) SUPPLEMENTAL GENERAL CONDITIONS

(H) SPECIAL CONDITIONS

(I) PAYMENT BOND

(J) PERFORMANCE BOND

(K) NOTICE OF AWARD

(L) NOTICE TO PROCEED

(M) CONTRACTORS AFFIDAVIT

(N) CONTRACTORS RELEASE

(O) CERTIFICATE OF SUBSTANTIAL COMPLETION

(P) CHANGE ORDER(S)

(Q) DRAWINGS prepared by: CMA Engineers, Inc.

Multi-purpose Recreation Field Lighting Project

numbered 1 through 7 , and dated November 2021

(R) TECHNICAL SPECIFICATIONS prepared or issued by: CMA Engineers, Inc.

Included in Contract and Specifications for Multi-purpose Recreation Field Lighting Project

_____ , and dated November 2021

(S) ADDENDA:

No. _____ , dated _____ , 20 _____

No. _____ , dated _____ , 20 _____

No. _____ , dated _____ , 20 _____

6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT DOCUMENTS.

7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in 3 copies, each of which shall be deemed an original on the date first above written.

OWNER: City of Portsmouth, New Hampshire

By: _____

Name: Karen Conard
City Manager
(Please type)

(SEAL)

ATTEST: _____

Name: _____

Title: _____

CONTRACTOR: _

By: _

Name: _

Address: _

_____

(SEAL)

ATTEST: _____

Name: _____

Title: _____

B-3.1

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal,
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

City of Portsmouth, New Hampshire
(Name of Owner)

1 Junkins Avenue, Portsmouth, NH 03801
Address of Owner)

hereinafter called OWNER and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the contract and to their successors and assigns, in the total aggregate penal sum of _____ Dollars, ($ _____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the O WNER, dated the _____ day of _____ 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

_____

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and for all labor cost incurred in such WORK including that be a subcontractor, and to any mechanic or material lienholder whether it acquires its lien by operation of State or Federal Law; then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, that beneficiaries or claimants hereunder shall be limited to the subcontractors, and persons, firms, and corporations having a direct contract with the PRINCIPAL or its SUBCONTRACTORS.
PROVIDED FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER that no suit or action shall be commenced hereunder by any claimant: (a) Unless claimant, other than one having a direct contract with the PRINCIPAL shall have given written notice to any two of the following: The PRINCIPAL, the OWNER, or the SURETY above named within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the PRINCIPAL, OWNER, or SURETY, at any place where an office is regularly maintained for the transaction business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer. (b) After the expiration of one (1) year following the date on which PRINCIPAL ceased work on said CONTRACT, it being understood, however, that if any limitation embodied in the BOND is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 20 percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the Contract as so amended. The term "Amendment", wherever used in this BOND and whether referring to this BOND, the contract or the loan Documents shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of
(number)

which shall be deemed an original, this _____ day of _____ , 20 ___ .

ATTEST:

_____
Principal

By: _____
(Principal) Secretary

(SEAL) BY _

_____
(Address)

By: _____ _____
Witness as to Principal

_____
(Address)

_____
(Surety)

ATTEST: BY _
Attorney - in - Fact

By _____ _____
Witness as to Surety (Address)

_____ _____

_____ _____
(Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of New Hampshire.

B-4.1
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal,
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

City of Portsmouth, New Hampshire
(Name of Owner)

1 Junkins Avenue, Portsmouth, New Hampshire 03801
(Address of Owner)

hereinafter called OWNER, in the total aggregate penal sum of _____

_____ Dollars, $ (_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____ 20 ___ , a copy of which is hereto attached and made a part hereof for the construction of:

_____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extension thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if the PRINCIPAL shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void: otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the specifications accompanying same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time alteration or addition to the terms of the contract or to the WORK or to the specifications.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 20 percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the Contract as so amended. The term "Amendment", wherever used in this BOND and whether referring to this BOND, the contract or the loan Documents shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in ____ counterparts, each one of (number)

which shall be deemed an original, this _____ day of _____ , 20 ___ .

ATTEST:

_____
Principal

By: _____
(Principal) Secretary

(SEAL) BY _

_____
(Address)

By: _____ _____
Witness as to Principal

_____
(Address)

_____
(Surety)

ATTEST: BY _
Attorney - in - Fact

By _____ _____
Witness as to Surety (Address)

_____ _____

_____ _____
(Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of New Hampshire.

B-5.1

NOTICE TO PROCEED

Dated _____ , 20 20

TO: _____

(Insert Name of Contractor as it appears in the Bid Documents)

ADDRESS: _____

OWNER'S PROJECT NO. _____

PROJECT: Multi-purpose Recreation Field Lighting Project

OWNER'S CONTRACT NO. Bid #11-22

CONTRACT FOR: Multi-purpose Recreation Field Lighting Project

---

You are notified that the Contract Time under the above contract will commence to run on _____ , 2021 . By that date, you are to start performing your obligations under the Contract Documents. In accordance with paragraph 3 of the Agreement, the dates of Substantial and Final Completion are as follows:

Before you may start any Work at the site, you must:

Provide a project schedule, project superintendent and work force, and pre-construction video.

_____

(add other requirements)

Copy to ENGINEER

(Use certified Mail, return Receipt Requested)

City of Portsmouth, New Hampshire

(owner)

By _____

(Authorized Representative)

Peter H. Rice, P.E.

Public Works Director

(Title)

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED Is hereby acknowledged by:

_____

(Contractor)

this the _____ , 20 21

Employer Identification Number: _____

_____

By: _____

_____

(Title)

B-6.1

CONTRACTOR'S AFFIDAVIT

STATE OF: New Hampshire

COUNTY OF: _____

Before me, the undersigned, a _____
(Notary Public, Justice of Peace, Alderman)

in and for said County and State personally appeared, _____
(Individual, Partner or duly

_____ who being duly sworn according to law
authorized representative of corporate contractor)

deposes and says that the cost of all the Work, and outstanding claims and indebtedness of whatever nature arising out of the performance of the contract between the City of Portsmouth, NH
(Owner)

and _____ of _____
(Contractor)

dated _____ for the construction of the Multi-purpose Recreation Field Lighting Project

and necessary appurtenant installations have been paid in full.

_____
(Individual, Partner, or duly authorized representative of corporate contractor)

_____
(Title)

Sworn to and subscribed before me

this _____ day of _____ , 20 ___

_____

_____
Notary Public

B-7.1

CONTRACTOR'S FINAL RELEASE AND WAIVER OF LIEN

Project/Owner	Contractor
Project:_____	Name_____
Address:_____	Address:_____
_____ City State Zip	_____ City State Zip
Owner_____	Contractor License:_____
_____	Contract Date:_____

TO ALL WHOM IT MAY CONCERN:

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the undersigned Contractor hereby waives, discharges, and releases any and all liens, claims, and rights to liens against the above-mentioned project, and any and all other property owned by or the title to which is in the name of the above-referenced Owner and against any and all funds of the Owner appropriated and available for the construction of said project, and any and all warrants drawn upon or issued against any such funds or monies, which the undersigned Contractor may have or may hereafter acquire or process as a result of the furnishing of labor, materials, and/or equipment, and the performance of Work by the Contractor on or in connection with said project, whether under and pursuant to the above-mentioned contract between the Contractor and the Owner pertaining to said project or otherwise, and which said liens, claims or rights of lien may arise and exist.

The undersigned further hereby acknowledges that the sum of

_____

Dollars ($_____) constitutes the entire *unpaid* balance due the undersigned in Connection with said project whether under said contract or otherwise and that the payment of said sum to the Contractor will constitute payment in full and will fully satisfy any and all liens, claims, and demands which the Contractor may have or assert against the Owner in connection with said contract or project.

Dated this___day of_____20_

_____

Contractor

Witness to Signature

By_____	By_____
Title_____	Title_____

B-1.1

CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER's Project No.: _____ ENGINEER's Project No.: 1119

Project: Multi-purpose Recreation Field Lighting Project

CONTRACTOR: _____

Contract For: Multi-purpose Recreation Field Lighting Project Contract Date: _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To: _____
(Owner)

And To: _____
(Contractor)

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

_____
(Date of Substantial Completion)

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within __ calendar days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as follows:

RESPONSIBILITIES:

OWNER: _____

_____

CONTRACTOR: _____

_____

The following documents are attached to and made a part of this Certificate:

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on _____ , 20 _

(Engineer)

By: _____

CONTRACTOR accepts this Certificate of Substantial Completion on _____ , 20 _

(Contractor)

By: _____

OWNER accepts this Certificate of Substantial Completion on _____ , 20 _

_____

(Owner)

By: _____

B-9.1

CHANGE ORDER No._____

PROJECT:	Multi-purpose Recreation Field Lighting Project	DATE OF ISSUANCE:	
OWNER: (Name & Address)	City of Portsmouth 1 Junkins Avenue Portsmouth, New Hampshire	OWNER's Project No.	
CONTRACTOR:		ENGINEER:	CMA Engineers, Inc. 35 Bow Street Portsmouth, New Hampshire
CONTRACT FOR:	Multi-purpose Recreation Field Lighting Project		
		ENGINEER's Project No.	

You are directed to make the following changes in the Contract Documents.

Description:

Purpose of Change Order:

Attachments:

CHANGE IN CONTRACT PRICE Original Contract Price $	CHANGE IN CONTRACT TIME Original Contract Time days (days or date)
Previous Change Orders No. -to No. -	Net change from previous Change Orders 0 days (days)
Contract Price prior to this Change Order $	Contract Time prior to this Change Order days (days or date)
Net Increase (Decrease) of this Change Order $	Net Increase (Decrease) of this Change Order 0 days (days)
Contract Price with all approved Change Orders $	Contract Time with all approved Change Orders days (days or date)

This document will become a supplement to the CONTRACT and all provisions will apply hereto. The attached Contractor's Revised Project Schedule reflects increases or decreases in Contract Time as authorized by this Change Order.

Stipulated price and time adjustment includes all costs and time associated with the above described change. Contractor waives all rights for additional time extension for said change. Contractor and Owner agree that the price(s) and time adjustment(s) stated above are equitable and acceptable to both parties.

Recommended: By:	Accepted: By:
Engineer , P.E.	Contractor

Approved: By:	Approved: By:	Approved: By:
Public Works Dir. Peter H. Rice, P.E.	Finance Dept. Director	City Manager Karen Conard

B-10.1

CERTIFICATE OF FINAL COMPLETION

Owner's Project No. _____ Engineer's Project No. _____
Project _____
Owner: _____
Contractor: _____
Engineer: _____

Agreement Date: _____
Notice to Proceed Date: _____
Contractual Substantial Completion Date as modified by Change Orders: _____
Actual Substantial Completion Date: ____
Contractual Final Completion Date as modified by Change Orders: _____

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, Engineer, the punch list has been completed and the Work of the Contract is hereby declared to be Finally Complete in accordance with the Contract Documents on:

_____
Date of Final Completion

This Certificate does not constitute an acceptance of any Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents. The Warranty for all Work completed subsequent to the date of Substantial Completion expires one year from the date of this Final Acceptance.

Executed by Engineer on: _____, 20____

By: _____

Contractor Accepts this Certificate of Final Completion on: _____, 20____

By: _____

Owner Accepts this Certificate of Final Completion on: _____, 20____

By: _____

Section C
GENERAL CONDITIONS

GENERAL CONDITIONS

SUPPLEMENTARYGENERAL CONDITIONS

C. GENERAL CONDITIONS

JUNE 2012

GENERAL CONDITIONS

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GENERAL CONDITIONS

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GENERAL CONDITIONS

1. Contract and Contract Documents. The plans, information for bidders, bids, advertisement for bids, bid payment and performance bonds, Agreements, change orders, notice to proceed, specifications and addenda, hereinafter enumerated in the Agreement, shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

2. Definitions.

2.1 "Addenda" means written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, drawings and specifications, by additions, deletions, clarifications or corrections. Such written or graphic instruments will be issued no less than five days before the bid opening.

2.2 "Bid" means the offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the work to be performed.

2.3 "Bidder" means any person, firm or corporation submitting a bid for the work.

2.4 "Bonds" means bid, performance, and payment bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.

2.5 "Change Order" means a written order to the Contractor authorizing an addition, deletion or revision in the work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

2.6 "Contract Documents" means the Contract, including any advertisement for bids, information for bidders, bid, bid bond, Agreement, payment bond, performance bond, notice of award, notice to proceed, change orders, drawings, specifications and addenda.

2.7 "Contract Price" means the total monies payable to the Contractor under the terms and conditions of the Contract Documents.

2.8 "Contract Time" means the number of calendar days stated in the Contract Documents for the completion of the Work.

2.9 "Contractor" means the person, firm or corporation with whom the Owner has executed the Agreement.

2.10 "Division" means the state of New Hampshire Department of Environmental Services, Water Division.

2.11 “Drawings” mean the part of the Contract Documents which show the characteristics and scope of the work to be performed and which have been prepared or approved by the Engineer.

2.12 “Engineer” means the person, firm or corporation named as such in the contract documents.

2.13 “Field order” means a written order effecting a change in the work not relating to an adjustment in the contract price or an extension of the contract time and issued by the Engineer to the Contractor during construction.

2.14 “Notice of Award” means the written notice of the acceptance of the Bid from the Owner to the successful Bidder.

2.15 “Notice to Proceed” means the written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

2.16 “Owner” means a public or quasi-public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.

2.17 “Plans” means the contract drawings or exact reproductions thereof which show the scope, character, dimensions and details of the work and which have been prepared or approved by the Engineer.

2.18 “Project” means the undertaking to be performed as provided in the Contract Documents.

2.19 “Resident Project Representative” means the authorized representative of the Owner who is assigned to the Project site or any part thereof.

2.20 “Shop Drawings” means all drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrates how specific portions of the Work shall be fabricated or installed.

2.21 “Special conditions” means revisions or additions to these general conditions, Supplemental General Conditions or specifications applicable to an individual project.

2.22 “Specifications” means a part of the contract documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

2.23 “Subcontractor” means an individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

2.24 “Substantial Completion” means that date as certified by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in

accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

2.25 "Supplemental General Conditions" means modifications to these general conditions required by a Federal agency for participation in the PROJECT and approved by the agency in writing prior to inclusion in the CONTRACT DOCUMENTS, or such documents that may be imposed by applicable State laws.

2.26 "Supplier" means any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

2.27 "Work" means all labor necessary to produce the construction required by the contract documents, and all materials and equipment incorporated or to be incorporated in the project.

2.28 "Written Notice" means any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the Work.

3. Additional Instructions and Detail Drawings. The Contractor may be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the contract documents and will be so prepared that they can be reasonably interpreted as part thereof.

4. Shop or Setting Drawings. Shop or setting drawings shall be in accordance with the following:

4.1 The Contractor shall furnish 6 copies of the manufacturer's shop drawings, specific design data as required in the detailed specifications, and technical literature covering all equipment and fabricated materials which he proposes to furnish under this contract in sufficient detail to indicate full compliance with the specifications. Shop drawings shall indicate the method of installing, the exact layout dimensions of the equipment or materials, including the location, size and details of valves, pipe connections, etc.

4.2 No equipment or materials shall be shipped until the manufacturer's shop drawings and specifications or other identifying data, assuring compliance with these specifications, are approved by the Engineer.

4.3 The Contractor shall check and verify all field measurements and shall be responsible for the prompt submission of all shop and working drawings so that there shall be no delay in the work.

4.4 Regardless of corrections made in or approval given to such drawings by the Engineer, the Contractor will nevertheless be responsible for the accuracy of such

drawings and for their conformity to the plans and specifications. The Contractor shall notify the Engineer in writing of any deviations at the time he furnishes such drawings. He shall remain responsible for the accuracy of the drawings showing the deviations but not for the acceptance of the deviations from the original design shown in the plans and specification. Approval by the Engineer and the Owner of any deviation in material, workmanship or equipment proposed subsequent to approval of the shop drawings or design data, shall be requested in writing by the Contractor.

4.5 When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that he has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents.

5. Materials, Services, Facilities and Workmanship shall be furnished as follows:

5.1 Except as otherwise specifically stated in the contract documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

5.2 Unless otherwise specifically provided for in the specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose.

5.3 The Contractor shall furnish to the Engineer for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required.

5.4 Materials which are specified by reference to the number or symbol of a specific standard, such as an ASTM standard, a federal specification or other similar standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the advertisement for bids, except as limited to type, class or grade, or modified in such reference. The standards referred to shall have full force and effect as though printed therein.

5.5 For equipment or for materials, when requested by the Engineer, the Contractor shall submit certificates of compliance from the manufacturer, certifying that the equipment or the materials comply with the requirements of the specifications or the standards.

5.6 Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

5.7 Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.

6. Contractor's Title To Materials. No material, supplies, or equipment to be installed or furnished under this contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease purchase or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this contract shall have any right to a lien upon any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when formal contract is entered into for such materials.

7. Inspection and Testing of Materials shall be as follows:

7.1 All materials and equipment used in the construction of the project shall be subject to inspection and testing by the Engineer in accordance with accepted standards at any and all times during manufacture or during the project construction and at any or all places where such manufacture is carried on.

7.2 The Contractor shall furnish promptly upon request by the Engineer, all materials required to be tested. All tests made by the Engineer shall be performed in such manner and ahead of scheduled installation, as not to delay the work of the Contractor. When required, testing of concrete, masonry, soils, pipe and pipe materials will be made in accordance with provisions in the specifications.

7.3 Material required to be tested which is delivered to the job site shall not be incorporated into the work until the tests have been completed and approval or acceptance given in writing by the Engineer.

7.4 Each sample submitted by the Contractor for testing shall carry an identification label containing such information as is requested by the Engineer. It shall also include a statement that the samples are representative of the remaining materials to be used on the project.

7.5 Approval of any materials shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with the contract requirements.

7.6 The Engineer may, at his own discretion, undertake the inspection of materials at the source. In the event plant inspection is undertaken, the following conditions shall be met:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such areas as may concern the manufacture or production of the materials being furnished.

c. If required, the Contractor shall arrange for a building for the use of the inspector; such building to be located near the plant, independent of any building used by the material producer, in which to house and use the equipment necessary to carry on the required tests. Cost for such arrangement shall be paid by the Owner as a stated allowance in the bid.

d. Adequate safety measures shall be provided and maintained at all times.

7.7 Except as otherwise specifically stated in the contract, the costs of sampling and testing will be divided as follows:

a. The Contractor shall furnish the Engineer, without extra cost, all samples required for testing purposes. All sampling and testing including the number and selection of samples shall be determined by the Engineer for his own information and use.

b. When testing of materials is specified in the appropriate section of the specifications, the cost of the same shall be charged to the Owner or Contractor, as detailed in the specifications. However, costs of equipment performance tests shall be borne by the Contractor, as detailed in the appropriate section of the specifications.

c. When the Contractor proposes a material, article or component as equal to the ones specified, reasonable tests may, or may not, be required by the Engineer. If the Engineer requires tests of a proposed equal item, the Contractor will be required to assume all costs of such testing.

d. Any material, article or component which fails to pass tests required by the Engineer or by the specifications, will be rejected and shall be removed from the project site. However, if, upon request of the Contractor, retesting or further tests are permitted by the Engineer, the Contractor shall assume all costs related to such retesting or further tests.

e. Neither the Owner nor the Engineer will in any way be charged for the manufacturer's costs in supplying certificates of compliance.

7.8 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested or approved by someone other than the Contractor, the Contractor will give the Engineer

timely notice of readiness. The Contractor will then furnish the Engineer with the required certificates of inspection, testing or approval.

7.9 Inspections, tests, or approvals by the engineer or others shall not relieve the Contractor from obligations to perform the Work in accordance with the requirements of the Contract Documents.

8. "Or Equal" Clause, Substitutions and Contractor Options.

8.1 Whenever a material, article, or piece of equipment is identified on the plans or in the specifications by reference to manufacturer's or vendor's names, trade names, catalogue numbers, etc., it is intended merely to establish a standard of quality and performance. Any material, article, or equipment of other manufacturers and vendors, which will perform satisfactorily the duties imposed by the general design, shall be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Engineer, of equal quality and function. The Engineer shall determine equality based on such information, tests, or other supporting data that may be required of the Contractor.

8.2 Upon acceptance and approval by the Engineer of an equal product, it shall remain the responsibility of the Contractor to coordinate installation of the item with all other items to be furnished to assure proper fitting together of all items. Similar responsibility applies to items which are left to the Contractor's option. Any additional cost of equal items and any additional cost incidental to the coordination and/or fitting together of such items shall be borne by the Contractor at no extra cost to the Owner.

8.3 If a specified or equal item is not available to meet the construction schedule, the Contractor may propose a substitute item of less than equal performance and quality. If this substitute is acceptable to the Engineer, any difference in purchase cost or costs incidental to the installation of such item will be negotiated between the parties to the contract.

8.4 Neither equal nor substitute items shall be installed without written approval of the Engineer.

8.5 The Contractor shall warrant that if substitutes are approved, no major changes in the function or general design of the Project will result.

9. Patents. Patent information is as follows:

9.1 The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.

9.2 License and/or royalty fees for the use of a process used in wastewater plant design which is authorized by the Owner for the project, must be reasonable, and paid to the holder of the patent, or his authorized licensee.

9.3 If the Contractor uses any design, device or materials in the construction methods for the project covered by patents or copyrights, he shall provide for such use by suitable agreement with the owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, that, without exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the construction of the work or after completion of the work.

10. Surveys. Surveys of land, property and construction shall be as follows:

10.1 The Owner will provide all land surveys and will establish and locate all property lines relating to the project.

10.2 For structures, the Engineer will establish and stake out one or more base lines as needed and will establish bench marks in and around the project site for the use of the Contractor and for the Engineer's own reference in checking the work in progress. For structures such as pipelines, the Engineer will establish the location of the pipe, manholes and other appurtenances, and will establish bench marks along the route of the pipeline at intervals for the using of the Contractor and for his own reference in checking the pipe and manhole inverts and other elevations throughout the project. The Contractor shall utilize the lines and bench marks established by the Engineer to set up whatever specific detail controls he may need for establishing location, elevation lines and grades of all structures. All this work is subject to checking, approval, and continuous surveillance by the Engineer to avoid error. The Contractor shall provide the Engineer with a qualified man or men to assist in this checking as needed and on request of the Engineer.

10.3 For construction other than pipelines and appurtenances in roadways and cross country, the Contractor shall be responsible for the location and setting lines and grades. The Contractor shall establish the location for pump station and wastewater treatment facility structures, associated yard piping including electrical conduits, internal piping and all equipment. Base lines and benchmarks for setting of the lines and grades for the above shall be provided by the Engineer.

10.4 Protection of stakes. The Contractor shall protect and preserve all of the established baseline stakes, bench marks, or other controls placed by the Engineer. Any of these items destroyed or lost through fault of the Contractor will be replaced by the Engineer at the Contractor's expense.

11. Contractor's Obligations are as follows: The Contractor shall and in good workmanlike manner, do and perform all work and furnish and pay for all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time stated in the proposal in accordance with the plans and drawings covered by this contract, and any and all supplemental plans and drawings, in accordance with the directions of the Engineer as given from time to time during the progress of the work, whether or not he considers the direction in accordance with the terms of the contract. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the contract documents, and shall do, carry on and complete the entire work to the satisfaction of the Engineer and Owner.

Contractor shall carry on the work and adhere to the progress schedule during all disputes, disagreements or unresolved claims with the Owner. No work shall be delayed or postponed pending the resolution of any disputes, disagreements, or claims except as the Owner and Contractor may otherwise agree in writing.

12. Weather Conditions. In the event of temporary suspension of work, or during inclement weather, or whenever the Engineer shall direct, the Contractor and his Subcontractors shall protect their work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor.

13. Protection of Work and Property shall be provided as follows:

13.1 The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work, and that of adjacent property, from damage. The Contractor shall replace or make good any such damage, loss or injury unless caused directly by errors contained in the contract, or by the Owner, or his authorized representatives. The Contractor will notify owners of adjacent utilities when prosecution of the Work may affect them.

13.2 The Contractor shall take all necessary precautions for the safety of employees on the work site, and shall comply with all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of the workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, trenches and other excavations, and falling materials, and he shall designate a responsible member of his organization on the work, whose duty shall be the prevention of accidents. The name and position of any person so designated shall be reported to the

Engineer by the Contractor. The person so designated shall be available by phone during nonworking hours.

13.3 In case of emergency which threatens loss or injury of property, and/or safety of life, the Contractor is allowed to act, without previous instructions from the Engineer. He shall notify the Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted in writing to the Engineer for approval.

13.4 When the Contractor has not taken action but has notified the Engineer of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Engineer.

13.5 The intention is not to relieve the Contractor from acting, but to provide for consultations between Engineer and Contractor in an emergency which permits time for such consultations.

13.6 The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Article 17 (extra work and change orders) of the general conditions.

14. Inspection of work for conformance with plans and specifications.

14.1 For purposes of inspection and for any other purpose, the Owner, the Engineer, and agents and employees of the Division or of any funding agency may enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefore. The Engineer shall be furnished with every facility for ascertaining that the work is in accordance with the requirements and intention of this contract, even to the extent of uncovering or taking down portions of finished work.

14.2 During construction and on its completion, all work shall conform to the location, lines, levels and grades indicated on the drawings or established on the site by the Engineer and shall be built in a workmanlike manner, in accordance with the drawings and specifications and the supplementary directions given from time to time by the Engineer. In no case shall any work which exceeds the requirements of the drawings and specifications be paid for as extra work unless ordered in writing by the Engineer.

14.3 Unauthorized work and work not conforming to plans and specifications shall be handled as follows:

a. Work considered by the Engineer to be outside of or different from the plans and specifications and done without instruction by the Engineer, or in wrong location, or done without proper lines or levels, may be ordered by the Engineer to be uncovered or dismantled.

b. Work done in the absence of the Engineer or his agent may be ordered by the Engineer to be uncovered or dismantled.

c. Should the work thus exposed or examined prove satisfactory, the uncovering or dismantling and the replacement of material and rebuilding of the work shall be considered as "Extra Work" to be processed in accordance with article 17.

d. Should the work thus exposed or examined prove to be unsatisfactory the uncovering or dismantling and the replacement of material and rebuilding of the work shall be at the expense of the Contractor.

15. Reports, Records and Data shall be furnished as follows: The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as are required by the Contract Documents or as the Owner, Division or any funding agency may request concerning work performed or to be performed under this contract.

16. Superintendence by Contractor shall be furnished as follows: At the site of the work, the Contractor shall employ a competent construction superintendent or foreman who shall have full authority to act for the Contractor. The superintendent or foreman shall have been designated in writing by the Contractor as the Contractor's representative at the site. It is understood that such representative shall be acceptable to the Engineer and shall be the one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll. Such representative shall be present on the site at all times as required to perform adequate supervision and coordination of the Work.

17. Extra Work and Change Orders shall be processed as follows:

17.1 The Engineer may at any time by written order and without notice to the sureties require the performance of such extra work or changes in the work as may be found necessary. The amount of compensation to be paid to the Contractor for any extra work so ordered shall be made in accordance with one or more of the following methods in the order of precedence listed below:

a. A price based on unit prices previously approved; or

b. A lump sum price agreed upon between the parties and stipulated in the order for the extra work;

c. A price determined by adding 15 percent to the "reasonable cost" of the extra work performed, such "reasonable cost" to be determined by the Engineer in accordance with the following paragraph.

17.2 The Engineer shall include the reasonable cost to the Contractor of all materials used, of all labor, both common and skilled, of foreman, trucks, and the fair-market rental rate for all machinery and equipment for the period employed directly on the work. The reasonable cost for extra work shall include the cost to the Contractor of any additional

insurance that may be required covering public liability for injury to persons and property, the cost of workmen's compensation insurance, federal social security, and any other costs based on payrolls, and required by law. The cost of extra work shall not include any cost or rental of small tools, buildings, or any portion of the time of the Contractor, his project supervisor or his superintendent, as assessed upon the amount of extra work, these items being considered covered by the 15 percent added to the reasonable cost. The reasonable cost for extra work shall also include the premium cost, if any, for additional bonds and insurance required because of the changes in the work.

17.3 In the case of extra work which is done by Subcontractors under the specific contract, or otherwise if so approved by the Engineer, the 15 percent added to the reasonable cost of the work will be allowed only to the Subcontractor. On such work an additional percentage of the reasonable cost (before addition of the 15 percent) will be paid to the Contractor for his work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs. Such percentage shall be in accordance with the following schedule: reasonable cost up to and including $50,000—10 percent; next $50,000 to and including $100,000—7½ percent; greater than $100,000—5 percent.

17.4 The Engineer may authorize minor changes or alterations in the work not involving extra cost and not inconsistent with the overall intent of the contract documents. These shall be accomplished by a written field order. However, if the Contractor believes that any minor change or alteration authorized by the Engineer entitles him to an increase in the contract price, he may make a claim therefore as provided in article 21.

18. Time For Completion and Liquidated Damages. The following paragraphs address time for completion and liquidated damages:

18.1 It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are Essential Conditions of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the "Notice to Proceed."

18.2 The Contractor agrees that said work shall be pursued regularly, diligently and continuously at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

18.3 If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

18.4 The liquidated damages amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing

and ascertaining the actual damages the Owner would in such event sustain. Said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted from time to time by the owner from current periodical payments.

18.5 It is further agreed that "time is of the essence" of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall "be of the essence". Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in the completion of the work is due to:

a. A preference, priority or allocation order duly issued by the government;

b. An unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather;

c. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article:

18.6 The Contractor shall promptly notify the Owner in writing of the causes of the delay. The Owner shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of his decision in the matter.

19. Defective Work. Defective work shall be processed as follows:

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

19.2 All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such condemned work and materials within 10 days after receipt of written notice, the Owner may remove them and store the material at the expense of the Contractor. If the Contractor does not pay the expense of such removal and storage within 10 days time thereafter, the Owner may, upon 10 days written notice, sell such materials at auction or at private sale and shall pay to the Contractor any net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

20. Differing Site Conditions. Claims for differing site conditions shall be processed as follows:

20.1 The Contractor shall promptly and before such conditions are disturbed, notify the Engineer in writing of:

a. Subsurface or latent physical conditions at the site differing materially from those indicated in this contract; or,

b. Unknown physical conditions at the site, differing materially from those ordinarily encountered and generally recognized as inherent in the type of work provided for in this contract.

20.2 The Engineer shall promptly investigate the conditions. If he finds that conditions differ materially and will cause an increase or decrease in the Contractor's cost or the time required to perform any part of the work under this contract whether or not changed as a result of such conditions, the Engineer shall make an equitable adjustment and modify the contract in writing.

20.3 No claim of the Contractor under this clause shall be allowed unless the Contractor has given proper notice as required in paragraph 20.1 of this clause.

20.4 No claim by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

21. Claims For Extra Cost. Claims for extra cost shall be processed as follows:

21.1 No claim for extra work or cost shall be allowed unless the same was done pursuant to a written order by the Engineer, approved by the Owner and the claim presented for payment with the first estimate after the changed or extra work is done. When work is performed under the terms of article 17, the Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost when requested by the Owner and shall allow the Owner access to accounts relating thereto.

21.2 If the Contractor claims that any instructions by drawings or similar documents issued after the date of the contract involve extra cost under the contract, he shall give the Engineer written notice after the receipt of such instruction and before proceeding to execute the work, except in an emergency which threatens life or property, then the procedure shall be as provided for under article 17, “Extra Work & Change Orders.” No claim shall be valid unless so made.

22. Right of Owner to Terminate Contract:

22.1 In the event that any of the provisions of this contract are violated by the Contractor, or by any of his Subcontractors, the Owner may serve written notice upon the Contractor and the surety of its intention to terminate the contract, and unless within 10 days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement for correction be made, the contract shall, upon the expiration of said 10 days cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the surety and the Contractor and the surety shall have the right to take over and perform the contract; provided, however, that if the surety does not commence performance thereof within 10 days from the date of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner

may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.

22.2 If the Contractor should be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should refuse or should fail, except in cases for which extensions of time are provided, to supply enough skilled workmen or materials, or if he should fail to make payments to Subcontractors or for material or labor, so as to affect the progress of the work, or be guilty of a violation of the contract, then the Owner, upon the written notice of the Engineer that sufficient cause exists to justify such action may, without prejudice to any other right or remedy and after giving the Contractor and his surety 7 days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools, equipment and other facilities installed on the work and paid for by the Owner, and finish the work by whatever method he may deem expedient. In the case of termination of this contract before completion from any cause whatever, the Contractor, if notified to do so by the Owner, shall promptly remove any part or all of his equipment and supplies at the expense of the Contractor. If such expense exceeds such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be approved by the Engineer.

22.3 Where the contract has been terminated by the Owner, said termination shall not affect or terminate any of the rights of the Owner as against the Contractor or his surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the Owner due the Contractor under the terms of the contract, shall not release the Contractor or his surety from liability for his default.

22.4 After ten (10) days from delivery of a Written Notice to the Contractor and the Engineer, the Owner may, without cause and without prejudice to any other remedy, elect to abandon the Project and terminate the Contract. In such case the Contractor shall be paid for all Work executed and any expense sustained plus reasonable profit.

22.5 If through no act or fault of the Contractor, the Work is suspended for a period of more than ninety (90) days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) days after it is submitted, or the Owner fails to pay the Contractor substantially the sum approved by the Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then the Contractor may, after ten (10) days from delivery of a Written Notice to the Owner and the Engineer terminate the Contract and recover from the Owner payment for all Work executed and all expenses sustained. In addition and in lieu of terminating the Contract, if the Engineer has failed to act on a request for payment or if the Owner has failed to make any payment as aforesaid, the Contractor may upon ten (10) days written notice to the Owner and the Engineer stop the Work until paid all amounts then due, in which event and upon resumption of the Work Change Orders shall be issued for adjusting the Contract Price or Extending the Contract Time or both to compensate for the costs and delays attributable to the stoppage of the Work.

22.6 If the performance of all or any portion of the Work is suspended, delayed, or interrupted as a result of failure of the Owner or Engineer to act within the time specified in the Contract Documents, or if no time is specified, within a reasonable time, an adjustment in the Contract Price or an extension of the Contract Time, or both, shall be

made by Change Order to compensate the Contractor for the costs and delays necessarily caused by the failure of the Owner or Engineer.

23. Construction Schedule and Periodic Estimates shall provide for the following:

23.1 Before starting the work or upon request by the Engineer during its progress, the Contractor shall submit to the Engineer a work plan showing construction methods and the various steps he intends to take in completing the work.

23.2 Before the first partial payment is made, the Contractor shall prepare and submit to the Engineer:

a. A written schedule fixing the dates for submission of drawings; and

b. A written schedule fixing the respective dates for the start and completion of segments of the work. Each such schedule shall be subject to review and change during the progress of the work.

c. Respective dates for submission of Shop Drawings and for the beginning of manufacture, the testing, and the installation of materials, supplies, and equipment.

d. A schedule of payments that the Contractor anticipates will be earned during the course of the Work.

24. Payments to Contractor. Payments to the Contractor shall be made as follows:

24.1 Progress payments. The Owner will once each month make a progress payment to the Contractor on the basis of an estimate of the total amount of work done to the time of the estimate and its value as prepared by the Contractor and approved by the Engineer.

24.2 Retainage by Owner. The Owner will retain a portion of the progress payment, each month, in accordance with the following procedures:

a. The Owner will establish an escrow account in the bank of the Owner's choosing. The account will be established such that interest on the principal will be paid to the Contractor. The principal will be the accumulated retainage paid into the account by the Owner. The principal will be held by the bank, available only to the Owner, until termination of the contract.

b Until the work is 50% complete, as determined by the Engineer, retainage shall be 10% of the monthly payments claimed. The computed amount of retainage will be deposited in the escrow account established above.

c. After the work is 50% complete, and provided the Contractor has satisfied the Engineer in quality and timeliness of the work, and provided further that there is no specific cause for withholding additional retainage no further amount will be withheld. The escrow account will remain at the same balance throughout the remainder of the project, unless drawn upon by the Owner in accordance with articles 19, 22, and 58.

d. Upon substantial or final completion (as defined in article 25), the amount of retainage will be reduced to 2% of the total Contract Price plus an additional retainage based on the Engineer's estimate of the fair value of the punch list items and the cost of completing and/or correcting such items of work, with specified amounts for each incomplete or defective item of work. As these items are completed or corrected, they shall be paid for out of the retainage until the entire project is declared completed (See article 25). The final 2% retainage shall be held during the one-year warranty period and released only after the Owner has accepted the project.

24.3 In reviewing monthly estimates for payments of the value of work done, the Engineer may accept in the estimate, prior to subtracting the retainage, the delivered cost of certain equipment and nonperishable material which have been delivered to the site or off-site location and which are properly stored and protected from damage. With the estimate, the Contractor shall submit to the Engineer invoices as evidence that the material has been delivered to the site. Prior to submitting the next monthly estimate, the Contractor shall provide the Engineer with paid invoices or other evidence that the materials have been paid for. If the Contractor fails to submit such evidence, the Engineer may then subtract the value of such materials or equipment for which the Owner has previously paid, from the next monthly estimate. The type of equipment and material eligible for payment prior to being incorporated in the work will be at the Engineer's discretion. Material and equipment made specifically for the subject job will be eligible for payment.

24.4 All material and work for which partial payments have been made shall thereupon become the sole property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or for the restoration of any damaged work, or as a waiver of the right of the Owner to require compliance with all of the terms of the contract.

24.5 Owner's right to withhold payments and make application. The Contractor agrees that he will indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts, equipment, power, tools and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all claims of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails to do so, then the Owner may, upon written notice to the Contractor either pay unpaid bills of which the Owner has written notice directly, or withhold from the Contractor's unpaid compensation a sum of money to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged. Payment to the Contractor shall then be resumed in accordance with the terms of this contract but in no event shall the above provisions be construed to impose any obligations upon the Owner to either the Contractor or his surety or any third party. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as payment made under contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

24.6 If the Owner fails to make payment forty-five (45) days after approval by the Engineer, in addition to other remedies available to the Contractor, there shall be added to

each such payment interest at an annual rate of 10% commencing on the first day after said payment is due and continuing until the payment is received by the Contractor.

25. Acceptance and Final Payment provisions shall be as follows:

25.1 Substantial completion and payment.

a. Substantial completion shall be that point, as certified by the Engineer, at which the contract has been completed to the extent that the Owner may occupy and/or make use of the work performed for the purposes for which it was intended. Upon substantial completion there may be minor items, such as seeding, landscaping, etc., yet to be completed or items of work to be corrected.

b. Upon receipt of written notice from the Contractor that the work is substantially complete, the Engineer shall promptly make an inspection, and when he finds the work complies with the terms of the contract and the contract is substantially completed, he will issue a signed and dated certificate, and a list of all items to be completed or corrected, stating that the work required by this contract has been substantially completed and is accepted by him.

c. Upon substantial completion, the entire balance due and payable to the Contractor less 2 percent of the Contract Price, and less a retention based on the Engineer's estimate of the fair value for the cost of completing or correcting listed items of work with specified amounts for each incomplete or defective item of work shall be made.

d. The general guarantee period for the work shall begin on the date certified by the Engineer that the work is substantially completed.

25.2 Final completion shall be that point at which all work has been completed and all defective work has been corrected. Unless the Engineer has issued a certificate of substantial completion, the general guarantee period shall begin upon certification by the Engineer of final completion.

25.3 At the end of the general guarantee period for the entire contract which has been certified finally completed or substantially completed, the Owner, through the Engineer, shall make a guarantee inspection of all or portions of the work. When it is found that the work is satisfactory and that no work has become defective under the terms of the contract, the Owner will accept the entire project and make final payment, including the reimbursement of monies retained pursuant to the guarantee period.

25.4 If the guarantee inspection discloses any work as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of such work, and the Contractor shall immediately execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the guarantee inspection, provided the work has been satisfactorily completed.

25.5 Before issuance of final payment, the Contractor shall certify in writing to the Engineer that all payrolls, material bills, and other indebtedness connected with the work have been paid or otherwise satisfied; except that in case of disputed indebtedness or liens, if the contract does not include a payment bond, the Contractor may submit in lieu of certification of payment a surety bond in the amount of the disputed indebtedness or

liens, guaranteeing payment of all such disputed amounts, including all related costs and interest in connection with said disputed indebtedness or liens which the Owner may be compelled to pay upon adjudication.

25.6 If upon substantial completion, full completion is delayed through no fault of the Contractor, and the Engineer so certifies, the Owner may, upon certificate of the Engineer, and without termination of the contract, make payment of the balance due for that portion of the work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

25.7 The acceptance by the Contractor of final payment shall release the Owner from all claims and all liability to the Contractor for all things relating to this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations of the performance and payment bond under this contract.

26. Payments by Contractor. The Contractor shall pay the costs:

26.1 For all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered;

26.2 For all materials, tools, and other expendable equipment to the extent of 90 percent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools and equipment are delivered at the site of the work and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools and equipment are incorporated or used; and

26.3 To each of his Subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his Subcontractors to the extent of each Subcontractor's interest therein.

27. Insurance. The Contractor and any Subcontractor shall obtain all the insurance required under this article and such insurance shall be approved by the Owner.

27.1 The Contractor and all Subcontractors shall procure and shall maintain during the life of this contract workmen's compensation insurance as required by applicable state law. The Contractor shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance.

Limits of Liability: $100,000 each accident;
$500,000 disease - policy limit;
$100,000 disease - each employee.

27.2 The Contractor shall procure and shall maintain during the life of this contract Commercial General liability insurance to include contractual liability, explosion, collapse and underground coverages.

Limits of liability: $1,000,000 each occurrence bodily injury and property damage;
$2,000,000 general aggregate - include per project aggregate endorsement;
$2,000,000 products/completed operations aggregate.

If blasting or demolition or both is required by the contract, the Contractor or Subcontractor shall obtain the respective coverage and shall furnish the Engineer a certificate of insurance evidencing the required coverages prior to commencement of any operations involving blasting or demolition or both.

27.3 The Contractor shall procure and shall maintain during the life of this contract comprehensive automobile liability insurance to include all motor vehicles including owned, hired, borrowed and non-owned vehicles.

Limits of liability: $1,000,000 combined single limit for bodily injury and property damage.

27.4 The Contractor shall either:

a. Require each of his Subcontractors to procure and to maintain during the life of his subcontract commercial general liability insurance and comprehensive automobile liability insurance of the type and in the amounts specified in articles 27.2 and 27.3; or

b. Insure the activities of his Subcontractors in his policy.

27.5 The required insurance shall provide adequate protection for the Contractor and his Subcontractors, respectively, against damage claims which may arise from work under this contract, whether such work be by the insured or by anyone employed by him and also against any of the special hazards which may be encountered in the performance of this contract.

27.6 The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such insurance shall not be canceled or materially altered, except after 10 days written notice has been received by the Owner.

27.7 For builder's risk insurance (fire and extended coverage) and until the work is completed and accepted by the Owner, the Contractor is required to maintain builder's risk type insurance on a 100 percent completed value basis on the insurable portion of the work for the benefit of the Owner, the Contractor, and Subcontractors as their interests may appear.

27.8 The Contractor shall take out and furnish to the Owner and maintain during the life of this contract, complete Owner's protective liability insurance.

Limits of Liability: $1,000,000 each occurrence;
$2,000,000 aggregate.

28. Contract Security. The Contractor shall within ten (10) days after the receipt of the Notice of Award furnish the Owner with a performance bond and a payment bond in penal sums equal to the amount of the contract price conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the Work provided by the contract Documents. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact business in the state in which the Work is to be performed

and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these Bonds shall be borne by the Contractor.

29. Additional or Substitute Bond. If at any time a surety on any such Bond is declared as bankrupt or loses its right to do business in the state in which the Work is to be performed, or is removed from the list of Surety Companies accepted on Federal Bonds, the Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished such an acceptable bond to the Owner.

30. Assignments. The Contractor shall not assign the whole or any part of this contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

31. Mutual Responsibility of Contractors. If, through acts of neglect on the part of the Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the work site, the Contractor agrees to settle with such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractors will so settle. If such other Contractor or Subcontractors shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

32. Subcontracting. When subcontracting, the Contractor:

32.1 May utilize the services of specialty Subcontractors on those parts of the work which, under usual contracting practices, are performed by specialty Subcontractors.

32.2 Shall be as fully responsible to the Owner for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

32.3 Shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind Subcontractors to the Contractor by the terms of the contract documents insofar as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the contract documents.

32.4 Shall not create any contractual relation between any Subcontractor and the Owner.

32.5 Shall not award Work to Subcontractor(s), in excess of fifty percent (50%) of the Contract Price, without prior written approval of the Owner.

33. Authority of the Engineer. In performing his duties, the Engineer or his representative shall:

33.1 Have the authority to suspend the work in whole or in part for such periods as he may deem necessary due to the failure of the Contractor to carry out provisions of the Contract or for failure of the Contractor to suspend work in weather conditions considered by the Engineer to be unsuitable for the prosecution of the work. The Engineer shall give all orders and directions under this contract, relative to the execution of the work. The Engineer shall determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to the work. The Engineer's estimates and decisions shall be final and conclusive, except as otherwise provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected to any extent by such question. The Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found unclear. Any differences or conflicts in regard to their work which may arise between the Contractor under this contract and other Contractors performing work for the Owner shall be adjusted and determined by the Engineer.

a. The purpose of the above article is not in any way to relieve the Contractor of his responsibilities for the safety of workmen or general public in the execution of the work. Attention is drawn to Article 13 of these Conditions which refers to the safety obligations of the Contractor.

b. The Engineer, acting on behalf of the Owner, has the authority to enforce corrective action for work not in accordance with the specifications.

c. In addition, the Engineer, acting on behalf of the Owner, is to ensure that the work is in accordance with the Contract documents. He is not held responsible, however, for the methods of construction, sequences, schedules and procedures in the execution of the work. The Engineer does have the opportunity under 33.1 to reject the method of construction, work plan schedule, procedures, as he thinks appropriate.

33.2 Appoint assistants and representatives as he desires, and they shall be granted full access to the work under the contract. They have the authority to give directions pertaining to the work, to approve or reject materials, to suspend any work that is being improperly performed, to make measurements of quantities, to keep records of costs, and otherwise represent the Engineer in all matters except as provided below. The Contractor may, however, appeal from their decision to the Engineer himself, but any work done pending its resolution is at the Contractor's own risk. Except as permitted and instructed by the Engineer, the assistants and representatives are not authorized to revoke, alter, enlarge, relax, or release any requirements of these specifications, nor to issue instructions contrary to the plans and specifications. They are not authorized to act as superintendents or foremen for the Contractor, or to interfere with the management of the work by the Contractor. Any advice which the assistants or representatives of the Engineer may give the Contractor shall not be construed as binding the Engineer or the Owner in any way, nor as releasing the Contractor from the fulfillment of the terms of the contract. All transactions between the Contractor and the representatives of the Engineer which are liable to protest or where payments are involved shall be made in writing.

34. Stated Allowances. The Contractor shall include in his proposal for costs of materials not shown in his bid under "cash allowances" or "allowed materials," any cash allowances stated in the supplemental general conditions or other contract documents. The Contractor shall purchase the "allowed materials" as directed by the Owner on the basis of the lowest and best bid of at least 3 competitive bids. If the actual price for purchasing the "allowed materials" is more or less than the "cash allowance," the contract price shall be adjusted accordingly. The adjustment in contract price shall be made on the basis of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation of the "allowed materials" shall be included in the applicable sections of the contract specifications covering this work.

35. Use of Premises, Removal of Debris, Sanitary Conditions. In the use of premises or removal of debris, the Contractor expressly undertakes at his own expense: to take every precaution against injuries to persons or damage to property; to maintain sanitary conditions; to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not interfere with the progress of his work or the work of any other Contractors; to place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work; to clean up frequently all refuse, rubbish, scrap materials and debris caused by his operations, to the end that at all times the site of the work shall present an orderly and workmanlike appearance; before final payment to remove all surplus material falsework, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in an orderly condition; to effect all cutting, fitting or patching of his work required to make the same conform to the plans and specifications and, except with the consent of the Engineer, not to cut or otherwise alter the work of any other Contractor; to provide and maintain in a sanitary condition such toilet accommodations for the use of his employees as may be necessary to comply with the requirements of the state and local boards of health, or of other bodies or authorities having jurisdiction.

36. Quantities of Estimate. Wherever the estimated quantities of work to be done and materials to be furnished under this contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is specifically reserved except as herein otherwise specifically limited, to increase or decrease them as may be deemed reasonably necessary by the Owner to complete the work contemplated by this contract, and such increase or decrease shall in no way invalidate this contract, nor shall any such increase or decrease give cause for claims or liability for damages. Such increases or decreases shall not exceed 25 percent of the estimated quantities of work. An increase or decrease in quantities for subsurface materials (e.g. ledge, unsuitable backfill), which overrun or underrun by 25% or more of the bid quantity may be the basis for a contract price adjustment, at the rate of a negotiated adjusted unit rate. Negotiated unit price rates shall be equitable and shall take into account, but not be limited to the following factors; bid unit rate, distribution of rates and bid balance, and the scope of work as affected by the changed quantities. Claims for extra work resulting from changed quantities shall be processed under article 21.

37. Lands and Rights-of-Way. Acquisition and usage of lands and rights-of-way shall be as follows:

37.1 Prior to issuing the Notice to Proceed, the Owner shall legally obtain all lands and rights-of-way necessary for carrying out and completing the work to be performed under this contract.

37.2 The Contractor shall not (except after written consent from the Owner) enter or occupy with men, tools, materials, or equipment, any land outside the rights-of-way or property of the Owner. A copy of the written consent shall be given to the Engineer.

37.3 The Owner shall provide to the Contractor information which delineates and describes the lands owned and the rights-of-way acquired.

37.4 The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

38. General Guarantee. With reference to warranties, neither the final certificate of payment nor any provision in the contract documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the contract documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which appear within the warranty period one year or longer if required by the contract, from the certified date of completion or substantial completion of the work. The Owner will give notice of observed defects within two working days of their discovery.

39. Errors and Inconsistencies. With reference to errors and inconsistency in contract documents, any provisions in any of the contract documents which may be in conflict with the paragraphs in these general conditions shall be subject to the following order of precedence for interpretation:

39.1 Drawings will govern technical specifications.

39.2 General conditions will govern drawings and technical specifications.

39.3 Supplemental general conditions will govern general conditions, drawings and technical specifications.

39.4 Special conditions will govern supplemental general conditions, general conditions, drawings and technical specifications.

39.5 The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, he shall notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.

39.6 Figure dimensions on Drawings shall govern over general drawings.

40. Notice and Service Thereof. Any notice to the Contractor from the Owner relative to any part of this contract will be in writing and will be considered delivered and the service completed, when said notice is mailed, by certified registered mail, to the Contractor at

his last given address, or delivered in person to the Contractor or his authorized representative on the work.

41. Required Provisions Deemed Inserted. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted or is not correctly inserted (example; miswording, etc.), then upon the application of either party the contract shall forthwith be physically amended to make such insertion or correction.

42. Protection of Lives and Health. The work under this contract is subject to the safety and health regulations (CRF 29, part 1926, and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974. Contractors are urged to become familiar with the requirements of these regulations.

43. OSHA Construction Safety Program.

43.1 Pursuant to NHRSA 277:5-a, the Contractor shall provide an Occupational Health and Safety Administration (OSHA) 10-hour construction safety program for its on-site employees. All employees are required to complete the program prior to beginning work. The training program shall utilize an OSHA-approved curriculum. Graduates shall receive a card from OSHA certifying the successful completion of the training program.

43.2 Any employee required to complete the OSHA 10-hour construction safety program, and who cannot within 15 days provide documentation of completion of such program, shall be subject to removal from the job site.

43.3 The following individuals are exempt from the requirements of the 10-hour construction safety program: law enforcement officers involved with traffic control or jobsite security; flagging personnel who have completed the training required by the Department of Transportation; all relevant federal, state and municipal government employees and inspectors; and all individuals who are not considered to be on the site of work under the federal Davis-Bacon Act, including, but not limited to, construction and non-construction delivery personnel and non-trade personnel.

44. Equal Employment Opportunity. Under equal employment opportunity requirements and during the performance of this contract the Contractor agrees to the following:

44.1 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, or sex. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, national origin, or sex. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

44.2 The Contractor will in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment, without regard to race, creed, color, national origin, or sex.

44.3 The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the labor union or worker's representative of the Contractor's commitment under section 202 of executive order no. 11246 of September 24, 1965, and 11375 of October, 13, 1967, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

44.4 The Contractor will comply with all provisions of executive orders no. 11246 and 11375.

44.5 The Contractor will furnish all information and reports required by executive orders no. 11246 and 11375.

44.6 In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part by the Owner or the Department of Labor and the Contractor may be declared ineligible for further government contracts or federally-assisted construction, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Department of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

44.7 A breach of this article may be grounds for termination of this contract and for debarment as provided in 29 CFR 5.6.

45. Interest of Federal, State or Local Officials. No federal, state or local official shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

46. Other Prohibited Interests. No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, Engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, Engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

47. Use and Occupancy Prior to Acceptance. Use and occupancy of a portion or unit of the project, upon completion of that portion or unit, and before substantial completion of the project, shall be a condition of this contract with the following provisions:

47.1 The Owner will make his request for use or occupancy to the Contractor in writing.

47.2 There must be no significant interference with the Contractor's work or performance of duties under the contract.

47.3 The Engineer, upon request of the Owner and agreement by the Contractor, will make an inspection of the complete part of the work to confirm its status of completion.

47.4 Consent of the surety and endorsement of the insurance carrier must be obtained prior to use and/or occupancy by the Owner. Also, prior to occupancy, the Owner will secure the required insurance coverage on the building.

47.5 The Owner will have the right to exclude the Contractor from the subject portion of the project after the date of occupancy but will allow the Contractor reasonable access to complete or correct items.

47.6 The warranty period shall begin upon substantial completion.

48. Suspension of Work. The Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than 90 days by notice in writing to the Contractor and the Engineer. The Owner shall fix the date on which work shall be resumed. The Contractor will be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to any suspension if he makes a claim therefore as provided in articles 17 and 21.

49. [Reserved]

50. [Reserved]

51. [Reserved]

52. Project Sign. Furnish and erect a sign at the project site to identify the project and to indicate that the State Government is participating in the development of the project. Place the sign in a prominent location as directed by the Engineer. Do not place or allow the placement of other advertising signboards at the project site or along rights-of-way furnished for the project work. See Exhibit 1 for details of construction.

53. [Reserved]

54. Public Convenience and Traffic Control requirements:

54.1 The Contractor shall at all times so conduct his work as to assure minimal obstruction to traffic. The safety and convenience of the general public and the residents along the work site route and the protection of property shall be provided for by the Contractor. The Contractor shall be responsible for timely notification to local residents before causing any interruptions of their access.

54.2 Fire hydrants and water holes for fire protection on or adjacent to the work site shall be kept accessible to fire apparatus at all times, and no obstructions shall be placed within 10 feet of any such facility. No footways, gutters, drain inlets, or portions of highways adjoining the work site shall be obstructed. In the event that all or part of a roadway is officially closed to traffic during construction, the Contractor shall provide and maintain safe and adequate traffic accessibility, satisfactory to the Engineer, for residences and businesses along and adjacent to the roadway so closed.

54.3 When the maintenance of traffic is considered by the Engineer to be minimal, the contract may not show this work as a pay item. In such cases, the Contractor shall bear all expense of maintaining traffic over the sections of road undergoing improvement and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary, without direct reimbursement.

55. Pre-Construction Conference. The Contractor shall not commence work until a pre-construction conference has been held at which representatives of the Contractor, Engineer, Division and Owner are present. The pre-construction conference shall be scheduled by the Engineer.

56. Maintenance During Construction.

56.1 The Contractor shall maintain the work during construction and until it is accepted by the Owner. This maintenance shall be continuous and effective work prosecuted day by day, with adequate equipment and forces, to the end that roads or structures are kept in satisfactory condition at all times.

56.2 All cost of maintenance during construction and before the work is accepted by the Owner shall be included in the unit prices bid on the various pay items and the Contractor shall not be paid an additional amount for such maintenance.

56.3 If the Contractor, at any time, fails to comply with the provisions above, the Engineer may direct the Contractor to do so. If the Contractor fails to remedy unsatisfactory maintenance within the time specified by the Engineer, the Engineer may immediately cause the project to be maintained and the entire cost of this maintenance will be deducted from money to become due the Contractor on this contract.

57. Cooperation with Utilities.

57.1 The Owner will notify all utility companies, all pipe line owners, or other parties affected, and have all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

57.2 Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners of such utilities at their expense, except as may otherwise be provided for in the special conditions or as noted on the plans.

57.3 It is understood and agreed that the Contractor has considered in his bid all of the permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans and as evident on the site, and that no additional compensation will be allowed for any delays, inconvenience, damage sustained by him due to any interference from such utility appurtenances or the operation of moving them.

57.4 The Contractor shall cooperate with the Owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication of rearrangements may be reduced to a minimum, and that services rendered by those parties will be minimal.

57.5 In the event of interruption to a water or utility service as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with said authority in the restoration of services. If water service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority. If any utility service is interrupted for more than 4 hours, the Contractor shall make provisions for temporary service at his own expense until service is resumed.

58. Work Performed at Night and on Sundays and Holidays shall comply with the following:

58.1 No work will be permitted at night or on Sundays or holidays except as approved in writing by the Engineer, and provided such work is not in violation of a local ordinance. When working at night, the Contractor shall provide flood lighting sufficient to insure the same quality of workmanship and the same conditions regarding safety as would be achieved in daylight.

58.2 Whenever Memorial Day or Fourth-of-July is observed on a Friday or a Monday and during the weekend of Labor Day, the Contractor may be required to suspend work for the 3 calendar days. Prior to the close of work, the work site shall be placed in a condition acceptable to the Engineer for the comfort and safety of the traveling public. An arrangement shall be made for responsible personnel acceptable to the Engineer to maintain the project in the above conditions.

59. Laws to be Observed. With reference to laws that shall be observed:

59.1 The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations, and all orders and decrees of tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the state and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his employees.

59.2 Indemnification

The Contractor will indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses, and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

In any and all claims against the Owner or the Engineer, or any of their agents of employees, by any employees of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by disability benefit or other employee benefit acts.

The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, his agents or employees arising out of the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications.

60. Permits. Permits to be obtained by the Contractor shall be in accordance with the following:

60.1 Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities will be secured and paid for by the Owner. Permits may include:

a. New Hampshire Department of Transportation Highway Trench Permits.

b. RSA 485-A:17 and 483-A N.H. DES Wetlands Bureau Dredge and Fill Permit.

c. RSA 485-A:17 - N.H. DES Site Specific Permit (Water Quality)

d. RSA 149-M:10 N.H. DES Solid Waste Management Bureau - disposal of construction debris and/or demolition waste.

e. N.H. Department of Environmental Services Air Resources Division (burning permits).

f. Other permits, as required by State and Local laws and ordinances.

g. Notice of intent for coverage under EPA's General NPDES Permit for construction dewatering activities.

61. Control of Pollution due to construction shall comply with the following:

61.1 During construction, the Contractor shall take precautions sufficient to avoid the leaching or runoff of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride and any other polluting materials which are unsightly or which may be harmful to humans, fish, or other life, into groundwaters and surface waters of the State.

61.2 In waters used for public water supply or used for trout, salmon, or other game or forage fish spawning or nursery, control measures must be adequate to assure that turbidity in the receiving water will be increased not more than 10 standard turbidity units (s.t.u.) in the absence of other more restrictive locally-established limitations, unless otherwise permitted by the Division. In no case shall the classification for the surface water be violated.

61.3 In water used for other purposes, the turbidity must not exceed 25 s.t.u. unless otherwise permitted by the Division.

62. Use of Explosives.

62.1 When the use of explosives is necessary for the prosecution of the Work, exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage resulting from the use of explosives.

62.2 Store all explosives in a secure manner, in compliance with all State and local laws and ordinances, and legally mark all such storage places. Storage shall be limited to such quantity as may be needed for the work underway.

62.3 Designate as a "Blasting Area" all sites where electric blasting caps are located and where explosive charges are being placed. Mark all blasting areas with signs as required by law. Place signs as required by law from each end of the blasting area and leave in place while the above conditions prevail. Immediately remove signs after blasting operations or the storage of caps is over.

62.4 Notify each property Owner and public utility company having structures in proximity to the site of the work sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property. Such notice shall not relieve the Contractor of any of his responsibility for damage resulting from his blasting operation. Warn all persons within the danger zone of blasting operations and do not perform blasting work until the area is cleared. Provide sufficient flagmen outside the danger zone to stop all approaching traffic and pedestrians. Provide watchmen during the loading period and until charges have been exploded. Place adequate protective covering over all charges before being exploded.

63. Arbitration by Mutual Agreement.

63.1 All claims, disputes, and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by making an acceptance of final payment as provided in Section 25, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

63.2 Notice of the request for arbitration shall be filed in writing with the other party to the Contract Documents and a copy shall be filed with the Engineer. Request for arbitration shall in no event be made on any claim, dispute, or other matter in question which would be barred by the applicable statute of limitations.

63.3 The Contractor will carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

64. Taxes. The Contractor shall pay all sales, consumer, use, and other similar taxes required by the laws of the place where the Work is performed.

65 Separate Contracts.

65.1 The Owner reserves the right to let other contracts in connection with this Project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate the Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results.

65.2 The Owner may perform additional Work related to the Project or the Owner may let other contracts containing provisions similar to these. The Contractor will afford the other Contractors who are parties to such Contracts (or the Owner, if the Owner is performing the additional Work) reasonable opportunity for the introduction and storage of materials and equipment and the execution of the Work, and shall properly connect and coordinate the Work with theirs.

65.3 If the performance of the additional Work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice shall thereof be given to the Contractor prior to starting such additional Work. If the Contractor believes that the performance of such additional Work by the Owner or others involves it in additional expense or entitles it to an extension of the Contract Time, the Contractor may make a claim thereof as provided in Sections 17 and 18.

SUPPLEMENTAL GENERAL CONDITIONS

Supplemental General Conditions

The following supplemental general conditions modify, change, delete, or add to the "General Conditions." Where any part of the General Conditions is modified or voided by these Sections, the unaltered provisions of that part shall remain in effect.

SGC 14.1 Inspection

Replace first sentence to read: "For purposes of inspection and for any other purpose, the Owner, the Engineer, and of any funding agency may enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefore."

SGC- 15 Reports, Records and Data

Replace first sentence to read: "The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as are required by the Contract Documents or as the Owner may request concerning work performed or to be performed under this contract."

SGC-17.1 Extra Work and Change Orders

The first sentence is modified to read: "The Engineer, with the approval of the Owner, may at any time by written order and without notice to the sureties require the performance of such extra work or changes in the work as may be found necessary.

SGC-18.6 Time for Completion and Liquidated Damages

Add the following to Article 18.6:

"If contractor is delayed in the performance or progress of the work by reasons outlined in Article 18.5a, 18.5b, or 18.5c, then contractor shall be entitled to an equitable adjustment in contract times, if such adjustment is essential to contractors ability to complete the work within the contract times. Such an adjustment shall be the contractor's soul and exclusive remedy for the delays."

SGC-20.2 Claims for Differing Site Conditions

Delete paragraph 20.2 in its entirety. Replace with the following:

"The Engineer shall promptly investigate the conditions. If he finds that conditions differ materially and will cause an increase or decrease in the Contractor's cost or the time required to perform any part of the work under this contract whether or not changed as a result of such conditions, the Engineer will notify the Owner and recommend an equitable adjustment. Following recommendations by the Engineer, the Contractor and Owner will enter into negotiations to modify the contract in writing."

SGC-24.2 Payment to Contractor

Delete paragraph 24.2a in its entirety.

Delete the second sentence of 24.2.b.

Delete the second sentence of 24.2.b. Replace with the following:

"The retainage amount will remain at the same balance throughout the remainder of the project, unless drawn upon by the Owner in accordance with articles 19, 22, and 58.

SGC-27 Insurance (Special Condition to GC27)

Change the following in paragraph two, Article 27.1:

"Limits of Liability:	~~$100,000~~	$1,000,000 each accident
		$1,000,000 disease-policy limit
	~~$100,000~~	$1,000,000 disease- each employee"

Change the following in paragraph two, Article 27.2:

"Limits of liability:	~~$1,000,000~~	$2,000,000 each occurrence bodily injury and property damage;
		$2,000,000 general aggregate- include per project aggregate endorsement;
		$2,000,000 products/completed operations aggregate."

Add the following to Article 27.2:

"Coverage amounts may be satisfied by excess or umbrella policies provided the City of Portsmouth is listed as an additional insured on the excess/umbrella policy as well as the general liability policy. The City of Portsmouth shall be named as additional insured as follows:

City of Portsmouth
Attn: Legal Department
1 Junkins Avenue
Portsmouth, NH 03801"

Change the following in paragraph two, Article 27.3:

"Limits of liability:	~~$1,000,000~~	$2,000,000 combined single limit for bodily injury and property damage."

Add the following to Article 27.3:

"Coverage amounts may be satisfied by excess or umbrella policies provided the City of Portsmouth is listed as an additional insured on the excess/umbrella policy as well as the general liability policy."

Change the following in Article 27.6:

The second sentence shall read: "Such insurance shall not be cancelled or materially altered, except after 30 days written notice has been received by the Owner."

Insert the following article 27.7:

27.7.1 Installation Floater:

For construction projects to which a "Builder's Risk" type of insurance is not applicable, the Contractor shall purchase and maintain an "Installation Floater" in an amount not less than the value of materials for the project covered under the policy.

Delete Article 27.8 in its entirety.

Change the following in paragraph two, Article 27.8:

"Limits of Liability:	$2,000,000 each occurrence; $2,000,000 aggregate."

Add Article 27.9:

> "For access onto Pike Industries, Inc. property, the Contractor shall maintain worker's compensation, employer's liability, automobile liability (if operating vehicles on the Property), and general liability insurance covering Contractor's activities on the Property. Before accessing the Property and at any time Owner so requests, the Contractor shall furnish certificates of insurance evidencing the required insurance. The Contractor shall name "Pike Industries, Inc., 3 Eastgate Park Road, Belmont, NH" as an additional insured on a primary basis and Pike's coverage shall be noncontributory."

SGC-28 Contract Security (Supplement to GC 28)

Add the following paragraphs to Article 28 of the General Conditions:

> The payment bond and performance bond furnished by the contractor shall be in the form of the bonds shown on Page C-2.5 and C-2.6 and C-2.7 and C-2.8, unless approved otherwise by the engineer.
>
> The terms contained in the performance bond shall in no way invalidate the provisions of the contract documents or the right of the owner to terminate the contract as specified therein.

SGC-44 Non-Discrimination

Add the following sentence to paragraph 44.2:

"Pursuant to New Hampshire law, the Contractor shall not discriminate on the basis of sexual orientation."

SGC-55 Pre-Construction Conference

Replace first sentence to read: "The Contractor shall not commence work until a pre-construction conference has been held at which representatives of the Contractor, Engineer, and Owner are present. The pre-construction conference shall be scheduled by the Engineer."

SGC-59.2 Indemnification (Special Condition to GC 59.2)

Delete the first paragraph in its entirety.

Replace with the following paragraph:

"Contractor will indemnify Owner and Engineer against all suits, claims, judgments, awards, loss, cost or expense (including without limitation attorneys fees) arising in any way out of the Contractor's negligence or breach of its obligations or warranties under this Contract. Contractor will defend all such actions with counsel satisfactory to the Owner at Contractor' expense, including attorneys' fees and will satisfy any judgment rendered against Owner in such action."

SGC-62.5 Use of Explosives (Special Condition to GC 62)

Add the following after paragraph 62.4:

All blasting shall conform fully with all applicable local, state and Federal laws. See Appendix B for City of Portsmouth Blasting Ordinance.

Section D

TECHNICALSPECIFICATIONS

DIVISION 1	GENERAL REQUIREMENTS
DIVISION 2	SITE WORK
DIVISION 3	CONCRETE
DIVISION 16	SITE ELECTRICAL

Scope of Work

The scope of this Division covers the General Administrative Requirements and the general work-related provisions of the Construction Contract.

Contents of Division

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK UNDER THIS CONTRACT

A. The work to be completed under this Contract includes all work as shown on the drawings or identified in the contract documents, including but not limited to:

Includes Sport Field Lighting Posts, Fixtures, typical of four locations; lighting controls; powering the existing scoreboard; and electrical service infrastructure from Community Campus Road, including conduit, manholes and transformer pad.

1.2 CONTRACTORS RESPONSIBILITIES

A. The General Contractor shall have the following responsibilities:

1. The Contractor will perform all work in accordance with the Drawings, Contract, and Specifications.
2. Traffic Control – Coordinate with and submit to the City of Portsmouth Department of Public Works, a Traffic Control Plan for review and approval (see Prosecution of Work and Section 01570 of these specifications).
3. Erosion and Sediment Control and Stormwater Management Plan – The Contractor shall submit an Erosion and Sediment Control and Stormwater Management Plan in accordance with Section 02540.
4. Furnish all labor, materials, equipment and incidentals required to complete all work in accordance with the bid documents within the allotted time schedule and maintain required warranties.
5. Protect against vandalism. All losses incurred through vandalism are to be reimbursed by the Contractor or Contractor's insurance company.
6. Coordinate with the City of Portsmouth Department of Public Works, including securing any required permits (i.e., excavation and flagging permits) on all work accomplished within City roadway rights-of-way.
7. Perform all work within City right-of-way or limits of easements as shown on the drawings unless written authorization is provided for further occupation of private properties.
8. Coordinate activities involving other utilities with the respective utility companies.
9. The work also includes but is not limited to furnishing all materials, labor and equipment to perform the following activities:
    a. Preparation and submittal of contract specified submittals.
    b. Testing of materials as specified herein.
10. Contractor shall maintain sanitary and storm flow during construction.
11. The Contractor shall conduct work in a professional manner. Any unprofessional conduct (i.e., foul language and use of excessive speed) will not be tolerated.
12. Contractor shall maintain access to all homes and businesses while completing the work.

1.3 ENUMERATION OF DRAWINGS

A. The following drawings which form a part of this contract are:

1. Sheet No's 1 through 7, entitled Multi-purpose Recreation Field Lighting

1.4 ENUMERATION OF SPECIFICATIONS

The following specifications which form a part of this contract are:

A. Bidding Requirements
B. Contract
C. Conditions of Contract
D. Technical Specifications
E. NHDOT Standard Specifications and Amendments
F. Appendices:
    A. Geotechnical Information
    B. City of Portsmouth Blasting Ordinance

All Addenda issued during the bidding process also form a part of this Contract.

PART 2 - PRODUCTS

2.1 STANDARDS

A. The contractor shall meet the requirements of the following:

1. City of Portsmouth standards for water and sewer construction
2. NHDES standards for water and sewer construction

PART 3 - EXECUTION

3.1 WORK SEQUENCE

A. No work may commence until a Traffic Control Plan has been approved in writing by the Public Works Department in accordance with Section 01570 – Traffic Regulation and the Special Conditions.
B. No earthwork may commence until an Erosion Control has been installed.
C. It is the intention that the work required to be completed under this Contract be performed in an organized and workmanlike manner. Construction areas shall be restored as soon as practical in an effort to minimize disturbance to private and public property. The contractor is responsible for scheduling work to meet these objectives.

3.3 WORK RESTRICTIONS

A. Hours of Construction - Work on the project shall be conducted between the hours of 7:00 a.m. and 5:00 p.m., excluding weekends and holidays.

3.4 CONTRACTOR SCHEDULE

A. Contractor shall provide an updated schedule as necessary but no less than every month and for each project meeting.
B. Provided schedule shall be Gantt chart, Critical Path Method, or other tabular form approved by the Engineer.

END OF SECTION

SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL

1.1 INTRODUCTION

A. Project meeting requirements

1.2 PROJECT MEETINGS (FORMAL)

A. The Contractor shall attend project meetings throughout the progress of the work.
B. Meetings shall be held at a frequency no less than twice per month; weekly meetings are possible.
C. The following representatives of the Contractor shall attend:
    1. Superintendent or authorized representative
    2. Representative of major subcontractors (when requested)
    3. Representatives of major suppliers (when requested)
    4. Other representatives as appropriate to agenda topics
D. The Engineer shall prepare and distribute project meeting notes.
E. Sample Agenda
    1. Work progress
    2. Progress schedule
    3. Delivery schedules
    4. Submittals
    5. Payment applications
    6. Change Orders and Field Orders
    7. Other items

1.3 WEEKLY COORDINATION MEETINGS (INFORMAL)

A. The contractor's superintendent, the owner, and the resident engineer shall meet weekly to informally discuss the project progress/schedule, sequence, and other issues.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

(NOT PART OF THIS SECTION)

END OF SECTION

SUBMITTALS

PART 1 -- SECTION 01340

PART 2 -- GENERAL

2.1 DESCRIPTION

A. Work Included:
   1. Submit to the Engineer, Shop Drawings, Operation and Maintenance Manuals, Manufacturers' Certificates, Project Data, and Samples required by the Specification Sections.

B. Alternates
   1. If the Contractor elects to submit an Alternate that is equivalent or superior, the Contractor will be responsible to make all modifications to the Work resulting from the use of the Alternate at no additional cost to the Owner.
   2. If the Contractor elects to submit an Alternate, the Contractor must follow the procedures listed in Section 01630 – Substitutions and Product Options.

2.2 SHOP DRAWINGS

A. Shop Drawings are required for each and every element of the work. Each shop drawing shall be assigned a sequential number for purposes of easy identification, and shall retain its assigned number, with appropriate subscript, on required resubmission.

B. Shop Drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills of material, manufacturers data, spare parts lists, and other data prepared by the Contractor, his subcontractors, suppliers, or manufacturers which illustrate the manufacturer, fabrication, construction, and installation of the work, or a portion thereof.

C. The Contractor shall submit to the Engineer a minimum of six (6) copies of Shop Drawings and approved data. The Engineer will retain three (3) copies (for Owner's, Engineer's and Field Representative's files) and return three (3) copies to the Contractor for distribution to subcontractors, suppliers and manufacturers. If the Contractor requires more than three (3), then the number of copies submitted shall be increased accordingly.

D. The Contractor shall provide a copy of a completed submittal certification form which shall be attached to every copy of each shop drawing. Shop Drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for the work.

E. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.

F. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as hereinabove provided and reviewed for conformance to the Contract requirements. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.

G. Until the necessary review has been made, the Contractor shall not proceed with any portion of the work (such as the construction of foundations), the design or details of which are dependent upon the design or details of work, materials, equipment or other features for which review is required.

H. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. Shop drawings shall be of standardized sizes to enable the Owner to maintain a permanent record of the submissions. Approved standard sizes shall be: (a) 24 inches by 36 inches; (b) 11 inches by 17 inches, and (c) 8-1/2 inches by 11 inches. Provision shall be made in preparing the shop drawings to provide a binding margin on the left-hand side of the sheet. Shop drawings submitted other than as specified herein may be returned for re-submittal without being reviewed.

I. Only drawings, which have been checked and corrected by the fabricator, should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Drawings and Specifications in all respects. All drawings which are correct shall be marked with the date, checker's name, and indication of the Contractor's approval, and then shall be submitted to the Engineer.

J. If a shop drawing shows any deviation from the Contract requirements, the Contractor shall make specific mention of the deviations in his letter of transmittal.

K. Should the Contractor submit equipment that requires modifications to the structures, piping, electrical conduit, wires and appurtenances, layout, etc., detailed on the Drawings, he shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications.

L. A maximum of two submissions of each Shop Drawing will be reviewed, checked, and commented upon without charge to the Contractor. Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Drawings and Specifications, and which are required by virtue of the Contractor's neglect or failure to comply with the requirements of the Drawings and Specifications, or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of each Shop Drawing, will be reviewed and checked as deemed necessary by the Engineer, and

the cost of such review and checking, as determined by the Owner, and based upon Engineer's documentation of time and rates established for additional services in the Owner-Engineer Agreement for this Project, may be deducted from the Contractor to make all modifications and/or corrections as may be required by the Engineer in an accurate, complete, and timely fashion.

2.3 SAMPLES

A. The Contractor shall submit samples when requested by the Engineer to establish conformance with the specifications, and as necessary to define color selections available.

2.4 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall furnish the Engineer six (6) copies of a complete instruction manual for installation, operation, maintenance, and lubrication of each item specified. At least three months prior to the expected substantial completion date, the Contractor shall submit to the Engineer all manuals in accordance with the requirements specified herein.

B. Manuals shall include operating and maintenance information on all systems and items of equipment. The data shall consist of catalogs, brochures, bulletins, charts, schedules, equipment numbers, shop drawings corrected to as-built conditions, wiring diagrams, and assembly drawings which shall describe location, operation, maintenance, lubrication, operating weight, lubrication charts showing manufacturer recommended lubricants for each rotating or reciprocating unit, and other necessary information for the Engineer to establish a complete maintenance program.

C. The submittal shall also include details of all replacement parts; "Nameplate" data for all equipment; detailed instructions for start-up, normal operation, shutdown procedures, and control techniques; and a guide to troubleshooting the system.

2.5 MANUFACTURER'S CERTIFICATES AND WARRANTEE

A. Prior to accepting the installation, the Contractor shall submit manufacturer's certificates and warrantees for each item specified.

B. Such manufacturer's certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction and that the installation meets all conditions of the guarantee/warrantee period. All costs for meeting this requirement shall be included in the Contractor's bid price.

C. Certified performance test data will also be submitted to the Engineer as required by the specifications.

2.6 SUBMISSION REQUIREMENTS

A. Accompany submittals with transmittal letter, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. The number of each Shop Drawing, Project Data and Sample submitted.
   5. Notification of deviations from Contract Documents.
   6. Other pertinent data.

B. Submittals shall include:
   1. Date and revision dates.
   2. Project title and number.
   3. The names of:
      a. Engineer.
      b. Contractor.
      c. Subcontractor.
      d. Supplier.
      e. Manufacturer.
      f. Separate detailer when pertinent.
   4. Identification of product or material.
   5. Relation to adjacent structure or materials.
   6. Field dimensions, clearly identified as such.
   7. Specification section number.
   8. Applicable standards, such as ASTM number or Federal Specification.
   9. A blank space, 4" x 4", for the Engineer's stamp.
   10. Identification of deviations from Contract Documents.
   11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.
   12. Where specified or when requested by the Engineer, manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
   13. Where specified, manufacturer's guarantee.

2.7 RESUBMISSION REQUIREMENTS

A. Revise initial drawings as required and resubmit as specified for initial submittal.

B. Indicate on drawings any changes which have been made other than those required by Engineer.

2.8 ENGINEER'S REVIEW

A. The review of shop and working drawings hereunder will be general only, and nothing contained in this specification shall relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified thereunder.

PART 3 -- PRODUCTS

(NOT PART OF THIS SECTION)

PART 4 -- EXECUTION

(NOT PART OF THIS SECTION)

SUBMITTAL CERTIFICATION FORM

PROJECT: _____

CONTRACTOR'S PROJ. No: ____ ENGINEER'S PROJ. No: _____

CONTRACTOR: _____ ENGINEER: _____

TRANSMITTAL No: _____ SHOP DRAWING No: _____

SPECIFICATION OR DRAWING NUMBER: _____

DESCRIPTION: _____

MANUFACTURER: _____

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment meets or exceeds the project specification requirements with

_____ NO DEVIATIONS

or

_____ A COMPLETE LIST OF DEVIATIONS AS FOLLOWS

By: _____ By: _____

Contractor[b] Manufacturer[c]

Date: _____ Date: _____

[a] Any deviations not brought to the attention of the Engineer for review and concurrence shall be the responsibility of the Contractor to correct, if so directed.

[b] Required on all submittals

[c] When required by specifications

SECTION 01562
DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. Work Included: Furnish water truck and apply water to the road surfaces on a daily basis, unless rain is imminent. Use mechanical street sweeper on paved surfaces or sweep paved surfaces on a daily basis.

B. The Contractor shall have a water truck on site at all times.

C. Dust control operations will be required multiple times daily and on weekends when needed.

D. Dust control work shall be incidental to the appropriate items of the Contract unless a separate unit item is provided

PART 2 - PRODUCTS

2.1 MATERIALS

A. Water for Sprinkling: Clean, free of salt, oil, and other injurious matter.

B. Calcium Chloride: Meet the requirements of AASHTO M144.

C. Street Sweeper: Mechanical street sweeper with watering device able to pick up and haul away debris.

PART 3 - EXECUTION

3.1 APPLICATION

A. Water: Use suitable equipment including a tank with gauge equipped pump or spray bar. Apply water 2-3 times a day and on weekends as needed.

B. Calcium Chloride: Apply at a rate sufficient to maintain a damp surface but low enough to assure non-contamination of water courses.

3.2 PROTECTION

A. Perform all Dust Control Work in a manner that will prevent damage to public and private property from dust and the materials used.

B. Repair, replace or make payment for all damage caused by Dust Control Work at no additional cost to the Owner.

C. Street sweeping: Minimum of once per week and as needed or requested by the Engineer.

END OF SECTION

SECTION 01570
TRAFFIC REGULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Contractor shall provide a Traffic Control Plan for approval by the Engineer and the Owner.
   2. Provide all materials and perform all work necessary to completely regulate traffic in the area of Work.
   3. Provide Dust Control in accordance with Section 01562.
   4. Perform all work in such a manner as to provide safe passage at all times for the public and with a minimum of obstruction to traffic.
   5. Do not close roads or streets to passage of the public without the permission of the Public Works Department.

B. The City of Portsmouth DPW will decide if adequate Traffic Control is being maintained and shall have the authority to require the Contractor to take any additional steps necessary to maintain safe passage.

1.2 SCHEDULING WORK

A. The Contractor shall schedule and maintain work so that one-lane traffic is maintained at all times, unless road closures are approved by the Public Works Department.
B. Revise the plan of work if it will create a traffic hazard.
C. Do not start work in any new location without the permission of the Engineer.
D. Notify all police and fire departments of all scheduled detours and when streets are reopened.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND BARRICADES

A. An overview plan of the work area has been provided following this specification for the Contractor's use in developing the traffic control plan.
B. Do not perform work without providing adequate warning signs, barricades, signal lights, watchmen and take other necessary precautions for the safety of the public.
C. Provide and illuminate suitable warning signs to show where construction, barricades or detours exist.
D. Provide barricades of substantial construction and painted with a finish that increases visibility at night.
E. Keep signal lights illuminated at all barricades and obstructions from sunset to sunrise.
F. Maintain all necessary signs, barricades, lights, watchmen and other safety precautions during authorized suspension of the Work, weekends, holidays or other times when the Work is not in progress.
G. Traffic control signs for construction work shall be located and of the size and type as outlined in Manual on Uniform Traffic Control Devices for Streets and Highways (latest edition) as published by U.S. Department of Transportation.

PART 3 - EXECUTION

3.1 DETOURS

A. Detours will only be allowed with pre-approval from the owner at least 48 hours in advance.
B. Notify the Public Works Department who will coordinate with the Police and Fire Departments of all scheduled detours and when streets are reopened.
C. Provide, identify and maintain suitable detours when the project, or any part thereof, is closed to public travel. Closure of public travel on any portion of the project shall be coordinated with the City Police and Fire Departments as well as the Department of Public Works. A minimum of 48-hours notice shall be provided for planned shutdowns and detours are required to complete the work.
D. When the closed part of the project is reopened, restore the detour area and any other disturbed areas to the original condition and immediately

3.2 INCONVENIENCE TO RESIDENTS OF VICINITY

A. Whenever a traveled way is closed, perform the Work in such a manner that local travel and residents in the vicinity of the Work will be inconvenienced as little as possible.
B. Allow access to residents and abutting landowners along the project to driveways and other normal outlets from their property.

3.3 UNIFORMED POLICE OFFICERS

A. The Contractor shall use uniformed police officers in locations required by the Owner.
B. Arrange police detail with the local Chief of Police.
C. Any police officers, whether regular, reserve, special or otherwise, shall be employed by the Contractor.

3.4 PEDESTRIANS

A. Maintain safe pedestrian corridors throughout project area.
B. Protect and/or barricade uneven or irregular surfaces impacted by construction.

END OF SECTION

Scope of Work

Furnish, install and test all site work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

Contents of Division

SECTION 02100
SITE WORK

A. WORK INCLUDED

1. Work under this Section includes all work specified herein including Site Preparation, Earthwork and Cleanup & Restoration upon completion of such construction to the extent practicable. Site work shall consist of all work necessary to complete the project that is not covered under a separate bid item but that is indicated or reasonably implied in the drawings, shall be included in Items B through D described below.

B. SITE PREPARATION

1. Clearing and Grubbing
   a. Clearing & Grubbing shall be done in accordance with Section 02110 and Section 02118 as modified herein.
   b. Clearing shall be carefully controlled, and exact limits shall be laid out and approved before any clearing is done. Methods shall ensure against damage to trees to remain. Clearing in easements shall be at an absolute minimum of tree removals. Damaged or scarred trees to remain shall be trimmed of damaged branches and treated with wood paint promptly. Burning and/or chipping shall conform to all applicable State and City regulations.
   c. Clearing & Grubbing shall include tree removal for all trees required to be cleared regardless of diameter.
   d. The stumps of all trees and brush cleared shall be removed, together with all major roots and satisfactorily disposed of away from the project.
   e. All clean loam grubbed from the work area shall be stockpiled and used for loaming and seeding at project clean up. The CONTRACTOR shall stockpile at a location approved by the ENGINEER.
2. Demolition, Removal
   a. The contractor shall remove all asphalt, bit. concrete, ruble, debris, boulders, etc., and all material necessary around entire site prior to construction.
   b. As required to complete the work, remove abandoned utilities.
   c. All materials encountered/removed that are not wanted (salvaged) by the City are to be removed and legally disposed of by the Contractor.

C. EARTHWORK

Earthwork shall be done in accordance with applicable technical specifications and as required on the project plans.

1. Earthwork & Miscellaneous Site Work
   a. This work shall consist of excavation of all material; excavation support (sheeting and shoring if required); dewatering; placement and compaction of all material required for the work, and necessary disposal of all other material. Embankment-in-place shall consist of furnishing common borrow, placing and compacting the total volume of embankment material required to construct fills below subgrade and within template lines as shown on the plans.

b. Earthwork and miscellaneous site work shall consist of support or replacement of existing utilities, sawcutting pavement, stripping and stockpiling of topsoil, excavation of all materials, backfill, cut and fill, providing borrow, compaction and grading required to complete the project, including but not limited to excavation to subgrade, embankment in place, base gravel preparation, swales and blending in of slopes.

c. Other earthwork not mentioned here but indicated or reasonably implied in the drawings shall be included in the work of this section. Any saw-cutting of pavement, or grinding for transitioning to existing pavement, shall be considered incidental to the site work.

D. CLEANUP & RESTORATION

Cleanup & Restoration shall be done in accordance with applicable technical specifications and as required on the project plans. Restoration shall include items such as turf establishment, project cleanup, removal and replacement of existing signs and similar construction as required for all equipment, materials, labor and incidental work necessary for the satisfactory completion of the work. Any restoration item not specifically mentioned here, but necessary to restore conditions to their original form, is considered incidental to this item.

1. Turf Establishment

   Turf Establishment shall include grading; preparation of subgrade and surface; placement, spreading, and furnishing and grading of loam; application of seed, fertilizer, lime & mulch (hydraulic); watering seeded areas on a regular basis; ensuring proper growth of grass; and all work required for turf establishment.

END OF SECTION

SECTION 02110
CLEARING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Clearing work, when applicable, includes but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, signs, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of unsalvageable structures and materials, and necessary preliminary grading.

B. Limits of Work:

1. Perform clearing work within the areas required for construction or as shown on the Drawings and to a depth of 12 inches below the existing grade.

2. Perform additional clearing work within areas and to depths which, in the opinion of the Engineer, interfere with excavation and/or construction.

C. Work Not Included: Clearing and/or grubbing work performed for the convenience of the Contractor will not be considered for payment.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Dispose of combustible material by burning only when permitted by and in accordance with all applicable local and state laws, ordinances, and code requirements.

B. Remove and dispose of unsalvageable structures and material in accordance with all applicable local and state laws, ordinances, and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all materials required to complete the Work.

B. Timber and Wood:

1. All timber and wood greater than 4" in diameter within the limits of clearing for easements across all private property shall become the property of the private property owner. Such timber and wood shall be stacked in log lengths on the private property just beyond the construction easement boundary.

2. All timber and wood removed from within the limits of clearing for construction across the property of the Owner shall become the property of the Contractor.

C. Restore materials and structures to be replaced to their original condition and location.

D. Repair all damage to structures using the same materials contained in the structures, to the complete satisfaction of the Owner, Engineer, and the property owner.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully preserve and protect from injury all trees and shrubs not to be removed.

B. No trees shall be cut until designated by the Engineer. Particular reference is made to fruit, ornamental or shade trees or other plants. Cut or scarred surfaces of trees or shrubs selected for retention shall be painted with an approved wound dressing treated according to other accepted arboricultural practices.

C. The Contractor may be required to file an intent to cut and shall pay all charges, fees, and taxes as may be required under Chapter 79 of the RSA.

D. Right-of-Way

1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the Engineer's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.
2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Engineer, essential for construction operations.
3. Replace all other removals and repair all damage at no additional cost to the Owner.

3.2 PERFORMANCE

A. Clearing:

1. Remove and dispose of all trees, brush, slash, stubs, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except as otherwise on the Drawings or as directed by the Engineer.
2. Remove all stumps unless otherwise directed by the Engineer.
3. Dispose of material to be removed daily as it accumulates.
4. Take special care to completely dispose of all elm trees and branches immediately after cutting either by burial in approved locations or, when permitted, by burning in areas well removed from standing elm growth.
5. Dispose of all brush and trees, not otherwise removed from cleared right-of-way, by chipping.

B. Protection of Wooded Growth:

1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove, and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged and are to be left standing and paint all cut surfaces with a suitable bituminous paint.

C. Disposal:

1. Remove from the site and dispose of material in locations approved or designated by the Owner.
2. All trees ordered to be cut and debris cleared shall become the property of and shall be disposed of by the Contractor, except as provided hereinafter.
3. Burning of trees, brush, slash, stubs, bushes or other combustible materials on the construction site is not allowed under this Contract.

3.3 REPLACEMENT OF MATERIALS

A. Paving, Curbing and Miscellaneous Material:

1. Remove and replace all paving, subpaving, curbing, gutters, brick, paving block, granite curbing, flagging and minor structures over the areas to be excavated.
2. Remove and replace bituminous asphaltic and Portland cement concrete in accordance with the appropriate Sections of these Specifications.
3. Properly store and preserve all material to be replaced in a location approved or designated by the Owner.

B. Shrubs and Bushes: Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.

C. Topsoil: When applicable, carefully remove, store and protect topsoil in accordance with the appropriate Section of this Division.

D. Responsibility: Replace, at no additional cost to the Owner, all materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02220
EXCAVATION - EARTH

PART 1 -- GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Excavation work includes the removal of all subsurface materials except ledge and rock (as defined in Section 02224 – Excavation – Ledge) necessary to install the facilities as designed.
   2. All excavation shall be classified as earth or ledge/rock.

B. Work Specified Elsewhere. This Section is not a stand-alone Section. Other requirements which relate to this Section are noted elsewhere in these documents. The Contractor and all Subcontractors are required to review this entire document along with the Drawings in an effort to identify all requirements.

1.2 JOB CONDITIONS

A. Utilities:
   1. The information about known utilities was collected from the owning agency and may or may not have been supplemented by additional field survey or investigation.
   2. The approximate locations of known buried and overhead utilities are shown on the Drawings. No guarantee is made as to the accuracy or correctness of the locations shown and to the completeness of the information given. The Contractor is responsible for confirming the location of utilities in the field prior to commencement of work.
   3. Discontinue excavation by machinery when the excavation approaches pipes, conduits, or other underground structures of which the approximate locations are known. Use manual excavation methods to locate the utilities.

B. Existing Structures:
   1. Perform excavation in such a manner that will prevent any possibility of undermining or disturbing existing structures, utilities, and work previously completed under this Contract.
   2. Where existing buildings and other structures are in close proximity to the proposed construction, exercise extreme caution and utilize sheeting, bracing, and all other precautionary measures that may be required.

C. Repairing Damage: Repair all damage to existing utilities, structures, grassed, or paved areas which results from construction operations, at no additional cost to the Owner, to the complete satisfaction of the Owner, the Engineer, the utility company and the property owner.

D. Do not leave any trenches open overnight. Unless otherwise approved by the Owner, all trenches shall be completely backfilled at the end of each day

E. Unless authorized in writing by the Owner, all roadways shall be opened to full width two-lane traffic at the end of each day.

F. Erect a barrier around all structure excavations to prevent the entry of unauthorized individuals.

PART 2 -- PRODUCTS

2.1 UNSUITABLE MATERIAL:

A. If, in the opinion of the Engineer, the material encountered above the indicated grade as shown on the Drawings for excavation is unsuitable the Contractor shall remove the material to the widths and depths as directed by the Engineer.

B. If, in the opinion of the Engineer, the material encountered at or below the indicated invert or grade shown on the Drawings for excavation is unstable (as determined by the Engineer), the Contractor shall remove the material. Replace this material with thoroughly compacted bank run gravel or crushed stone bedding material as shown on the Drawings, or as directed by the Engineer.

C. Materials made unsuitable by Contractor's construction methods shall be suitably dried for reuse or removed from the site and replaced with suitable materials at no additional cost to the Owner. This material shall not be eligible for payment as unsuitable material.

D. Materials determined unsuitable only due to moisture content shall be aerated and stockpiled and may be used as suitable backfill with the approval of the Engineer.

2.2 DISPOSAL OF EXCESS MATERIAL:

A. All excess material that is, in the opinion of the Engineer, suitable shall remain the property of the Contractor unless specified otherwise in Section 01611 - Owner's Right to Materials.

2.3 DISPOSAL OF UNSUITABLE MATERIAL:

A. All unsuitable material shall become the property of the Contractor unless specified otherwise in Section 01611 - Owner's Right to Materials.

2.4 DISPOSAL OF MATERIAL:

A. Disposal of excess and unsuitable material shall be the responsibility of the Contractor.

B. Dispose of suitable and unsuitable material in accordance with applicable environmental law, and if applicable, at the locations acceptable to the Owner and/or funding agency.

C. The property owners where the material is disposed of shall sign a release form indemnifying the Owner, Engineer, and Contractor from any liability of disposal of the said material.

2.5 EMBANKMENT MATERIAL:

A. Obtain prior approval and instructions from the Engineer prior to undertaking the excavation for pipe placement of any fill material that has been in an embankment for less than one year.

B. Prior to the installation of any pipe, determine by means of compaction testing that the base material is suitably dense to support the pipe.

PART 3 -- EXECUTION

3.1 PERFORMANCE

A. Structure Excavation:

1. Amount of excavation:
   a. Excavate areas large enough to provide suitable room for building or placing the structures.
   b. The extent of open excavation shall be controlled by prevailing conditions.

B. Trench Excavation:

1. General:
   a. Unless otherwise specifically directed or permitted by the Engineer, begin trench excavation at the low end of gravity lines and proceed upgrade.
   b. Perform excavation for force mains and water mains in a logical sequence.
2. Amount of Excavation:
   a. Trench width: As shown on the Drawings.
   b. Trench depth: As shown on the Drawings.
   c. Open Excavation:
      1). The extent of open excavation shall be controlled by prevailing conditions.
      2). Open excavation shall, at all times, be confined to the limits acceptable to the Owner.

C. Unauthorized Excavation:

1. Backfill and compact to the specified grade, any excavation beyond the limits stated above for trench excavation and as shown on the Drawings (unless specifically ordered otherwise by the Engineer) with material approved by the Engineer. Backfill material may be crushed gravel or crushed stone.
2. Backfill and compact unauthorized excavation at no additional cost to the Owner.

D. Shoring and Bracing:

1. Structures: Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the Work, adjacent structures and property in accordance with all State and OSHA safety standards.
2. Trenches: As trench excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the Local, State and OSHA safety standards.

See additional requirements in Section 02369 – Sheeting.

E. Dewatering:

1. Control of surface water is a critical requirement of the work. All necessary actions shall be taken to minimize the effect of precipitation and runoff on the work. Upgradient runoff shall be diverted from active or completed work areas, and all work shall be graded and crowned to promote controlled runoff.

2. The Contractor shall prevent surface water and subsurface or groundwater from flowing into excavations or onto any work and from flooding the project site and surrounding area.
3. Water shall not accumulate in excavations. Contractor shall remove water to prevent softening of subgrades and soil changes detrimental to stability of the subgrade. The Contractor shall dewater excavated areas as required to perform the work, and in such a manner as to preserve the undisturbed state of subgrade material.
4. The Contractor shall provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Discharge of dewater lines shall be directed through a dewatering filter bag, Ultratech International or equal, to remove sediment prior to discharge into existing drainage basin or stabilized drainage swale.
5. The Contractor shall prevent migration of sediment in accordance with the erosion control requirements of this Contract.

F. Fencing:

1. Structures: Erect barriers around structure excavation and other dangerous locations created by the Work to prevent entry of unauthorized personnel and at no additional cost to the Owner.
2. Trenches: If the end of the trench is allowed to be left open during nonworking hours by the Owner. The Contractor shall place barriers to prevent entry of unauthorized personnel at no additional cost to the Owner.
3. Place fences and/or suitable barriers around equipment and material to prevent damage, theft, and injury to individuals.

END OF SECTION

SECTION 02224
EXCAVATION - LEDGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Trench excavation work in ledge includes the removal of ledge and rock required for the installation of pipes and/or structures. Blasting shall only be permitted on this project when mechanical means of ledge removal are proven ineffective.
2. All trench excavation shall be classed as earth or ledge.

A. Definitions:

1. "Ledge" shall be defined as any natural compound, natural mixture, and chemical element (e.g. solid piece of rubble concrete or masonry) required to be excavated that, in the opinion of the Engineer, can be removed from its existing position and state only by wedging, drilling and wedging, wedging, hoe-ramming, and breaking with power hand tools, or by extending the use of an approved excavating machine beyond normal and design wear and tear.
2. “Rock” shall be defined as single pieces of rock that are greater than two cubic yards. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer, it must be removed from its existing position by one of the methods mentioned above.

1.2 REFERENCE STANDARDS

A. Manual of Accident Prevention issued by the Associated General Contractor’s of America, Inc.

B. United States Bureau of Mines Report of Investigation RI-8507

C. International Society of Explosives Engineers (ISEE) Field Practice Guidelines for Blasting Seismographs

D. All blasting work shall comply with the following regulations:

1. City of Portsmouth Blasting Rules and Procedures (see Appendix C);
2. City of Portsmouth Ordinance Article VII: Section 5:02;
3. State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction – latest edition.
4. Storage and Transportation of explosives shall be in accordance with State of New Hampshire Code of Administrative Rules: Chapter/Part Saf-c 1600. In case of conflict, the more stringent regulation shall govern.

1.3 JOB CONDITIONS

A. Utilities:

1. The locations of known buried water lines, sewer lines, telephone cables, storm drains, culverts, gas mains, electric conduits and other utilities are shown on the Drawings. No guarantee is made as to the correctness of the locations shown and to the completeness of the information given.

2. Use manual excavation methods to locate existing utilities.

B. Existing Structures:

1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures and any work previously completed under this Contract.

2. Where existing buildings and other structures are in close proximity to the proposed construction, exercise extreme caution and utilize whatever precautionary measure that may be required.

C. Repairing Damage:

1. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional cost to the Owner, to the complete satisfaction of the Owner, the Engineer, the utility company and the property owner.

D. Backfill of Trenches:

1. Do not leave any trenches open overnight. Unless otherwise approved by the Owner, all trenches shall be completely backfilled at the end of each day

PART 2 - PRODUCTS

2.1 MATERIALS

A. Disposal of Suitable Material:

1. All material that is, in the opinion of the Engineer, suitable shall remain the property of the Owner.

2. Stockpile all suitable material in locations approved or designated by the Owner.

B. Disposal of Unsuitable Material:

1. All unsuitable material shall become the property of the Contractor unless specified otherwise in Division 1.

2. Dispose of unsuitable material at the locations acceptable to or designated by the Owner.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer lines and proceed upgrade.
2. Perform excavation for force mains and/or water mains in a logical sequence.

B. Amount of Excavation:

1. Trench width: As shown on the Drawings.
2. Trench depth: As shown on the Drawings.
3. Open Excavation:
   a. The extent of open excavation shall be controlled by prevailing conditions.
   b. Open excavation shall, at all times be confined to the limits acceptable to the Owner.
4. Unauthorized Excavation:
   a. Backfill to the specified grade, any excavation beyond the limits stated above and as shown on the Drawings (unless specifically ordered otherwise by the Engineer) with thoroughly compacted crushed stone or screened gravel.
   b. Backfill unauthorized excavation at no additional cost to the Owner.

C. Shoring and Bracing:

1. As the excavation progresses, install such shoring and bracing (i.e., trench box) necessary to prevent caving and sliding and to meet the requirements of the State and OSHA safety standards.

END OF SECTION

SECTION 02290
SEEDING

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section includes furnishing all labor, materials, equipment, seed and incidental materials necessary to accomplish all grass seeding and related work, complete in place, maintained, and accepted, in accordance with the Contact Drawings and Specifications. All grassed areas disturbed by the Contractor's operations shall be repaired as herein specified.

B. The Contractor shall bear the responsibility and cost of furnishing and applying water or any other substances, as necessary to ensure the sustainability of grass seeded areas, as part of the work of this contract.

1.02 RELATED WORK:

A. Section 02329, LOAM BORROW AND TOPSOIL

1.03 SUBMITTALS:

In accordance with requirements of general specifications, the Contractor shall submit the following to the Engineer for review and approval:

A. Six copies of information for seed mixes including the following:

1. Name and address of the seed supplier.

2. Source of origin and dates of harvest for each of the various types of seed

3. Certification of seed mix composition and proportion, indicating named seed varieties by percent, percent germination, purity, and percent crop seed, percent inert matter, and percent weed seed content.

4. Estimated number of seeds per pound of each type of seed in the mix

5. Ingredients that comprise the hydroseed mix

B. Information detailing proposed limestone, fertilizers, mulch materials, hydroseeding materials (as required), and slope protection material (as required) to be applied to seeded areas.

C. Information on watering, fertilizing and maintenance schedule.

D. Marked up print indicating the square footage of all proposed seeded areas with quantities of various soil additives and amendments, and quantities of seed for each area prior to beginning work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. LOAM BORROW;

B. Loam Borrow shall be as specified in Section 02329, LOAM BORROW AND TOPSOIL.

B. LIMESTONE:

1. Lime shall be an approved agricultural limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide). The material will be ground such that 50 percent of the material will pass through a No. 100 mesh sieve and 98 percent will pass a No. 2 mesh sieve. Lime shall be uniform in composition, dry and free-flowing and shall be delivered to the site in the original sealed containers, each bearing the manufacturer's guaranteed analysis.

C. FERTILIZER:

1. Fertilizer shall be a complete, standard commercial fertilizer, homogenous and uniform in composition, dry and free-flowing, and shall be delivered to the site in the manufacturer's original sealed containers, each bearing the manufacturer's guaranteed analysis and marketed in compliance with State and Federal Laws. All fertilizer shall be used in accordance with the manufacturer's recommendations. Refer to Appendix A – Sand and Soil Amendments for required fertilizers. All fertilizers and soil amendments shall meet these requirements or be an approved equal.

D. SEED:

1. Seed shall be of an approved perennial variety mixture, the previous year's crop, clean, and high in germinating value. Weed seed content shall be less than 0.5 percent and include no noxious weeds. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates of compliance relative to mixture purity and germinating value. Seed shall be furnished and delivered in new, clean, sealed and properly labeled containers. All seed shall comply with applicable State and Federal laws. Seed that has become wet, moldy or otherwise damaged shall not be accepted.

2. Grass seed for general lawn areas shall conform to the following requirements:

Botanical and Common Names	Proportion by Weight	Germination Rate	Purity Minimum
Chewing's Fescue (Festuca rubra commutata)	33%	70%	97%
'Kentucky 31' Tall Fescue (Festuca arundinacea 'Kentucky 31')	33%	90%	98%
Kentucky Bluegrass (Poa pratensis)	24%	80%	85%
Perennial Ryegrass (Lolium perenne)	10%	90%	98%

G. MULCH

1. Materials to be used in mulching seeded areas shall be free of weed seed and shall conform to the following requirements:

   a. Hay Mulch shall consist of mowed and properly cured grass, clover or other acceptable plants. No salt hay shall be used.

   b. Straw Mulch shall consist of stalks or stems of grain after threshing.

H. HYDROSEED MULCH, TACKIFIERS AND WATER RETENTION AGENTS:

1. Wood fiber mulch for Hydroseed application shall be a manufactured product of natural wood cellulose fibers with a non-toxic green marking dye incorporated to ensure uniform distribution. Mulch shall be packed in sealed original containers, clearly labeled with brand name and manufacturer. It shall have delivered moisture content less than 12 percent.

1. Hydroseed tackifier shall be a powdered starch-based product approved by the Engineer. Hydroseed tackifier shall be applied in conjunction with the hydroseed slurry in accordance with the manufacturer's recommendations.

2. Moisture retention agent shall be a powdered starch-based product, approved by the Engineer, and shall be capable of retaining up to 400 times their weight in water. Moisture retaining agents shall be added to the hydroseed slurry in accordance with the manufacturer's recommendations. Moisture retention agent shall be 'Hydro-Gel', as manufactured by Finn Corporation, Fairfield, OH.

3. Contractor to submit mix ingredients prior to installation of hydroseed.

I. SLOPE EROSION PROTECTION:

1. Erosion control blanket shall be 100 percent biodegradable mesh with 100 percent biodegradable straw or straw/coconut fill. Fill shall be held together by biodegradable fastening. Weight shall be 0.50 pounds per square yard. Erosion control blankets shall be applied parallel to direction of water flow. The erosion control blankets shall be by North American Green, Evansville, IN or approved equal. For slopes 4:1 or greater, erosion control blanket shall be composed of 70 percent straw 30 percent coconut fiber, Model SC150. For slopes less than 4:1, erosion control blanket shall be high velocity straw matting, Model S150.

2. Six-inch wire staples shall be placed in accordance with the manufacturer's recommendations to anchor the mesh material. Staples shall be biodegradable.

J. WATER:

1. Water shall be furnished by the Contractor, unless otherwise specified, and shall be suitable for irrigation and free from ingredients harmful to plant growth and viability. The delivery and distribution equipment required for the application of water shall be the furnished by the Contractor, at no additional cost to the Owner.

PART 3 - EXECUTION

3.01 GENERAL:

A. All work shall be performed by skilled workers with a minimum of 2 years of seeded lawn construction and establishment experience and under the full-time supervision of a qualified foreman.

B. Seeding operations shall not begin less than 4 days after the application of lime and fertilizer and the seedbed areas are reviewed and approved by the Engineer.

C. Seeding shall be done when soil and weather conditions permit in early spring, until June 15, or from September 10 to October l5, unless otherwise approved. If it becomes necessary for seed to be sown after June 15, provisions shall be made for supplementary water and using mulch cover over lawn areas.

D. If there is a delay in seeding, during which weeds grow, or soil is washed out, the Contractor shall eliminate the weeds by physical means, or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.

E. Seed shall be sown at the approved rate, on a non-windy day by machine, or as approved by the Engineer.

F. The surface shall be kept moist by a fine spray until the seed shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 square feet, the Contractor shall reseed, roll, straw and water as necessary to obtain proper germination.

G. If there is insufficient time in the planting season to complete soil preparations, fertilizing, and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor, or on order of the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.

H. Protection of all newly loamed and graded areas is required and shall be accomplished by whatever means necessary such as mulch applied with a tackifier, or by other means approved by the Engineer. The Contractor shall be responsible for the prevention of siltation in areas beyond the limit of work and for all means of protection throughout the maintenance period at no additional cost to the Owner.

3.02 SURFACE PREPARATION:

A. Refer to Section 02329, LOAM BORROW AND TOPSOIL for surface preparation.

3.03 BROADCAST SEEDING, PLACING MULCH AND SLOPE EROSION PROTECTION:

A. The seed mix shall be broadcast at 6 pounds per 1000 square feet, as recommended by the seed supplier, or as directed by the Engineer. Seed shall be divided into 2 equal amounts and uniformly

distributed in 2 applications at right angles to each other. Seed shall then be raked lightly into the soil to a depth of l/4 inch.

B. If mulch is not necessary the seed shall be directly firmed into the soil with a roller that will apply pressure between 75 and 100 pounds per linear foot of width.

C. Hay or Straw Mulch shall be used based on time of seeding as previously specified over all seeded areas, as designated on the plans, or as otherwise directed. If mulch is to be used, it shall be loosely spread to a uniform depth at a rate of 4-1/2 tons per acre to provide ¼ inch of cover, or as otherwise directed. The seed and mulch shall then be firmed into the soil with a roller that will apply a pressure between 75 and 100 pounds per foot of width.

D. Hay or Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer, the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80 percent of the hay or straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.

E. Slope erosion control blankets shall be placed as indicated on the plans or as directed by the Engineer.

3.04 HYDROSEEDING:

A. The application of lime, fertilizer, grass seed and mulch may be accomplished in a single operation with the use of approved hydroseeding equipment. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The slurry shall be of such consistency that it can be sprayed from a hydroseed gun or through at least 200 feet of 1 ½ inch diameter hose. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of lime, fertilizer, grass seed, and mulch shall be equal to the specified quantities.

B. Prior to the start of hydroseeding, the Contractor shall furnish to the Engineer, in writing, the weights of limestone, fertilizer, grass seed, mulch, tackifier (as required) and moisture retention agent (as required) per 100 gallons of water to be used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of hydroseeding operations are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other means.

C. Seed shall be incorporated with the mulching material to obtain minimum hydroseeded sown coverage of 200 pounds of the specified seed mix per acre, as recommended by the seed suppliers, or as directed by the Engineer.

D. Wood fiber mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise directed. Mulch shall be placed by spraying from an approved spraying machine with pressure sufficient to cover the entire area in a single operation.

E. The Contractor shall immediately cleanup hydroseed oversprays from plant materials, pavements, furnishings, etc., to the satisfaction of the Engineer.

3.05 MAINTENANCE:

A. The Contractor shall maintain the entire seeded area, as necessary to ensure dense healthy growth, until completion of the guarantee period and final acceptance of the project which is two full growing seasons. If lawns are planted in late summer or during the fall, maintenance shall continue through the following fall. Maintenance shall include watering as specified, liming, fertilizing, removal of stones, control of weeds, insect pests and fungal pathogens, and regular mowing. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.

B. The first cutting of lawn areas shall be done when the grass is between 2 ½ - 3 inches in height. The lawn shall be cut no shorter than 2 inches in height and shall be regularly mowed as necessary to maintain the above-prescribed conditions. All cuttings shall be removed from the lawn during the maintenance period and disposed of off-site. Cutting shall be accomplished with approved equipment that is weed free, clean of all herbicides and pesticides and has freshly sharpened blades. No mowing shall occur without inspection and approval of the owner or Engineer.

C. The Contractor shall be responsible to regularly water seeded areas with the equivalent of 1-inch minimum of rainfall per week, or as necessary to develop and sustain dense, green growth.

D. Six weeks after turf has established, and only during the months of April, May, or September, the Contractor shall apply fertilizer as specified above, at one half the rate recommended by the initial soils laboratory tests, or as directed by the Engineer.

E. The Contractor shall be responsible for securing all seeded areas from physical damage as necessary, including warning signs, barriers, temporary fencing, or other means of protection, FOR TWO COMPLETE GROWING SEASONS AFTER INSTALLATION through the guarantee period until final acceptance. All damaged areas shall be repaired to reestablish healthy vigorous growth of turf to the satisfaction of the Engineer, at no additional cost to the Owner. All field protection fencing is to be 6’ tall chain link with driven posts and two 10’ gates to allow access for maintenance and shall remain the property of the Contractor and shall be removed by the Contractor upon final acceptance by the Engineer.

F. Pavement shall be kept clean and clear of cuttings and debris at all times during the maintenance period to the satisfaction of the Engineer.

3.06 INSPECTION AND PRELIMINARY ACCEPTANCE:

A. At the beginning of the planting season following that in which the permanent grass crop is sown, seeded areas will be inspected. Any section not showing dense, vigorous growth shall be promptly reseeded by the Contractor at no additional cost to the Owner. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor, as many times as necessary, in accordance with these specifications, until they are accepted.

B. The Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of inspection for preliminary acceptance. The Engineer shall recommend preliminary acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals, or replacements.

C. Inspection and acceptance of seeded areas may be requested and granted in part, provided the areas for which acceptance is requested are relatively substantial in size, and with clearly definable boundaries. Acceptance and use of these areas by the Owner shall not waive any other provisions of this Contract.

3.07 GUARANTEE:

A. Seeded areas shall be guaranteed until final acceptance of the project, or, in the case of late summer or fall planting, the guarantee period shall extend through the following fall.

B. When the work is accepted in part, the guarantee period shall extend from each partial acceptance to the terminal date of the last guarantee period. All guarantee periods terminate at one time.

C. Guarantee shall not apply to the replacement of seeded lawns resulting from the removal, loss, or damage due to occupancy of the project in any part; vandalism or acts of neglect on the part of others; physical damage by animals, vehicles, etc.; and natural disasters, including but not limited to, catastrophic fire, hurricanes, etc.

D. In the instance of curtailment of water by local water authorities (when supply was to be furnished by the Owner), the Contractor shall furnish all necessary water by water tanker, the cost of which will be approved and paid for by the Owner.

3.08 FINAL INSPECTION AND FINAL ACCEPTANCE:

A. At the end of the guarantee period, the Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of final inspection for final acceptance.

B. The Engineer shall recommend final acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

END OF SECTION

SECTION 02329
LOAM BORROW AND TOPSOIL

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. Under this Section, the Contractor shall furnish all labor, materials, equipment and transportation required to furnish and place 6" Loam Top Soil as shown on the drawings and as specified. Where proposed tree and shrub planting mix and/or sod or seed is noted on the drawings, it shall be composed of Loam Borrow, or Topsoil in compliance with this specification.

1.02 SAMPLES/TESTS:

A. The Contractor shall furnish a Certified Laboratory Report showing the soils classification and nutrient analysis of representative samples of the proposed Loam to be used, including the extent of lime and fertilizer required. Samples submitted for approval must be representative of the total volume to be furnished, taken in the presence of the Engineer, and delivered to a certified laboratory by the Contractor; all costs for such shall be borne by the Contractor.

B. At least ten (10) days prior to shipment/delivery of materials, the Contractor shall submit to the Owner a one (1) cubic foot representative sample, certifications, certified test results for materials as specified below. The Contractor shall provide a listing of the addresses (locations) identifying the origin of the soil to be delivered. If the origin is from multiple locations, all locations shall be provided at the time of submission of required information specified above. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Owner. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner shall reserve the right to reject, on or after delivery, any material that does not meet these Specifications.

C. If the material does not conform to the above requirements it shall be rejected and additional sources shall be found. Sampling and testing shall be accomplished as specified herein until an approved material is found, all at the Contractor's expense.

D. To assure that materials fulfill specified requirements regarding textural analysis, organic matter content, pH, and fertility testing may be undertaken:

1. Prior to site delivery; at source;

2. At time of delivery; on-site; and/or

3. Immediately following spreading on site. Soil sampling shall also indicate if specified soil was supplied uniformly to the minimum specified depth.

1.03 STANDARDS:

A. ASTM - American Society for Testing and Materials.

1.04 NOTIFICATION:

A. The Contractor shall notify the Owner in writing at least ten (10) days in advance of the time he intends furnishing Screened Loam Borrow stating the location and amount of such deposit, the name and address of the supplier and also shall furnish such facilities, transportation and assistance as the Owner may require for collecting and forwarding samples.

PART 2 - MATERIALS

2.01 LOAM TOPSOIL:

A. In accordance with the specific requirements of this project, existing on-site soil may be re-used as Loam Borrow only if it meets this Specification. Existing topsoil that does not meet this Specification may be re-used only up to the subgrade elevation within the limits of areas to receive new Loam Borrow. The Contractor shall furnish all required Loam Borrow, from off site sources, as necessary, to complete the project.

B. Screened Loam shall be "fine sandy loam" or "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA" Classification System". Screened Loam has the following mechanical analysis:

Textural Class	Percentage of Total Weight	Average Percentage
Sand (0.05 – 2.0mm)	45 – 75	60
Silt (0.002 – 0.05mm)	15 – 35	25
Clay (Less than 0.002mm)	5 – 20	15

C. Screened Loam shall be a natural product consisting primarily of natural topsoil, free from subsoil, and obtained from an area that has never been stripped, as noted above, the location of the source of the loam must be submitted to the Owner. Loam shall not contain less than five percent (5%) nor more than ten percent (10%) organic matter as determined by the loss on ignition of oven-dried samples, at 100°C ± 5°C. To adjust organic matter content, the soil may be amended, prior to site delivery, by the addition of composted leaf mold or peat moss. Use of organic amendments is accepted only if random soil sampling indicates a through incorporation of these materials. No mixing or amending of Loam will be permitted on site. The Loam shall not be delivered when in a wet or frozen condition.

D. Loam shall consist of fertile, friable, natural loam capable of sustaining vigorous plant growth. Loam shall be without admixture of subsoil, and refuse, resulting in a homogeneous material free of stones greater than ½" in the longest dimension, be free of lumps, plants, glass, roots, sticks, excessive stone content, debris, and extraneous matter as determined by the Owner. Loam shall be within the pH range of 6.0 to 6.5 except as where noted on plans and details. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The maximum soluble salt index shall be 100. Screened Loam shall not have levels of aluminum great than 200 parts per million.

E. If limestone is required to amend the screened loam to bring it within a pH range of 6.0 to 6.5 no more than 200 pounds of limestone per 1,000 square feet of loam, incorporated into the soil, or 50 pounds of limestone per 1,000 square feet of loam, surface application, within a single season.

F. The Owner will reject any material delivered to the site that does not meet these Specifications after post-delivery testing. If the delivered screened loam does not meet the specifications stated in this document, the delivered screened loam will be removed by the Contractor at the Contractor's expense and at the time of rejection.

G. The topsoil shall not be handled or moved when in a wet or frozen condition.

H. Topsoil structure shall not be destroyed through excessive and unnecessary handling or compaction. Inappropriate handling leading to the compaction or deterioration of soil structure will result in rejection of topsoil for use

I. At no time should equipment or material rest on the soil.

J. Loam Topsoil shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to, or less than, 1.0 millimhos/cm. (test material passing #4 sieve).

PART 3 - EXECUTION

3.01 PLACEMENT:

A. The Contractor shall furnish and spread Loam topsoil to the depths shown on the contract drawings, which depth shall be the minimum required depth after settlement. No compaction shall be required beyond that extent necessary to place sod or to plant trees and shrubs to ensure against unevenness or settling below accepted growth lines.

3.02 ADDITIVES:

A. The Contractor shall apply all necessary fertilizer and lime to the soil in accordance with the manufacturer and laboratory's recommendations and as required by the sodding, seeding and/or planting specifications referenced elsewhere.

END OF SECTION

SECTION 02402
DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall provide all materials, equipment, and labor necessary for the removal of water and as required to provide silt and erosion control devices.

2. The Contractor shall build all drains and do all ditching, pumping, bailing, and all other work necessary to keep the excavation clear of ground water, or storm water during the progress of the work and until the finished work is safe from damage.

1.2 RECOMMENDED GUIDES

A. AASHTO Highway Drainage Guidelines, Volume III, Guidelines for Erosion and Sediment Control in Highway Construction, American Association of State Highway and Transportation Officials, Inc., 444 North Capital St. N.W., Suite 249, Washington, D.C. 20001.

B. Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, New Hampshire Department of Environmental Services, Public Information Office, P.O. Box 95, 6 Hazen Drive, Concord, New Hampshire.

C. Storm Water Phase II Compliance Assistance Guide, Section 5 Small Construction Activity, United State Environmental Protection Agency, Publication No. 833-R-00-003.

1.3 SUBMITTALS

A. The Contractor shall furnish to the Engineer an Erosion and Sediment Control and Stormwater Management Plan (ESCSMP) plan for dewatering and diverting surface water before beginning the construction work for which the diversion is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

B. The Contractor shall provide the appropriate National Pollutions Discharge Elimination System (NPDES) permit number prior to the start of construction.

1.4 SUBSURFACE CONDITIONS

A. When available, locations of test borings and pits are shown on the Drawings. The boring logs are included in the Appendix of these Specifications.

B. Variations in subsurface conditions should be anticipated by the Contractor when planning and estimating the work due to seasonal water level fluctuation.

PART 2- PRODUCTS

2.1 MATERIALS

A. Provide, operate, and maintain a dewatering system to remove all water from excavations and trenches containing pumps, drains, wellpoints, piping and any other facilities necessary to keep the excavations and trenches free of water, including spare units available for immediate use in the event of equipment breakdowns.

PART 3 – EXECUTION

3.1 REMOVAL OF WATER

A. The Contractor shall install and maintain any required dewatering systems such that all work shall be done in dry conditions. The Contractor shall construct and maintain all necessary protective works, shall furnish all materials required and shall furnish, install, maintain and operate all necessary equipment for the removal of water and control of water in the work area as required.

Water pumped from excavations shall be piped to points discharging into approved treatment facilities prior to discharging into water courses.

3.2 DIVERTING SURFACE WATER

A. The Contractor shall build, maintain, and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protection works needed to divert drainage, streamflow, stormwater discharge and other surface water through or around the construction site and away from the construction work while construction is in progress. Unless otherwise specified, stream diversion must discharge into the same natural drainageway it originally flowed into.

3.3 EXCAVATION DEWATERING

A. At least two weeks prior to the start of construction in any areas of anticipated dewatering, submit a proposed initial plan for removal of water, method of excavation and support of the excavation to the Engineer for review. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by the Engineer. Concurrence by the Engineer with the Contractor's initial plan shall be the Engineer's agreement that the plan is satisfactory for initial trial.

B. Evaluate the impact of the anticipated subsurface soil/water conditions on the proposed method of excavation and removal of water.

C. Construct all elements of the BMP facilities in the dry. Excavate in the dry and not until the water level, as indicated by groundwater observation wells, is a minimum of six inches below the proposed bottom of final excavation. Where groundwater level is above the bottom of the proposed excavation level, install and operate a pumped dewatering system, including well points and/or sumps or closely spaced wells.

D. Provide and maintain, at all times during construction, proper facilities and equipment, including standby pumps, to promptly and adequately remove and dispose of all water entering excavations.

E. Conduct dewatering and excavation, at all times, in such a manner to preserve the natural undisturbed capacity of the subgrade soils supporting overlying or adjacent structures and to preserve the pipe bearing soil.

F. Pre-drain the soils prior to final excavation, and maintain the lowered groundwater level until construction has been completed to such an extent that all elements of the BMP facilities will not be floated or otherwise damaged.

G. Surround well points and other dewatering units with suitable filter sand to prevent fines from being removed by pumping.

H. Water pumped from excavations shall be disposed of in an approved area so that backflow, pollution, or public nuisance will not occur.

3.4 COFFERDAMS

A. Design, construct, maintain, and remove cofferdams where necessary for the dewatering, control, and diversion of water to keep excavations free ofwater.

B. Design and construct cofferdams to withstand all imposed loads to prevent injury to persons and property. Construct cofferdams of sufficient height to prevent flooding and of such dimensions to give sufficient clearance for construction and inspection.

C. Remove cofferdams, including all sheeting and bracing, after the completion or permanent construction.

3.4 COFFERDAMS

A. If required, dewater the excavations and trenches using an efficient drainage wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated area.

B. Use well points designed for dewatering work.

C. Use pumping units designed to be used with wellpoints, capable of maintaining high vacuums, and capable of handling large volumes of air and water at the sametime.

3.5 TREATMENT OF PUMPED WATER

A. The Contractor shall provide the means of removing all sediment from water pumped from the excavation areas. This shall include the use of filter bags, sedimentation basins, check dams, and sedimentation fences or tanks.

3.6 EROSION CONTROL PROVISIONS

A. The discharge from pumping operations during dewatering operations shall be contained by a device so constructed as toprevent silt from spreading off-site.

B. Prior to removal of all sediment control devices all retained silt or other materials shall be removed at no additional cost to theOwner.

3.7 TURBIDITY

A. When there is visible turbidity within the ponds or streams caused by the construction, the polluting activity will cease until adequate controls can be installed to protect the brook. Sufficient operating and stand-by pumps and equipment shall be available to dewater and keep the work areas dry during the construction period. Utility costs, and connections shall be arranged and paid for by the Contractor.

3.8 REMOVAL OF TEMPORARY WORKS

A. After the temporary works have served their purpose, the Contractor shall remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

3.9 ENVIRONMENTAL PERMITS (IF APPLICABLE)

A. All work under this section shall be done in accordance with all federal, state, and local regulations, laws, and rules which may apply and any individual permits that have been obtained for the project.

END OF SECTION

SECTION 02540
TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Description of Work:

1. Comply with all Federal, State and local regulations pertaining to erosion and sediment control and stormwater management.
2. Prepare a Stormwater Pollution Prevention Plan (SWPPP) for review and approval prior to the start of any construction activities.
3. Submit NOTICE OF INTENT letter to the USEPA for approval. Post the appropriate permit number on site.
4. Provide all labor, equipment, materials and maintain temporary erosion control devices as described in the Plan.
5. Provide such erosion control measures as may be necessary to correct conditions that develop prior to the completion of permanent erosion control devices and/or as required to control erosion that occurs during normal construction operations.
6. Provide such sediment control measures as may be necessary to address conditions created by construction dewatering methods and/or stormwater runoff.
7. After award of the Contract, prior to commencement of construction activities, meet with the Engineer to discuss the Plan and develop a mutual understanding relative to.
8. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
9. Stabilize disturbed earth surfaces in the shortest practical time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.

B. Recommended Guides:

1. AASHTO Highway Drainage Guidelines, Volume III, Guidelines for Erosion and Sediment Control in Highway Construction, American Association of State Highway and Transportation Officials, Inc., 444 North Capital St. N.W., Suite 249, Washington, D.C. 20001.
2. Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, New Hampshire Department of Environmental Services, Public Information Office, P.O. Box 95, 6 Hazen Drive, Concord, New Hampshire.
3. Storm Water Phase II Compliance Assistance Guide, Section 5 Small Construction Activity, United State Environmental Protection Agency, Publication No. 833-R-00-003.

PART 2 - PRODUCTS

2.1 Plan

A. Prior to the start of construction submit the Plan in accordance with the Shop Drawing review process in Section 01340 – Submittals.

B. Prior to the start of construction submit a Notice of Intent for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY Under a NPDES General Permit.

C. To assist in Plan preparation, the Engineer will supply the following as available:

1. Specific Reproducible plan sheet and if available, cross sections of the project.
2. Drainage calculations as available.
3. Permits obtained for the project.
4. Geotechnical reports.

2.2 ACCEPTABLE MATERIALS

A. Baled Hay: At least 14" x 18" x 30" securely tied and staked twice per bale.

B. Stone Check Dams: Washed ¾ inch crushed septic system stone free of sand and silts.

C. Sand Bags: Heavy cloth bags of approximately 1 cubic foot capacity filled with sand or gravel.

D. Mulches:

1. Asphalt emulsion, gravel, crushed stone, loose hay, straw, peat moss, pine straw or needles, sawdust, wood chips, wood excelsior, or wood fiber cellulose.
2. Type and use shall be suitable for the Work.

E. Mats and Netting:

1. Twisted craft paper, yarn, jute, excelsior, wood fiber mats, glass fiber, and plastic film.
2. Type and use shall be suitable for the Work.

F. Seed:

1. Standard conservation mix of 100% annual rye grass or field broomgrass.
2. Equivalent seed mixture may be used, as approved by the Engineer, based on its suitability for use is controlling erosion of the various soil types and slopes.

G. Sod:

1. Grown from seed of adapted varieties to produce high quality sod, free of any serious thatch, weeds, insects, diseases and other pest problems.
2. At least one year old and not older than three years. Cut with 1/2" to 1" layer of soil.

H. Drains:

1. Flexible drains consisting of collapsible neoprene pipe, minimum of 8" in diameter, or an approved equal.
2. Corrugated metal pipe and inlet of a gauge consistent with the loading conditions. A minimum size of 12 inches in diameter or approved equal.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Temporary Stone Checks:

1. Construct temporary erosion checks in ditches and other locations as needed.
2. Baled hay and/or sand bags may be used in an arrangement to fit local conditions designated by the Engineer.
3. Terrace side slopes to retard runoff velocities.

B. Temporary Berms (When Applicable):

1. Construct temporary barriers along the toe of embankments.
2. Construct temporary side drains in intervals as needed.

C. Temporary Slope Drains: Shall be collapsible pipe with corrugated metal pipe inlet with a crescent shaped barrier placed at each slope drain.

D. Debris Basin:

1. A barrier or dam constructed across waterway or other suitable location to form a silt or sediment basin.
2. Capacity shall be equal to the volume of sediment expected to be trapped at the site during the planned use for life of the structure or, if the periodic removal of debris would be practical, the capacity shall be proportionally reduced.

3.2 PERFORMANCE

A. Install erosion control devices as described in the Plan.

1. Apply seed for temporary cover at a rate of 40 lbs. per acre.
2. Apply hay or straw at a rate of 2 tons per acre.
3. Hydroseed all temporarily seeded areas.

B. Protection:

1. Protect streams and channels from fuel, lubricants and other pollutants.
2. Locate storage of materials in shop yards where erosion and sediment hazards are slight.

3.3 REMOVAL AND DISPOSAL

A. General: When permanent soil stabilization has been achieved, remove all temporary materials and devices that are unsightly.

B. Reuse: Materials and devices of suitable type and conditions may be reused at other onsite locations. Materials and devices, determined by the Engineer to be unsuitable for reuse, shall become the Contractor's property and shall be disposed of in a manner and location approved by the Owner.

C. Onsite Disposal when Applicable: The locations and methods of onsite disposal are subject to the Owner's approval. Onsite disposal that results in unsightly conditions, precludes proper maintenance and is detrimental to the physical environment will not be permitted.

END OF SECTION

SECTION 02551
BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish all plant, labor, equipment and materials required to install subgrades and bituminous concrete pavement courses as shown on the Drawings and as specified herein.
2. Hand method shall include only the paving of raised islands, slopes, cattle passes, areas between rails at railroad crossings, existing sidewalks, drives, drive aprons, curb patch between granite curb and pavement, and paving of 50 tons or less added after the completion of paving operations.
3. Machine method shall include all paving not classified as hand method.

1.2 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk bituminous concrete producer regularly engaged in the production of hot mixed, hot laid bituminous concrete.

B. Equipment: Provide, maintain and operate pavers, dump trucks, tandem, 3-wheel and pneumatic tired rollers well suited to the mixtures being placed. Provide, maintain and operate hand equipment as required. When applicable, provide, maintain and operate trimming equipment and materials.

C. Requirements of Regulatory Agencies: New Hampshire Department of Transportation Standard Specifications, latest edition, & current Special Provisions herein abbreviated NHDOT.

D. NHDOT "Measurement" and "Payment" paragraphs shall not apply.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall conform to Division 700 Materials; Section 702, Bituminous Materials and Section 703, Aggregates of the NHDOT Standard Specifications, latest edition, as amended herein.

B. Aggregate subbase courses shall be in accordance with Division 300 Base Courses; Section 304, Sand, Gravel and Crushed Gravel Base Courses of the NHDOT Standard Specifications, latest edition.

C. Hot Bituminous Pavement

a. All Hot Bituminous Pavement Job Mixes require shop drawing approval.
b. Base course and Wearing course of bituminous pavement shall be as shown on the Drawings and shall conform to Division 400, Section 401, Plant Mix Pavements - General of the NHDOT Standard Specifications, latest edition.
c. The following requirements pertain to machine method and hand method pavement mixes, not sidewalk mixes.
    i. Liquid asphalt cement binder shall have a Performance Grade (PG) of PG 64-28 for all standard bituminous pavements and PG 76-28 for all high strength bituminous pavements.

ii. All 3/8" nominal aggregate Hot Bituminous Pavement Job Mixes shall conform to 75 Gyration superpave mix design criteria. All ½" and ¾" nominal aggregate Hot Bituminous Pavement Job Mixes shall conform to 50 Gyration superpave mix design criteria.
iii. Minimum Binder Content to be 6.0% for 3/8" mix designs; 5.9% for ½" mix designs; and 5.1% for ¾" mix designs. All pavement mixes shall have a maximum Total Reused Binder (TRB) content of 0.5% and meet all the volumetric mix design criteria.
iv. Hot Bituminous Pavement to be placed under NHDOT Section 401 "Method Requirements" (not "QC/QA").
v. Pavement Joint Adhesive (Item 403.6) shall be applied to longitudinal joints in accordance with NHDOT Section 401.
vi. The CONTRACTOR is required to repair any pavement defects (rutting, cracking, aggregate separation, delamination, etc.) that occur in placed pavement within the 1-year correction period following the date of Substantial Completion at no cost to the OWNER. Suitable repair methods and materials (such as routing and crack sealing or cutting and patching) to be reviewed and approved by OWNER and ENGINEER prior to installation.
vii. Asphalt emulsion for tack coat shall be applied between all layers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Methods of construction shall be in accordance with Division 400, Pavements, Section 403, Hot Bituminous Paving of the NHDOT Standard Specifications, latest edition, as modified herein.

B. Prior to placing of any mix, a pre-paving conference shall be held with the Owner, Contractor, and Engineer to discuss the proposed paving schedule, source of mix, type and amount of equipment to be used, sequence of paving pattern, rate of mix supply, traffic control, and general continuity of the operation. Special attention shall be made to the paving pattern sequence to minimize cold joints.

C. Place permanent pavement only when the underlying surface is dry, when the atmospheric temperature in the shade is above 40 degrees F, and when the weather is not foggy or rainy, provided however, that the Engineer may permit in case of sudden rain, the placing of the mixture then in transit from the plant, if laid at the proper temperature and if the roadbed is free from pools of water.

D. Such permission shall in no way relax the requirements for quality of the pavement and smoothness of surface.

E. Do not lay material upon frozen base course or when wind conditions are such that rapid cooling will prevent satisfactory compaction.

F. Sweeping. Existing pavement or previously laid courses shall be thoroughly dry and free from all dust, dirt, and loose material. Sweeping with a power broom, supplemented by hand brooming, may be necessary.

G. Tack coat. Surfaces of any pavement course shall have a tack coat of emulsified asphalt applied in accordance with NHDOT Standards.

H. Drainage and utility structures within the limits of the pavement shall be set and raised. Contact surfaces of the drainage and utility castings as ordered shall be painted with a thin coating of suitable bituminous material.

END OF SECTION

Scope of Work

Furnish, install and test all concrete work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of the work.

Contents of Division

Section No.	Section Title
03000	Concrete – General
03010	Concrete Testing
03100	Concrete Formwork
03200	Concrete Reinforcement
03300	Cast-in-Place Concrete & Flowable Fill

SECTION 03000
CONCRETE - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install all concrete work of the type(s) and size(s) and in the locations shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. Testing:
   1. Have tests conducted as specified in the Concrete Testing Section of these specifications.
   2. Perform all concrete work in accordance with the latest ACT Code arid Manual.

1.3 SUBMITTALS TO THE ENGINEER

A. Shop Drawings:
   1. Submit shop drawings in accordance with the General Conditions of the Construction Contract.
   2. Submit schedules and detailed setting diagrams for all reinforcing steel.
   3. Submit copies of test results on all aggregates and on all mix design proportions for concrete strengths specified in this Division.

B. Informational Data:
   1. Have informational data available on the site at all times as a standard of reference when applicable.
   2. Informational data shall consist of the latest edition of the P.C.A. Manual of Concrete Mix Design.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials to prevent damage of any nature.

B. Store cement in undamaged condition with seals and labels intact as packaged by the manufacturer.

C. Store cement in weathertight bins or buildings and keep cement dry at all times.

D. Store aggregate in separate piles or bins and handle in a manner that will minimize segregation and prevent contamination.

E. Protect anchors, ties, reinforcement and other hardware from the elements.

1.5 JOB CONDITIONS

A. Wet Weather Protection:
   1. Do not place concrete during rain, sleet, or snow unless adequate protection is provided.
   2. Do not allow rain water or other weather conditions to damage the surface finish.

B. Cold Weather Protection:
    1. Do not place concrete in an ambient air temperature below 40 degrees F.
    2. When Work must be performed in temperatures below 40 degrees F, make approved provisions for heating materials and the completed work in accordance with A.C.I. 306.
    3. The minimum temperature of concrete as placed shall be 50 degrees F.

C. Hot Weather Protection:
    1. During hot weather conditions, place concrete in accordance with A.C.I. 305.
    2. Place concrete at a temperature which will not cause difficulty from loss of slump, flash set, or cold joints, usually somewhat less than 90 degrees F.

D. Metal Protection: Paint metal to be in contact with mortar, concrete or other masonry materials with alkali-resistant coatings, such as heavy bodied bituminous paint.

PART 2- PRODUCTS

2.1 MATERIALS

A. Materials are specified in the appropriate sections of these Specifications.

PART 3- EXECUTION

3.1 ACCEPTANCE OF STRUCTURE

A. Work which meets all applicable requirements will be accepted without qualification.

B. Work which fails to meet one or more requirements, but which has been repaired to bring it into compliance, will be accepted without qualification.

C. Work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected, as determined by the Engineer.

D. Concrete failing to meet the strength requirements as stated in these Specifications may require additional curing as directed by the Engineer. Modifications may be required in the concrete mix design for the remaining concrete work, at no additional cost to the Owner.

E. Formed surfaces larger or smaller than dimensional tolerances specified may be rejected. If the Engineer permits the Contractor to correct errors, such corrections shall be as directed and in such a manner as to maintain the strength, function and appearance of the structure.

F. Concrete members cast in the wrong location may be rejected and shall be removed at no additional cost to the Owner.

G. Inaccurately formed surfaces exposed to view may be rejected and shall be repaired or removed at no additional cost to the Owner.

H. Finished flatwork exceeding specified tolerances may be repaired by grinding high spots or patching low spots with an approved epoxy grout.

I. Concrete exposed to view with defects which adversely affect the appearance of the Specified finish may be repaired, if possible. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete shall be removed and replaced at no additional cost the Owner.

A. The strength of the structures in place will be considered potentially defective if it fails to comply with any of the following requirements:
    1. Low concrete strength as evaluated by the requirements of these Specifications.
    2. Reinforcing steel size, quantity, strength, position or arrangement at variance with the Drawings.
    3. Concrete which differs from the required dimensions or locations in such a manner as to reduce the strength.

END OF SECTION

SECTION 03010

CONCRETE TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Perform all testing of concrete as specified herein and as directed by the Engineer.

1.2 QUALITY ASSURANCE

A. Have all testing conducted by an independent testing laboratory approved in writing by the Engineer.
B. ASTM Requirements:
    1. Curing Test Cylinders: ASTM C31/C31M - 03.
    2. Slump Testing: ASTM C143/C143M - 03.
    3. Air Content Testing: ASTM C231 - 03.
    4. Core Testing: ASTM C42/C42M - 03.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete materials are specified in the appropriate Sections in these Specifications.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Test Cylinders:
    1. Have 4 standard test cylinders made and cured for each 50 cubic yards, or fraction thereof, of each type of concrete placed in any one day.
    2. Have 2 cylinders tested after 7 days, and 2 cylinders tested after 28 days.
    3. The necessity of breaking cylinders at intermediate periods will be determined by the testing laboratory.
B. Slump Tests:
    1. Have tests for slump made at the place of deposit.
    2. Have 1 slump test made for each 50 cubic yards of each type of concrete placed in any one day. Have at least 1 slump test made for each concrete pour.
    3. Have more frequent slump tests made if, in the opinion of the Engineer, the concrete delivered does not appear to be consistent.
C. Air Content:
    1. Have 1 air content test made for each 50 cubic yards of each type of concrete placed in any one day. Have at least 1 air content test made for each concrete pour.
D. Changes of Materials:
    1. Have the above specified tests made for each change of materials and mix proportions.
    2. Make test occasioned by changes of materials and mix proportions at no additional cost to the Owner.

E. Disputes:
    1. Have additional tests necessary to resolve disputes made only by the designated independent testing laboratory.
    2. If the work or materials are found to be deficient, testing shall be at no additional cost to the Owner.
    3. If the work or materials are found to be satisfactory, testing will be paid by the Owner.

3.2 EVALUATION OF STRUCTURES

A. Concrete Strength: The strength of the concrete shall be considered satisfactory if the average of any 5 consecutive strength tests of the laboratory cured specimens representing each strength of concrete is equal to or greater than the specified strength, and if not more than 10 percent of the strength tests have values less than the specified strength, and no single test has a value more than 500 psi below the specified strength.

B. Additional Tests:
    1. Impact hammers, sonoscopes, or other non-destructive testing devices may be used, if approved by the Engineer, to determine relative strengths of various areas of the structure, and as an aid in evaluating concrete strength in place or in determining locations of areas to be cored. Test results, so obtained, shall be used as a basis for acceptance or rejection only if these results are properly calibrated and correlated with other test data.
    2. When required by the Engineer, have core tests conducted.
    3. Have cores tested saturated-surface-dry if the concrete they represent will be wet at any time during the use of the completed structure. Have cores tested air-dry if the concrete they represent will be dry at all times during the use of the completed structure. The laboratory report shall state whether the cores were tested saturated-surface-dry or air-dry.
    4. Have at least 3 cores taken from each potentially deficient area. Locations will be determined by the Engineer. Damaged cores may be replaced.
    5. The strength of the cores from the concrete from each member or area shall be considered satisfactory if their average is equal to or greater than 90 percent of the specified strength, and no single core is less than 80% of the specified strength.
    6. Plug holes solid with 2:1 grout.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and erect formwork to provide concrete of the size(s) and in the location(s) shown on the Drawings and specified herein.

1.2 QUALITY ASSURANCE

A. Formwork Design:

1. A.C.I. 347

2. Wind loads: As specified by local building codes.

B. Earth Cut Forms: Do not use earth cuts as forms for vertical surfaces.

C. Allowable Tolerances:

1. Construct forms so that the concrete surfaces conform to the tolerances stated in A.C.I. 347.

2. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall e 1/240 of the span between structural members.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Form Accessories:

1. Provide commercially manufactured types of form accessories to be partially or completely embedded in the concrete, such as ties and hangers. Non-fabricated wire is not acceptable. Furnish and install form ties with a water seal in walls which will withstand a hydrostatic head.

2. The portion of accessories remaining within the concrete shall leave no metal within 1 inch of the surface when concrete is exposed to view.

3. Spreader cones on ties shall not exceed 1 inch in diameter.

4. Furnish and install removable thru-wall ties with suitable plugs tested to withstand a hydrostatic head of at least two times the hydrostatic head in the structure.

PART 3 - EXECUTION

3.1 FABRICATION

A. Construct moldings or chamfer strips in the corners of column, beam, and wall forms where the concrete will be exposed to view.

B. Construct temporary openings at the base of column forms, wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.

C. Construct forms sufficiently tight to prevent leakage of grout or cement paste. Swell board forms having joints opened by shrinkage of wood by wetting before concrete is placed.

D. Seal plywood, and other wood surfaces not subject to shrinkage against absorption of moisture from the concrete by one of the following methods:

1. A suitable field applied oil or sealer.

A suitable factory applied non-absorptive liner

E. Coating Forms (shall be compatible with potable water):

1. Coat form prior to placing reinforcing steel.
2. Do not allow coating material to stand in puddles in forms nor to come in.
3. Where as-cast finishes are required, do not coat form surfaces with materials that will impart a stain to the concrete.
4. Where painted finished surfaces are required, coat form surfaces with materials compatible with the type of paint to be used.

F. Clean all form surfaces before reuse.

3.2 INSTALLATION

A. Camber formwork to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and construction loads.

B. Provide positive means of adjustment (wedges or jacks) of shores and struts to take up settlement during concrete placing operation. Brace shores and struts securely against lateral deflections.

C. Edge Forms and Intermediate Screed Strips:

1. Set accurately to produce the designed elevations and contours.
2. Sufficiently strong to support vibrating bridge screeds or roller pipe screeds if finish requires the use of such equipment.
3. Align concrete surface to the contours of screed strips by use of strike-off templates or approved compacting type screeds.
4. When the formwork is cambered, set the screeds to a like camber to maintain the proper concrete thickness.

3.3 REMOVAL

A. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations, but must remain a minimum of 3 days after the placement of the concrete, when ambient temperatures are below 50^{O}F or 2 days after placement when ambient temperatures are above 50^{O}F

B. Leave formwork for beam soffits, slabs, and other parts that support the weight of the concrete in place until the concrete has reached 75 percent of the specified 28 day strength.

C. Do not place live loads on slabs until the concrete has reached the specified 28 day strength, unless the slab is reshored.

3.4 RESHORING

A. When required, plan reshoring in advance.

B. Loads and Strength:

1. Perform reshoring so that at no time will large areas of new construction be required to support their own weight.
2. While reshoring is under way, do not permit live loads on the new construction.
3. Leave reshores in place until concrete has reached its specified 28 day strength.

C. Reshore Supports:

1. Reshore floors supporting shores under wet conditions or leave their original shores in place.
2. The reshores shall have at least one-half the load capacity of the shores above and shall be distributed in approximately the same pattern as those above.
3. Leave these reshores in place until the freshly-placed concrete has reached 75 percent of its specified 28 day strength.

3.5 REMOVAL STRENGTH

A. When formwork removal or reshoring removal is based on the concrete reaching its 28 day strength (or a specified percentage thereof), the concrete shall be presumed to have reached this strength when any of the following conditions has been met:

1. When test cylinders, field cured under the most unfavorable conditions prevailing for any portion of the concrete represented, have reached the required strength. Except for the field curing and age at test, the cylinders shall be molded and tested as specified in the Concrete Testing Section of these Specifications.
2. When the concrete has been cured as specified for the same length of time as the age at test of laboratory-cured cylinders which reached the required strength. The length of time the concrete has been cured in the field shall be determined by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50 degrees F. and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.
3. When the concrete has reached a specified strength as determined by non-destructive tests.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install reinforcement for concrete of the type(s) and size(s) and in the location(s) shown on the Drawings and specified herein.

1.2 QUALITY ASSURANCE

A. Reinforcing Steel:
   1. Yield strength of 60 ksi as shown on the Drawings.
   2. ASTM A 615
   3. Allowable fabrication tolerances:
      a. Sheared length: +/- 1 inch.
      b. Depth of truss bars: to, 1/2 inch.
      c. Stirrups, ties, and spirals: +/- 1/2 inch.
      d. All other bends: +/- 1/2 inch.

B. Welded Wire Fabric: ASTM A185.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings and schedules in accordance with the General Conditions of the Construction Contract.

1.4 DELIVERY AND STORAGE

A. Protect reinforcement from the elements to prevent corrosion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All reinforcement shall be free of corrosion.

PART 3 - EXECUTION

3.1 PLACING

A. Allowable Placement Tolerances:
   1. Concrete cover to formed surfaces: +/- 1/4 inch.
   2. Minimum spacing between bars: +/- 1/4 inch.
   3. Top bars in slabs and beams:
      a. Members 8-inches deep or less: +/- 1/4 inch.
      b. Members more than 8-inches but not over 1 feet deep: +/- 1/2 inch.
   4. Crosswise of Members: Spaced evenly within 2 inches.
   5. Lengthwise of members: +/- 2 inches.

B. Interference:

1. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items.
2. If bars are moved more than one bar diameter, or enough to exceed the above specified placement tolerances, the resulting arrangement of bars shall be subject to the written approval of the Engineer.

C. Supports:

1. the placing of concrete beyond the above specified placement tolerances.

1. Use metal or plastic sand plate chairs on the ground at spacing called for on the drawings.
2. Use concrete, metal, plastic, or other approved bar chairs and spacers over framework.
3. Use galvanized or plastic accessories where concrete surface will be exposed to the weather in the finished structure, or where rust would impair architectural finishes.

D. Load Carrying Welded Wire Fabric Reinforcement:

1. Lap splice so that the overlap measured between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches.
2. Support welded wire fabric as required for reinforcing bars.

E. Non-Load Carrying Welded Wire Fabric Reinforcement:

1. Lap splice so that the overlap measured between outermost cross wires of each fabric sheet is not less than 2 inches.
2. Extend welded wire fabric across supporting beams and walls and to within 2 inches of concrete edges.
3. Extend welded wire fabric through contraction joints and construction joints except keyed joints in slabs on ground.
4. Position welded wire fabric during the placing of concrete to insure its proper position in the slab.

F. Column Reinforcement:

1. Offset vertical bars in columns at least one bar diameter.
2. To insure proper placement, provide templates for all column dowels.

G. Obtain the Engineer's written approval of all splices not shown on the Drawings.
H. Do not bend reinforcement partially embedded in hardened concrete.
I. Do not tack weld reinforcement.
J. Splicing:

1. Lapped splices will be used except where other methods are shown on the Drawings.
2. Minimum splices: 50 bar diameters.
3. Stagger splices by 50 bar diameters.
4. Spliced bars shall be in contact and wired together to maintain the bar alignment.
5. No splices will be permitted at points of high stress.

K. Minimum concrete cover when not shown on the plans.

1. Footings - 3 inches.
2. Walls, beams, columns, and slabs exposed to liquid immersion, earth or weather: 2 inches.
3. Walls, beams, columns, and slabs not exposed to liquid immersion, earth or weather: 1-1/2 inches.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE & FLOWABLE FILL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install the following, when applicable and as shown on the Drawings and as specified herein.
   1. Cast-in-place concrete, including building foundations, walls, slabs, beams, columns, equipment bases, conduit envelopes, concrete stair fill, and other concrete Work shown on the Drawings.
   2. completion of the work.
   3. Place flowable fill into abandoned pipes/structures (minimum 85% of total void for pipes) where directed by the Owner or the Owner's Representative including narrative summarizing execution and verification of the work.

1.2 REFERENCE SPECIFICATIONS

A. "Specifications for Structural Concrete for Buildings" by the American Concrete Institute (ACI-301), latest edition.

B. "Building Code Requirements for Structural Concrete and Commentary" (ACI-318). latest edition.

C. NHDOT Standard Specifications for Road and Bridge Construction (Latest Edition)

1.3 SHOP DRAWINGS

A. Submit complete shop drawings as stated in the General Conditions of the Construction Contract.

B. Provide shop drawings for fabricating and placing reinforcing steel. Show all required information for cutting, bending and placing reinforcing bars and show all accessories and support bars on placing drawings. Indicate suitable marks for placing bars.

C. Fabrication of any material or performing of any Work prior to the final approval of the shop drawings will be entirely at the risk of the Contractor.

D. For Flowable Fill: Provide narrative to Engineer prior to placement of flowable fill including the following:
   1. Sequence of placement including fill/pump points and vent locations.
   2. Method of verification that all voids (85% minimum for pipes) have been filled.

1.4 RELATED TRADES

A. Notify all trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc., when ready for such installation, and for final checking immediately before concrete is placed.

B. Leave openings in walls for pipes, ducts and other items for mechanical and electrical work, as shown on the Drawings, or required by layout of mechanical and electrical systems.

PART 2 - PRODUCTS

2.1 MATERIALS FOR CONCRETE

A. Cement: Portland cement - ASTM Specification C-150, Type II.

B. Aggregates:

1. Coarse aggregate: Hard, durable, uncoated crushed stone or gravel conforming to ASTM, Specification C-33 and shall pass through sieves 1-1/2 inch.
2. Fine aggregate: Sand, clean, hard, durable, uncoated grains, free from silt, loam, and clay, to meet ASTM Specification C-33.

C. Water: Potable from the local municipal supply.

D. Admixtures:

1. High range water Reducing Agent, ASTM 494 Type F or G, (superplasticizer) by same manufacturer as air-entraining agent.
    a. Daracem 100 by Grace Construction Products
    b. Sikament by Sika Corporation
    c. Or approved equal.
2. Water Reducing Agent, ASTM 494 Type A, by same manufacturer as air-entraining agent.
    a. WRDA with HYCOL by Grace Construction Products
    b. Plastocrete 161 by Sika Corporation
    c. Or approved equal.
3. Air-Entraining Agent, ASTM C-260, to be used to obtain percent air-entrainment specified unless obtained by cement used.
    a. "Daravair 1000" by Grace Construction Products
    b. Sika AER by Sika Corporation
    c. Or approved equal.
4. Water Reducing, Retarding Admixture, ASTM 494 Type D.
    a. Daratard 17 by Grace Construction Products
    b. Plastiment 161 by Sika Corporation
    c. Or approved equal.
5. Non-Corrosive, Non-Chloride Set Accelerating Admixture, ASTM 494 Type C, by same manufacturer as air-entraining agent.
    a. Polarset by Grace Construction Products
    b. Sikaset NC by Sika Corporation
    c. Or approved equal.
6. No other admixtures may be used without written approval by the Engineer.
7. Calcium chloride will not be permitted.

E. Joint Sealer: Furnish and install as specified in these Specifications.

F. Floor Hardener: Apply to concrete floors to remain exposed and not receiving floor cover.

1. "Lapidolith" by Sonneborn Building Products,
2. “Hornlith" by A.C. Horn Company,
3. "Saniseal 5" by Master Builders Company,
4. Or approved equal.

G. Moisture Barrier:

1. Black polyethylene film extruded onto both sides of high quality kraft paper and laminated with asphalt to rot and fungus resistant kraft paper. Kraft paper shall have crossed reinforcing fibers which are embedded in asphalt laminent for high resistance to puncturing and tearing during the application.
2. Moistop, Grade 395.
3. Or approved equal.

H. Perimeter and Under Slab Insulation as specified in Division 7.

I. Flowable Fill materials shall be in accordance with Section 520.2 of the NHDOT Standard Specifications for Road and Bridge Construction (latest edition).

2.2 STORAGE OF MATERIALS

A. Store all materials to prevent damage from the elements and other causes.

B. Store cement and aggregates in such a manner as to prevent deterioration or intrusion of foreign matter. Do not use any materials which have deteriorated, or which have been damaged, for concrete.

C. Store reinforcing steel on wood skids to protect it from weather, oil, earth and damage from trucking or other construction operations. Reinforcement shall be free from loose mill scale, rust, from oil, concrete spatter and other extraneous coatings at the time it is embedded in the concrete.

D. Store all forms in a neat manner and orderly fashion, protected from the weather and abuse.

E. Do not store materials which, in the opinion of the Engineer, are not acceptable for the Work and immediately remove them from the site.

2.3 CONCRETE MIXTURES

A. Strength, cement, and water requirements:

Use	Min.Strength @28 day-psi	Max.Size Coarse Agg.	% Air (+/-1%)	Min.-Max Slump	Min Cem.Fac.	Max W/C
Concrete	4,000	3/4"	5	2"- 4"	---	0.40
Concrete	3,000	3/4"	5	2"- 4"	---	0.45
Concrete	2,000	3/4"	5	1"- 3"	---	0.55

B. If a pumping process is utilized to convey concrete, established concrete mixtures may require increased proportion of cement and fine aggregate and a decreased proportion of coarse aggregate, but these mixtures may not be altered more than:

1. Cement plus 20 lbs./cu.yd.
2. Fine Aggregate plus 50 lbs./cu.yd.
3. Coarse Aggregate minus 50 lbs./cu.yd.

C. Concrete shall contain specified admixtures.
D. Flowable fill shall be mixed using the approximate proportions described below (per cubic yard):

Type II Portland Cement	20 lb.
Ground Granulated Blas Furnace Slag	100 lb.
Sand	2,830 lb.
Water	40 – 50 gal.
Air Entrainment	10% to 15%

a. Flowable fill shall have a minimum 28 day compressive strength of 100 psi.

2.4 CURB BARS

A. Wooster type 150, cast aluminum, or similar by National Guard, Granite State, or McKinley.

PART 3 - EXECUTION

3.1 MIXING PROCESS

A. Use ready-mix process, ACI 301-72 Par. 7.1.

3.2 PLACING

A. Notify the Engineer at least 24 hours prior to each placement.
B. Do not place concrete until soil bottoms, reinforcing steel, and inserts, sleeves and other work to be built into the concrete have been completed.
C. Conveying: Handle concrete from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.
D. Depositing: Program the delivery and placement of concrete so that the time between batching and placement shall not exceed 1-1/2 hours. Do not allow concrete to free fall over 4 feet. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing.
E. Deposit concrete continuously, in horizontal layers of such thickness (not deeper than 24 inches) that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Carry out placing at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials. No horizontal construction joints will be allowed in foundation walls.
F. Vibrate concrete thoroughly to produce a dense, homogenous mass without voids or pockets. Place vibrators in concrete rapidly to penetrate approximately 3 inches to 4 inches into the preceding lift and blend the two layers. Vibrating techniques must assure that when the coarse aggregate reaches the form, it stops and the matrix fills the voids.

3.3 FLOOR AND OTHER FLATWORK FINISHES

A. Use a "troweled finish" ACI 302, Sections 7.2.1 - 7.2.10, including tops of exposed walls, except where otherwise shown on the Drawings.

B. Screed all floors to establish elevations, then steel trowel level, with allowable tolerance not exceeding 1/8 inch in any direction when tested with a 10 foot long straightedge. Where floors contain drains, pitch the floors to drain as shown on the Drawings.

C. If either or both of the above requirements are not met, correct the conditions by grinding and filling, as directed by the Engineer, using materials and methods which will be compatible with all finish and surface materials to be installed on floors at no additional cost to the Owner.

3.4 MOISTURE BARRIER

A. Apply specified moisture barriers under all interior and exterior slabs-on-grade, after ensuring that gravel subbase or crushed stone base is level and well compacted.

B. Apply moisture barrier parallel with the direction of the concrete pour. Lap and seal all joints to a minimum width of 6 inches with adhesive provided by the moisture barrier manufacturer. Ensure that the moisture barrier lies flat against sides and bottom of wall footing trenches. Trim moisture barrier to fit neatly around column bases; seal to concrete footings for a minimum of 6 inches around base.

C. Do not damage the moisture barrier at any time; repair any accidental punctures with a patch of the same material extending a minimum of 6 inches in all directions, and seal.

3.5 SURFACE REPAIRS

A. Remove all honeycombed and other defective concrete down to sound concrete. Dampen area to be patched and area around it to prevent absorption of water from patching mortar. Fill areas concealed in the finished work with a trowel.

B. Make a patching mixture of the same sand and cement as necessary to match color of existing concrete as determined by trial patches in exposed areas.

C. Limit the amount of mixing water to that necessary for handling and placing. Mix mortar in advance, allow to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

D. After surface water has evaporated from the area to be patched, brush area with neat cement grout, let it set until the grout loses its sheen and apply the patching mortar. Pack the mortar thoroughly into place, strike off to leave the patch slightly higher than surrounding surfaces to permit initial shrinkage. Keep patched area damp for 7 days. Finish exposed surfaces of patch to match adjacent surfaces.

E. After cleaning and thoroughly dampening, fill all tie holes with patch mortar. Finish off as above specified for all exposed areas.

3.6 CUTTING OF HOLES

A. Cut holes required by all trades in any cast-in-place concrete which did not receive sleeves. Use a core drilling process or sawing process which produces clean sharp edges and the minimum hole size which accommodates the piping, conduit, or equipment requiring the opening.

B. Obtain written approval from the Engineer before cutting any holes for any trades.

3.7 NON-SHRINK GROUT

A. Grout solid all bearing plates in accordance with manufacturer's recommendations and as specified. Grout mixture for Steel Sleeves to be in accordance with Section 02445.

3.8 INSULATION

A. Under-Slab Insulation: Lay insulation under slabs directly on moisture barrier, tightly butting each sheet of insulation against adjacent piece, where shown on the Drawings.

B. Perimeter Insulation: Install vertical perimeter insulation dry, against foundation walls in a continuous manner as the backfill is placed, or hold in place with styrofoam mastic #7 or #11, or an approved equal.

3.9 STRENGTH OF STRUCTURE

A. The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements which control the strength of the structure, as outlined below:
   1. Low concrete strength, as evaluated by the requirements of this Section.
   2. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the project drawings.
   3. Concrete which differed from the required dimensions or locations in such a manner as to reduce the strength.

3.10 CONCRETE CURING AND PROTECTION

A. General:
   1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
   2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.
   3. Curing and protection shall be in accordance with ACI 301-12 and ACI 308

B. Curing Period:
   1. Not less than 14 days for slabs.
   2. For elements other than slabs, not less than 7 days for standard cements and mixes.
   3. For elements other than slabs, not less than 4 days for high early strength concrete using Type III cement.

C. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
   1. Keep wooden or metal forms moist when exposed to heat of the sun.
   2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.

D. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared, but before the surface is dry.
   2. Keep concrete slabs continuously moist for not less than 7 days and all other concrete elements continuously moist for not less than 3 days by uninterrupted use of any of the following:
      a. Water ponding.
      b. Water-saturated sand.
      c. Water-fog spray.
      d. Saturated burlap: Provide 4-inch minimum overlap at joints.
   3. Begin final curing procedures following initial curing and before concrete has dried but not sooner than 1 day after.

4. Acceptable final curing methods:
   a. Water ponding.
   b. Water-saturated sand.
   c. Water-fog spray.
   d. Saturated burlap: Provide 4-inch minimum overlap at joints.
   e. Moisture-retaining sheet.
   f. Moisture-retaining cover: Lap not less than 3 inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same tape or adhesive. Maintain covering intimate contact with concrete surface. Secure to avoid displacement.
      1. Extend covering past slab edges at least twice the thickness of slab.
   g. Do not use plastic sheeting on surfaces which will be exposed to view when in service.
   h. Curing compound: Apply at rate stated by manufacturer to conform with moisture-retention requirements specified, using second, immediate application at right angles to first, if necessary, and reapply if damaged by rain.
   i. Liquid curing compounds.
      1. Use curing compounds only in locations permitted or required.
      2. Do not apply to surfaces to receive other finishes, coating, coverings unless documentation is provided that the curing compound is compatible with the finish, coating or covering.
      3. For curing compounds used in contact with potable water, provide documentation of NSF 61 approval.
5. Continue final curing to end of curing period.

E. Avoid rapid drying at end of curing period.
F. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 degrees F per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

END OF SECTION

Scope of Work

Contractor's Duties

Contents of Division

Section No.	Section Title
260050	Electrical Work - General Provisions
260519	Low-Voltage Electrical Power Conductors and Cables
260526	Grounding and Bonding for Electrical Systems
260533	Raceways and Boxes for Electrical Systems
260553	Identification for Electrical Systems
262416	Panelboards
262713	Electricity Metering
62726	Wiring Devices
265668	Sports Lighting

SECTION 26 00 50

ELECTRICAL WORK - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to make ready for use the complete electrical systems as shown on the Drawings and as specified hereinafter.

B. In conjunction with other sections of Division 26, the work shall include but not be limited to furnishing and installing the following:

1. Electrical service
2. Electrical raceway systems
3. Wires and cables
4. Panelboards
5. Miscellaneous equipment
6. Grounding systems
7. Circuit breakers
8. Sports Lighting
9. Cabinets

C. Make all necessary connections at "packaged" equipment furnished under other sections and Divisions of these specifications.

D. Make all connections to equipment and devices furnished under Division 26 and other sections of these specifications except as otherwise specified.

E. Connect process and instrumentation cables furnished with field-mounted equipment under other sections and Divisions of these specifications.

F. Mount all motor control equipment enclosures not factory mounted, unless otherwise indicated.

G. It is the intent of these specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this section shall be furnished at no extra cost to the Owner.

1.2 RELATED WORK:

A. The Contractor's attention is directed to the General Conditions, Supplementary Conditions.

B. Excavation and backfilling required for underground electrical work is included under Division 2.

C. Concrete work and reinforcing for electrical equipment pads is included under Division 3.

1.3 CODES, INSPECTIONS, PERMITS AND FEES:

A. All material and installations shall be in accordance with the latest edition of the National Electric code (NEC) and all applicable local codes and ordinances.

B. Obtain all necessary permits and pay all fees for permits and inspections.

1.4 INTERPRETATION OF DRAWINGS:

A. The Drawings are not intended to show exact locations of conduit runs.

B. Each three-phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.

C. Unless otherwise noted and/or approved by the Engineer all conduits shall be installed concealed.

D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation.

E. Any work installed contrary to or without review by the Engineer shall be subject to change as required by the Engineer, and no extra compensation will be allowed for making these changes.

F. The locations of equipment, shown on the drawings are approximate only. Exact locations shall be as determined by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as required by the Engineer and furnish all labor and materials necessary to complete the work in an acceptable manner.

G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.

H. All connections to equipment shall be made as required and in accordance with the approved shop and setting drawings.

1.5 SUBMITTALS:

In accordance with requirements of general specifications, submit the following:

A. Complete shop drawings shall be submitted for but not limited to the following equipment: panelboards, fire alarm, service cabinets, load centers, conduit and wire.

B. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment:

1. Conduit
2. Boxes and fittings
3. Wires, cables and appurtenances
4. Service cabinets
5. Wiring devices and appurtenances
6. Circuit breakers
7. Panelboards
8. Grounding Equipment
9. Light Fixtures.

C. Prior to submittal, all shop drawings shall be checked for accuracy and conformance to contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the specifications and drawings. This statement shall also list all discrepancies with the specifications and drawings. Shop drawings not so checked and noted shall be returned.

D. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and drawings which may not be indicated on the shop drawings is included under the work of this section.

E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this section.

1.6 MANUFACTURER'S SERVICES:

Furnish manufacturer's services for testing and start-up when required.

1.7 ELECTRIC SERVICES:

A. The electric service shall be furnished and installed as indicated on the plans and in conformance with the power companies requirements.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials, where not specified, shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the Engineer.

B. Materials and equipment used shall be Underwriters' Laboratories, Inc. listed.

C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of- doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer or shall be replaced at no additional cost to the Owner.

D. The Contractor's attention is directed to the requirements of the various sections of division 26 for additional product specifications.

2.2 MANUFACTURER'S NAMEPLATES:

A. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information may be die-stamped into the surface of the equipment or may be marked on durable nameplates permanently fastened to the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Provide and place all sleeves for conduit penetrations through floors, walls, partitions, etc. Locate all necessary slots and inserts for electrical work and place in form before concrete is poured.

B. Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

3.2 RECORD DRAWINGS:

As the work progresses, legibly record (red line) all field changes on a set of project contract drawings. Prior to Substantial Completion of the project, submit the red lined prints to the Engineer for use in preparation of the record drawings.

3.3 TESTS AND ADJUSTMENTS:

A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and equipment and instruct the Owner's personnel in the proper operation of the systems and equipment.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.

3. Belden Inc.
4. Okonite Company (The).
5. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type RHH and Type RHW-2: Comply with UL 44.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. Belden Inc.
3. Okonite Company (The).
4. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.

E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

F. Ground Conductor: Bare.

G. Conductor Insulation:

1. Type THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel, interlocked.

I. Jacket: PVC applied over armor.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
3. Hubbell Power Systems, Inc.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12-inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
   a. Ground rods.
   b. Grounding arrangements and connections for separately derived systems.

2. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.

    a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    b. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. SIEMENS Industry, Inc.; Energy Management Division.
6. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kc mil, 14 strands of No. 17 AWG conductor, ¼-inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/-inches wide and 1/16-inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4-inches in cross section, with 9/32-inchholes spaced 1-1/8-inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Conduit Hubs: Mechanical type, terminal with threaded hub.

G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

H. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

J. Straps: Solid copper, copper lugs. Rated for 600 A.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor.

1. Bury at least 24-inches below grade.

C. Grounding Bus: Install in electrical cabinet.

1. Install bus horizontally, on insulated spacers 2-inches minimum from wall, 6-inches above finished floor unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except as otherwise indicated.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Flexible raceway runs.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven, their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AFC Cable Systems; a part of Atkore International.

b. Allied Tube & Conduit; a part of Atkore International.
c. Anamet Electrical, Inc.
d. Opti-Com Manufacturing Network, Inc (OMNI).
e. O-Z/Gedney; a brand of Emerson Industrial Automation.

2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. GRC: Comply with ANSI C80.1 and UL 6.
4. ARC: Comply with ANSI C80.5 and UL 6A.
5. IMC: Comply with ANSI C80.6 and UL 1242.
6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

a. Comply with NEMA RN 1.
b. Coating Thickness: 0.040-inch, minimum.

7. EMT: Comply with ANSI C80.3 and UL 797.
8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AFC Cable Systems; a part of Atkore International.
b. Allied Tube & Conduit; a part of Atkore International.
c. Anamet Electrical, Inc.
d. FSR Inc.
e. O-Z/Gedney; a brand of Emerson Industrial Automation.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew.

6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040-inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Anamet Electrical, Inc.
    c. FRE Composites.
    d. RACO; Hubbell.
    e. Thomas & Betts Corporation; A Member of the ABB Group.

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. ENT: Comply with NEMA TC 13 and UL 1653.
2. RNC: Type EPC-40-PVC, or type EPC-80-PVC as noted complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

C. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Anamet Electrical, Inc.
    c. Arnco Corporation.
    d. FRE Composites.
    e. RACO; Hubbell.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.

3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

4. Fittings for LFNC: Comply with UL 514B.
5. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. B-line, an Eaton business.
2. Hoffman; a brand of Pentair Equipment Protection.
3. MonoSystems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Crouse-Hinds, an Eaton business.
2. Erickson Electrical Equipment Company.
3. Hoffman; a brand of Pentair Equipment Protection.
4. Hubbell Incorporated.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

D. Cabinets:

1. NEMA 250, Type 4X, UL50 and UL 508 stainless steel box, painted green with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. **The entire cabinet shall be UL listed** either by using a cabinet already set up for this use and built in a factory and UL listed as such or if built with indivual components, it must be done by a UL specialist who can then list the cabinet as a complete unit.
2. The fault current rating needs to be labeled on the exterior of the cabinet. The fault current value will be provided by Eversource and the equipment inside the cabinet must be able to protect against that fault value. The Contractor shall get this value from Eversource before ordering the equipment within.
3. Hinged door in front cover with flush latch and concealed hinge.
4. Key latch to match panelboards.
5. Metal barriers to separate wiring of different systems and voltage.
6. Accessory feet where required for freestanding equipment.
7. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Armorcast Products Company.
    b. NewBasis.
    c. Oldcastle Enclosure Solutions.
    d. Oldcastle Precast, Inc.
    e. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." or per appropriate system.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of hot-dip galvanized-steel diamond plate.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Armorcast Products Company.
    b. NewBasis.
    c. Nordic Fiberglass, Inc.
    d. Oldcastle Precast, Inc.
    e. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." or per appropriate system.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Concrete Encased Conduit: RNC, Type EPC-40-PVC.
4. Underground Direct Buried Conduit: RNC, Type EPC-80-PVC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Minimum Raceway Size: 1/2-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface raceways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Arrange stub-ups so curved portions of bends are not visible above finished slab.

C. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12-inches of changes in direction.

D. Support conduit within 12-inches of enclosures to which attached.

E. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

F. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

J. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.

K. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

L. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6-inches in nominal diameter.
2. Install backfill as specified in Section 31 20 00 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12-inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3-inches of concrete for a minimum of 12-inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60-inches from edge of equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1-inch above finished grade.

D. Install handholes with bottom below frost line.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

3. ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

1. PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Comply with NFPA 70E requirements for arc-flash warning labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2. COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

B. Color-Coding for Phase-Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit] conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

a. Phase A: Black.
b. Phase B: Orange.
c. Phase C: Yellow.

4. Color for Neutral: White or gray.
5. Color for Equipment Grounds: Green.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:
1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36-INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.

3. LABELS

A. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Brother International Corporation.
c. Ideal Industries, Inc.
d. Panduit Corp.

2. Minimum Nominal Size:

a. 1-1/2 by 6-inches for raceway and conductors.
b. 3-1/2 by 5-inches for equipment.
c. As required by authorities having jurisdiction.

4. TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Champion America.
b. Ideal Industries, Inc.
c. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2-inches wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. emedco.
c. Marking Services, Inc.

C. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Ideal Industries, Inc.
    c. Marking Services, Inc.

2. Tape:

    a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

    a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

5. SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Carlton Industries, LP.
    c. emedco.

2. Engraved legend.

3. Thickness:

    a. For signs up to 20 sq. in., minimum 1/16-inch thick.

b. For signs larger than 20 sq. in., 1/8-inch thick.
c. Engraved legend with black letters on white face.
d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

6. CABLE TIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hellermann Tyton.
2. Ideal Industries, Inc.
3. Marking Services, Inc.
4. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16-inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

7. MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

PART 3 - EXECUTION

1. INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Verify identity of each item before installing identification products.

C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

F. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

I. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8-inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

J. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2-inches high.

K. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

2. IDENTIFICATION SCHEDULE

A. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

B. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

C. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
   a. Controls with external control power connections.

D. Arc Flash Warning Labeling: Self-adhesive labels.

E. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

F. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

   1. Include dimensioned plans, elevations, sections, and details.
   2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Include evidence of NRTL listing for SPD as installed in panelboard.
   6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   7. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Flush and Surface -mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

b. Outdoor Locations: NEMA 250, Type 3R.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Height: 84-inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

F. Incoming Mains Location: Top or Bottom.

G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. SIEMENS Industry, Inc.; Energy Management Division.
3. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NECA 407.

C. Mount top of trim 90-inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

F. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

G. Install filler plates in unused spaces.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 27 13

ELECTRICITY METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes electricity metering.

1.3 DEFINITIONS

A. KY or KYZ Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity (kWh) that is based on a relay opening and closing in response to the rotation of the disk in the meter. Electronic meters generate pulses electronically.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For each type of meter.
2. For metering infrastructure components.
3. For metering software.

B. Shop Drawings: For electricity-metering equipment.

1. Include elevation views of front panels of control and indicating devices and control stations.
2. Include diagrams for power, signal, and control wiring.
3. Wire Termination Diagrams and Schedules: Include diagrams for power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit

protection features. Differentiate between manufacturer-installed and field-installed wiring.

4. Include series-combination rating data for modular meter centers with main disconnect device.
5. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices used. Describe characteristics of network and other data communication lines.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Submit evidence that meters are compatible and conform to Eversource requirements

B. Qualification Data: For testing agency.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: In addition to items specified in division 1 Section "Operation and Maintenance Data," include the following:

1. Application and operating software documentation.
2. Software licenses.
3. Software service agreement.
4. Device address list.
5. Hard copies of manufacturer's operating specifications, user's guides for software and hardware, and PDF files on a USB storage device of hard-copy Submittal.
6. Meter data sheet for each meter, listing nameplate data and serial number, accuracy certification, and test results.
7. Meter installation and billing software startup report.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metering equipment that fail in materials or workmanship within specified warranty period.

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

a. Damage from transient voltage surges.

2. Warranty Period: Cost to repair or replace any parts for 1 year from date of Substantial Completion.
3. Extended Warranty Period: Cost of replacement parts (materials only, f.o.b. the nearest shipping point to Project site), for eight years, that failed in service due to transient voltage surges.

1.9 COORDINATION

A. Electrical Service Connections:

1. Coordinate with utility companies and utility-furnished components.

a. Comply with requirements of utility providing electrical power services.
b. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 916.

2.2 UTILITY METERING INFRASTRUCTURE

A. Install metering accessories furnished by the utility company, complying with its requirements.

B. Utility-Furnished Meters: Connect data transmission facility of metering equipment installed by the Utility.

C. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

D. Meter Sockets:

1. Comply with requirements of electrical-power utility company.
2. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

E. Arc-Flash Warning Labels:

1. Labels: Comply with requirements for "Self-Adhesive Equipment Labels" and "Signs" in Section 260553 "Identification for Electrical Systems." Apply a 3-1/2-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.

a. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1) Location designation.
2) Nominal voltage.
3) Flash protection boundary.
4) Hazard risk category.
5) Incident energy.
6) Working distance.
7) Engineering report number, revision number, and issue date.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install arc-flash labels as required by NFPA 70.

D. Wiring Method:

1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Series Combination Warning Label: Self-adhesive labels, with text as required by NFPA 70.
2. Equipment Identification Labels: Self-adhesive labels with clear protective overlay. For residential meters, provide an additional card holder suitable for printed, weather-resistant card with occupant's name.

3.3 FIELD QUALITY CONTROL

A. Testing: By Contractor.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Straight-blade convenience receptacles.
2. GFCI receptacles.
3. Toggle switches.
4. Wall plates.

1.3 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton (Arrow Hart).
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2.3 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Eaton (Arrow Hart).
        2) Hubbell Incorporated; Wiring Device-Kellems.
        3) Leviton Manufacturing Co., Inc.
        4) Pass & Seymour/Legrand (Pass & Seymour).

2.4 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: High-impact thermoplastic in finished spaces.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.5 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

C. Device Installation:
1. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
2. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
3. Connect devices to branch circuits using pigtails that are not less than 6-inches in length.
4. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three- fourths of the way around terminal screw.
5. Use a torque screwdriver when a torque is recommended or required by manufacturer.
6. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
7. Tighten unused terminal screws on the device.
8. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

G. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.2 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. Tests for Convenience Receptacles:

a. Line Voltage: Acceptable range is 105 to 132 V.
b. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
c. Using the test plug, verify that the device and its outlet box are securely mounted.
d. Correct circuit conditions remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 26 56 68

EXTERIOR ATHLETIC LIGHTING
(Lighting System with LED Light Source)

PART 1 – GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the lighting system performance and design standards for the Portsmouth Soccer Field lighting project using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.

C. The sports lighting will be for the following venues:

1. Soccer

D. The primary goals of this sports lighting project are:

1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.
2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
3. Control and Monitoring: To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

1.2 LIGHTING PERFORMANCE

A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Soccer	30FC	2.5:1	96	30’ x 30’

B. Color: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.

C. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

# of Poles	Pole Designation	Pole Height
4	S1, S2, S3 and S8	70’

1.3 ENVIRONMENTAL LIGHT CONTROL

A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.

B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 feet above grade.

Property Line	Maximum
Horizontal Footcandles	< 7.5 FC
Vertical Footcandles	< 9.5 FC
Candela	145,000 CD

C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.

D. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer’s laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

PART 2 – PRODUCT

2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.

B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected

from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

C. System Description: Lighting system shall consist of the following:
   1. Precast Concrete Foundations with integrated grounding, (ALREADY INSTALLED)
   2. Galvanized steel poles and cross-arm assembly.
   3. Non-approved pole technology:
      a. Square static cast concrete poles will not be accepted.
      b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.
   4. Manufacturer will supply all drivers and supporting electrical equipment
      a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
      b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002.
   5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
   6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
   7. Control cabinet to provide remote on-off control, monitoring of the lighting system. See Section 2.3 for further details.

D. Safety: All system components shall be UL listed for the appropriate application.

2.2 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:
   1. Electric power: 460 Volt, 3 Phase
   2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Energy Consumption: The kW consumption for the field lighting system shall be 50kW, or less.

2.3 CONTROL

A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

C. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming with be set via scheduling options (Website, app, phone, fax, email).

D. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

E. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

F. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

1. Cumulative hours: shall be tracked to show the total hours used by the facility
2. Report hours saved by using early off and push buttons by users.

G. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.

H. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

2.4 STRUCTURAL PARAMETERS

A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 130 and exposure category C.

B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).

C. Lighting system shall be structurally sound and pre-evaluated to meet building code mentioned above.

PART 3 – EXECUTION

3.1 DELIVERY TIMING

A. Delivery Timing Equipment On-Site: The equipment must be on-site 6-8 weeks from receipt of approved submittals and receipt of complete order information.

3.2 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.

B. Field Light Level Accountability

1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.

2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.

3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.

C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

3.4 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.

B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and

equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

PART 4 – DESIGN APPROVAL

4.0 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.

B. Approved Product: Musco's Light-Structure System™ with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.

C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. Submit checklist below with submittal.

Yes / No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics d. Height of light test meter above field surface. e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor.
	D	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	F	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.
	G	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system. They will also provide ten (10) references of customers currently using proposed system in the state of New Hampshire.
	H	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of New Hampshire.
	J	Project	Manufacturer to provide a list of ten (10) projects where the technology and

		References	specific fixture proposed for this project has been installed in the state of New Hampshire. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	K	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	L	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	M	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	N		

The information supplied herein shall be used for the purpose of complying with the specifications for the Portsmouth Soccer Field lighting project. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer:_____ Signature: _____

Contact Name:_____ Date:_____/_____/_____

Contractor:_____Signature: _____

APPENDIX A

GEOTECHNICAL INFORMATION

REPORT

18-1170 S

January 30, 2019

Explorations and Geotechnical Engineering Services

Proposed Athletic Fields
Portsmouth, New Hampshire

Prepared For:
CMA Engineers
Attention: Mr. Phillip A. Corbett, P.E.
35 Bow Street
Portsmouth, NH 03801

Prepared By:
S. W. Cole Engineering, Inc.
10 Centre Road
Somersworth, NH 03878-2926
T: 603-692-0088

S.W.COLE ENGINEERING, INC.

- *Geotechnical Engineering*
- *Construction Materials Testing and Special Inspections*
- *GeoEnvironmental Services*
- *Test Boring Explorations*

www.swcole.com

TABLE OF CONTENTS

18-1170 S

January 30, 2019

CMA Engineers
Attention: Mr. Phillip A. Corbett, P.E.
35 Bow Street
Portsmouth, NH 03801

Subject: Explorations and Geotechnical Engineering Services
Proposed Athletic Fields
Portsmouth, New Hampshire

Dear Phil:

In accordance with our Proposal dated August 30, 2018, the following presents results of our geotechnical evaluation for proposed athletic fields in the City of Portsmouth, New Hampshire. This report summarizes our findings and geotechnical recommendations, and its contents are subject to the limitations set forth in Appendix A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to explore subsurface conditions at the site in order to provide geotechnical recommendations relative to earthwork associated with proposed athletic field construction. Our scope of services included nine test boring and five test pit explorations, soils laboratory testing, a geotechnical evaluation of the findings relative to proposed athletic field construction, and preparation of this report.

Our overall scope of services under the August 30, 2018 Proposal included a proposed transfer station northeast of the proposed athletic field location. We were not authorized to undertake subsurface exploration work for the proposed transfer station, therefore this portion of our scope is not addressed herein. At the request of CMA Engineers, one of the test pits (TP-5) was excavated in the transfer station area for informational purposes.

1.2 Site and Proposed Construction

We understand the proposed athletic fields are to be located on the southerly side of Banfield Road and northerly side of West Road in the City of Portsmouth. The site is accessed by a gravel drive located off of Campus Drive. The proposed athletic fields are to be sited in an open area southwest of a reclaimed gravel pit and east of a wooded area. We understand porous pavement is under consideration for associated parking.

The proposed athletic field construction area encompasses about 8 acres, with site grades having a relative low area at about elevations 26 to 27 feet along the property boundary with the reclaimed gravel pit. Existing grades increase generally radially from this low point throughout the area up to about elevations 40 to 45 feet. There are several debris piles present in the southeasterly portion of the area. While project planning is in conceptual stages, we understand three soccer fields are planned, each having synthetic turf. We understand it is preferred that earthwork require fairly balanced cuts and fills. The main focus of our work has been to assess issues that will impact earthwork, including the potential for shallow bedrock and groundwater as well as reuse of excavated site soils. It is understood that synthetic turf and porous pavement design will be undertaken by others.

We have attached the initial concept plan forwarded to us by CMA Engineers depicting the exploration locations in relation in relation to the general construction area in Appendix B. Also included are existing conditions plans dated January 8, 2019 (Sheets 1 through 8). We have outlined the approximate location of the area explored for the athletic fields on Sheet 1 of the plans.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Nine test borings (B-1 through B-9) were made at the site on November 15, 2018 by S. W. Cole Explorations, LLC, a subsidiary of S. W. Cole Engineering, Inc. (S.W.COLE). Additionally, five test pits were excavated on November 26, 2018 by a local excavation subcontractor. Test Pits TP-1 through TP-4 were made in the proposed athletic field area while Test Pit TP-5 was made in the proposed transfer station area at the request of CMA Engineers, Inc. for information purposes. Test Pit TP-6 was planned nearby Test Pit TP-5 but cancelled by CMA Engineers, Inc. due to presence of wetlands.

The exploration locations were jointly selected by CMA Engineers, Inc. and S.W.COLE. We located the explorations by a combination of using a mapping grade GPS unit and measuring from existing site features. CMA Engineers provided us the coordinates to this end. Subsequent to undertaking the explorations, the explorations were located by the project surveyor, the locations of which have been included by CMA Engineers on the existing conditions plans. The plans indicated the location of Boring B-7 was in question and upon our review, we relocated this boring on the attached plan to more closely match our field observations during the exploration work.

We highlighted the exploration locations on the attached plans in Appendix B. Logs of the explorations, and a key to the notes and symbols used on the logs are attached in Appendix C.

2.2 Field Testing

The test borings were drilled using hollow stem augers and carried to depths varying from 4.1 to 17.0 feet. The soils were sampled where shown on the logs using a split spoon sampler and Standard Penetration Testing (SPT) procedures. SPT blow counts are shown on the logs. Refusals based on resistance to auger penetration or advancement of the split-spoon sampler were recorded in Borings B-1, B-2, B-5 and B-6 at depths of 7.8, 11.3, 4.2 and 4.1 feet, respectively. We also recorded refusals in three of the five test pits at comparable depths. Open standpipe piezometers were installed in Borings B-1 through B-4 after completion of the borings. Please see the attached logs for installation details.

2.3 Laboratory Testing

Soil samples retrieved from the test borings were visually classified in our laboratory. We performed two laboratory gradation and four moisture contest tests on selected samples to assist in our evaluation. Gradation test results are included in Appendix D. Moisture test results are presented on the boring logs.

3.0 SUBSURFACE CONDITIONS

3.1 Soils

The explorations that were undertaken in the area where athletic fields are proposed generally encountered miscellaneous fills overlying native silt-fine sand mixtures, silty clays, glacial till and what appeared to be shallow bedrock in some locations. The fills are predominantly granular with varying amounts of wood, asphalt, brick and other debris and

for the most part extend as deep as 4 to 7 feet in many locations. The fills are loose to medium dense based on SPT N-values (the number of hammer blows required to advance the soil sampler 12 inches).

Borings B-4 and B-7, made in the southerly portion of the athletic field area and encountered medium dense silts and fine sands beneath the fills. The stratum grades to a silt-clay mixture in Borings B-2, B-3 and B-7.

Where encountered, the glacial till consists of a medium dense heterogeneous mixture of silt, sand and gravel.

Borings B-8 and B-9, made along the access drive into the site, encountered 5 feet of very dense silty sand and gravel fill overlying gravelly sands that, in turn, overly silts and fine sands.

Refusals were encountered in several explorations. The following tabulates refusal depths and elevations.

Exploration	Approximate Ground Surface Elevation (ft)	Approximate Depth to Refusal (ft)	Approximate Refusal Elevation (ft)
B-1	36.8	7.8	29
B-2	36.0	11.3	25
B-3	38.7	-	-
B-4	40.7	-	-
B-5	40.0	4.2	36
B-6	28.8	4.1	25
B-7	37 (estimated)	-	-
B-8	44.2	-	-
B-9	42.2	-	-
TP-1	33.6	6	28
TP-2	30.4	2 - 4	26 - 28
TP-3	39.9	-	-
TP-4	28.3	-	-
TP-5	35.3	5	30

From our observations, the refusal in Test Pit TP-1 appeared to be on a boulder, while the refusals in Test Pits TP-2 and TP-5 likely reflect bedrock. It is more difficult to distinguish bedrock from large obstacles such as boulders in test borings, however with the exception of Boring B-5, the refusal elevations in Borings B-1, B-2 and B-6 are consistent with the apparent bedrock observed in Test Pit TP-2. For planning purposes, we suggest assuming refusals are on or near the bedrock surface. It may be prudent to undertake additional test pit work to obtain supplementary bedrock observations.

Please refer to the attached logs for more detailed subsurface information.

3.2 Groundwater

Groundwater and/or moist soils were observed in most of the explorations, the majority of which were within about 5 feet of existing grade. We returned to the site on December 5, 2018 and measured groundwater in the wells installed in Borings B-1 through B-4 at depths of 7.6, 0.9, 1.2 and 5.5 feet, respectively.

It is of note these observations were made during a seasonally wet period of the year. Groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

4.0 ASSESSMENT

We understand project planning is in the preliminary stages and the configuration of the athletic fields as well as proposed grading are in flux. From the perspective of balancing cuts and fills, a cursory look at site grades suggests the potential for fields to be established at elevations in the range of 31 to 34 feet, requiring site grading cuts along the southerly and southwesterly portions of the area. However, the shallow groundwater levels, subgrade soils expected to be highly susceptible to disturbance, and presence of shallow bedrock in the cut areas may render finish grades above elevation 34 feet more desirable. Further, there is the potential for encountering existing fills with asphalt and other debris that may be classified as “urban fills,” with associated disposal costs should they be excavated in the course of subgrade preparation and require off-site disposal.

We recommend that excavation to subgrade be made utilizing an excavator with a smooth-edge bucket. Use of equipment directly on the subgrade creates high potential for subgrade disturbance and should be avoided. Generally, an excavator working from existing grade to prepare the subgrade will create less potential for subgrade disturbance.

Where subgrades become yielding or difficult to work, we recommend over-excavation by at least 12 inches and replacement with Crushed Stone overlying non-woven geotextile filter fabric such as Mirafi 180N or equivalent. The Crushed Stone should meet the requirements of ASTM D-448, No. 57 stone.

Where subgrades are fills containing clustered boulders, blast spoils or excessive oversized materials, voids where present should be choked with Crushed Stone.

It is apparent that groundwater is at least seasonally within 2 to 4 feet of the ground surface. The explorations indicate that excavations made to these depths will likely encounter for the most part granular fills with the erratic presence of various debris. Excavations made deeper in fills are likely to encounter wetter conditions. Excavated fill materials may be used in compacted lifts to raise grades in ball field areas provided that organics, objectionable foreign debris and rocks larger than 6 inches in size are culled, and the materials are at a moisture content consistent with meeting project compaction requirements. We expect this effort will be easier during the typically drier summer months. The underlying native fine sand-silt-clays are expected to be more difficult to reuse are they will likely be at or near saturation.

Where imported borrow is needed, we recommend the material consist of Granular Borrow meeting the following gradation requirements.

GRANULAR BORROW	
Sieve Size	Percent Finer by Weight
6 Inch	100
Portion Passing 3 Inch Sieve	
No. 40	0 to 70
No. 200	0 to 20

Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for soil used in grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill be compacted to at least 92 percent of its maximum dry density as determined by ASTM D1557 (Modified Proctor).

Depending upon proposed site grading, it would be prudent to consider an interceptor

APPENDIX A

Limitations

This report has been prepared for the exclusive use of CMA Engineers, Inc. for specific application to proposed Athletic Fields in Portsmouth, New Hampshire. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

APPENDIX B

Figures

Pike Industries

CAMPUS DR

B5 B6 B7 B8 B9

TP1 TP2 TP3 TP4 TP5 TP6

PZ/B1 PZ/B2 PZ/B3 PZ/B4

Point #	Elevation	Northing	Easting	Description
2001	0.00	199259.22	1220490.46	TP1
2002	0.00	199132.21	1220688.60	TP-2
2003	0.00	199031.73	1221081.14	TP3
2004	0.00	199398.43	1220597.91	TP4
2005	0.00	199973.79	1221797.47	TP5
2006	0.00	199579.94	1221705.70	TP6
2007	0.00	199263.50	1220895.78	B-5
2008	0.00	199030.33	1220930.24	B-7
2010	0.00	198168.97	1220532.94	B-8
2011	0.00	198492.57	1220665.29	B-9
2012	0.00	199199.42	1220328.77	PZ/B1
2013	0.00	199048.40	1220553.37	PZ/B2
2014	0.00	198939.48	1220744.39	PZ/B3
2015	0.00	198865.00	1220977.43	PZ/B4

NAD83 New Hampshire State Planes, US Feet

Portsmouth Multi-purpose Recreation Fields

Round 1: Subsurface Investigation

0 100 200

B# Boring

PZ/B# Piezometer

TP# Test Pit

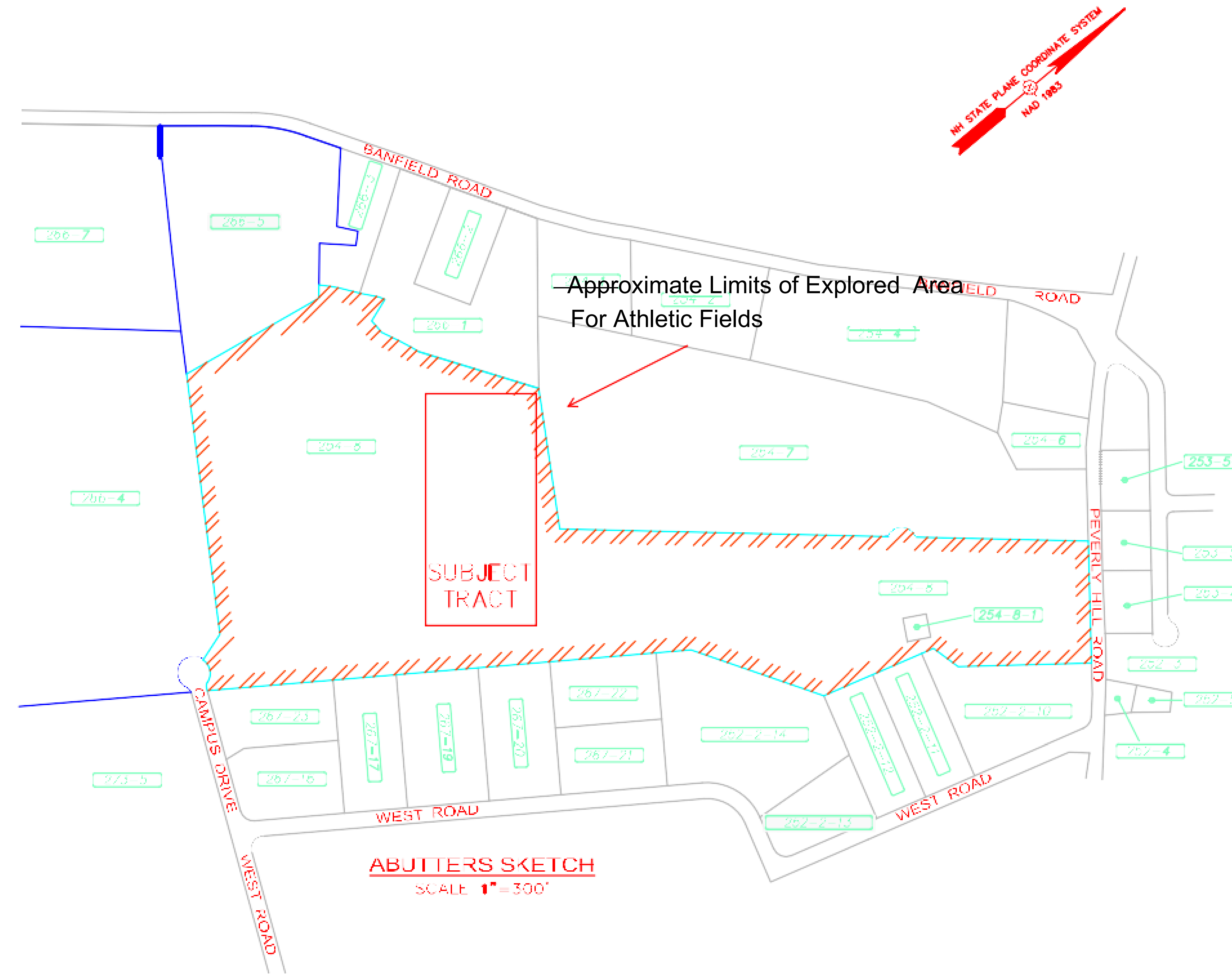
Approximate Wetland Limits

CMA ENGINEERS

R:\2018\18-1170\CAD\External References\DWG\1119-XREF-SURVEY.dwg, 1/14/2019 4:11:42 PM, 1:1, CEM, S. W. Cole Engineering, Inc.

ABUTTERS LIST

MAP-LOT	OWNER OF RECORD	DEED REFERENCE
252-2-10	JMK REALTY LLC, PO BOX 971, PORTSMOUTH, NH 03802	3656/744
252-2-11	HEC WEST ROAD LLC, 2 INTERNATIONAL WAY, LAWRENCE, MA 01843 60 WEST RD, PORTSMOUTH, NH 03801	5835/67
252-2-12	ONE HUNDRED WEST LLC, 100 WEST RD, PORTSMOUTH, NH 03801	3589/1427
252-2-14	LITCHFIELD PORTSMOUTH LLC C/O EATON PARTNERS INC, 175 CANAL ST STE 401, MANCHESTER, NH 03101	4800/1185
252-3	LIGHTHOUSE MANUFACTURING LLC, 25 SOUTH SATELLITE RD, SOUTH WINDSOR, CT 06074	N/A
252-4 & 252-5	4 AMIGOS LLC, 321 LAFAYETTE RD, HAMPTON, NH 03842	N/A
253-4	DPH REALTY LLC, 30 MIRONA RD EXT, PORTSMOUTH, NH 03801	N/A
253-5	GERALD W. & TERESA M. REYNOLDS, 164 MASON RD, MILTON, NH 03851	N/A
253-5-1	BOURAS GROUP LLC, 10 MIRONA RD, PORTSMOUTH, NH 03801	N/A
254-7	PIKE INDUSTRIES, INC., 3 EASTGATE PARK RD, BELMONT, NH 03220	3197/1085
254-8-1	VCM ACQUISITION 2017 LLC ATTN: TAX DEPT NH22094-A, 5051 CONGRESS AVE, BOCA RATON, FL 33487-1307	N/A
266-1	RICCI CONSTRUCTION CO., INC., 225 BANFIELD RD, PORTSMOUTH, NH 03801	2527/322
266-3	ANDREW R. & CAROL ANN CROTEAU, 285 BANFIELD RD, PORTSMOUTH, NH 03801	2274/1868
266-4	FOUNDATION FOR SEACOAST HEALTH, 100 CAMPUS DR SUITE 1, PORTSMOUTH, NH 03801	3276/2980 & 3259/2178
266-5	HOPE FOR TOMORROW FOUNDATION, 1 STONERIDGE DR, RYE, NH 03870	5783/602
267-17-1	300 WEST RD LLC, 300 WEST ROAD UNIT #1, PORTSMOUTH, NH 03801	4463/1140
267-17-2	GRAYWOLF PROPERTIES LLC, 1 LIBBEY LN, RYE, NH 03870	4397/2371
267-17-3	GRAYWOLF PROPERTIES LLC, 1 LIBBEY LN, RYE, NH 03870	4439/1934
267-17-4	GRAYWOLF PROPERTIES LLC, 1 LIBBEY LN, RYE, NH 03870	4397/2371
267-19-1	BBJ PROPERTIES, INC., 38 RAINBOW LN, SANFORD, ME 04073	3396/126
267-19-2	PETER PARADIS, 481 DENNETT ST, PORTSMOUTH, NH 03801	3090/1083
267-19-3	KEVIN J. DUPLISEA, 270 WEST RD #3, PORTSMOUTH, NH 03801	5564/2186
267-19-4	WEST ROAD EQUIPMENT LLC, 270 WEST RD UNIT 4A, PORTSMOUTH, NH 03801	5059/2202
267-20	HARVEY PROPCO LLC, 1400 MAIN ST, WALTHAM, MA 02451	5660/1693
267-21	P A M REALTY TRUST C/O CP MANAGEMENT, INC., 11 COURT ST, SUITE 100, EXETER, NH 03833	4438/828
267-21	STERLING REALTY, INC., 143 PINELOCH DR, PORTLAND, ME 04103	2762/2839
267-22	MICRONICS, INC., 200 WEST RD, PORTSMOUTH, NH 03801	5423/2254
267-23	ENGEL FAMILY TRUST, ROBERT ENGEL TRUSTEE, PO BOX 6070, MANCHESTER, NH 03108	3459/1842
273-5	BELLWOOD ASSOCIATES LTD PARTNERSHIP C/O FESTIVAL FUN PARK PROPERTY TAX SERVICES PO BOX 543185, DALLAS, TX 75354	3471/2972



ABUTTERS SKETCH
SCALE 1" = 300'

NOTES:

1. OWNER OF RECORD..................CITY OF PORTSMOUTH, N.H.
ADDRESS..................................1 JUNKINS AVE, PORTSMOUTH, NH 03801
DEED REFERENCE......................3276/2986 & 5819/2310
TAX SHEET / LOT......................254-8

ZONED:.................... MUNICIPAL — FRONT YARD SETBACK.....N/A
MINIMUM LOT AREA N/A — SIDE YARD SETBACK.........N/A
FRONTAGE.............. N/A — REAR YARD SETBACK.......N/A

2. THE RELATIVE ERROR OF CLOSURE WAS LESS THAN 1 FOOT IN 15,000 FEET.

3. THIS PLAN IS BASED ON A FIELD SURVEY, INFORMATION FROM PLANS OF RECORD AND AERIAL MAPPING BY EASTERN TOPOGRAPHICS.
PRIMARY BM: CITY CONTROL POINT "INDU"
HORIZONTAL DATUM: NAD 1983 (1996 CONTROL ADJUSTMENT)
VERTICAL DATUM: NAVD 1988

4. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE.

5. THE SUBJECT TRACTS LIE IN ZONE X (UNSHADED), AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON FLOOD INSURANCE MAP NO. 33015C0270E, EFFECTIVE DATE MAY 17, 2005, BY FEMA.

6. PARCEL 254-8 AND A PORTION OF PARCEL 266-4 ARE SUBJECT TO A RESTRICTIVE COVENANT AGREEMENT BETWEEN JOHN IAFOLLA CO., INC. & PIKE INDUSTRIES, INC., SEE RCRD BOOK 3192, PAGE 1088, BOOK 3193, PAGE 2059 AND BOOK 3198, PAGE 853.

7. WETLANDS DELINEATION 10/2018 BY GZA ENVIRONMENTAL.

8. ENGINEER OR CONTRACTOR TO VERIFY SITE BENCHMARKS BY LEVELING BETWEEN 2 BENCHMARKS PRIOR TO THE SETTING OR ESTABLISHMENT OF ANY GRADES/ELEVATIONS. DISCREPANCIES ARE TO BE REPORTED TO JAMES VERRA AND ASSOC., INC.

REFERENCE PLANS:

1. AMENDED SITE PLAN, PROPERTY OF MICRONICS INC, 200 WEST ROAD, PORTSMOUTH, N.H., DATED 12/30/2014, RCRD PLAN D-38846.
2. LOT LINE REVISION PLAN, 755 BANFIELD ROAD REALTY, LLC, CONSTITUTION AVENUE, PORTSMOUTH, N.H., REVISED TO 11/28/2011, RCRD PLAN D-37091.
3. DRAINAGE EASEMENT PLAN OVER LAND OF BELLWOOD ASSOCIATES LIMITED PARTNERSHIP, CAMPUS DRIVE, PORTSMOUTH, N.H., DATED 7/30/2007, RCRD PLAN D-35073.
4. ACTIVITY AND USE RESTRICTION EASEMENT PLAN FOR PORTSMOUTH DEPARTMENT OF PUBLIC WORKS, 680 PEVERLY HILL ROAD, PORTSMOUTH, N.H., REVISED TO 9/13/2006, RCRD PLAN D-34222.
5. LATTICE TOWER EASEMENT PLAN, PEVERLY HILL ROAD, PORTSMOUTH, N.H., FOR MESSAGE CENTER MANAGEMENT, REVISED TO 4/16/2002, RCRD PLAN D-30056.
6. FOUNDATION FOR SEACOAST HEALTH, PORTSMOUTH, N.H., LOT LINE ADJUSTMENT, JOHN IAFOLLA COMPANY, INC. AND CITY OF PORTSMOUTH, REVISED TO 4/14/1998, RCRD PLAN D-26202.
7. SUBDIVISION & LOT LINE RELOCATION PLAN FOR PIKE INDUSTRIES, INC. & JOHN IAFOLLA COMPANY, INC. PEVERLY HILL ROAD/ BANFIELD ROAD, PORTSMOUTH, N.H., REVISED TO 11/21/1997, RCRD PLAN D-26136.
8. SUBDIVISION PLAN FOR JOHN IAFOLLA COMPANY, INC., PEVERLY HILL ROAD/ BANFIELD ROAD, PORTSMOUTH, N.H., REVISED TO 11/20/1996, RCRD PLAN D-25124.
9. LOT LINE ELIMINATION PLAN FOR BELLWOOD ASSOCIATES LIMITED PARTNERSHIP, LAFAYETTE ROAD/ CONSTITUTION AVENUE, PORTSMOUTH, N.H., DATED 9/3/1991, RCRD PLAN D-21288.
10. PLAN OF DRAINAGE EASEMENT FOR LAFAYETTE WEST CORP & LFP INTERIM PARTNERS, WEST ROAD, PORTSMOUTH, N.H., REVISED TO 3/28/1989, RCRD PLAN D-22902.
11. SUBDIVISION PLAN, LINCOLN AND MARY HANSCOM, PORTSMOUTH, N.H., DATED 1/1983, RCRD PLAN D-11441.
12. LOT LINE REVISION PLAN, CAMPUS DRIVE, BANFIELD & PEVERLY HILL ROADS, PORTSMOUTH, N.H., FOR CITY OF PORTSMOUTH, N.H. & FOUNDATION FOR SEACOAST HEALTH, REVISED TO 12/14/2016, RCRD PLAN D-39897.

R:\2018\18-1170\CAD\External References\DWG\1119-XREF-SURVEY.dwg Date Plotted: Jan 14, 2019 - 4:11pm Plotted By: CMORRISON

City of Portsmouth, New Hampshire
Department of Public Works
Portsmouth Transfer Station

Existing Conditions Plan

date	designed by:	project no:	drawn by:	file name:	approved by:	scale:
January 10, 2018	n/a	1122	JCS	1119-XREF-SURVEY.dwg	JV	1"= 300'

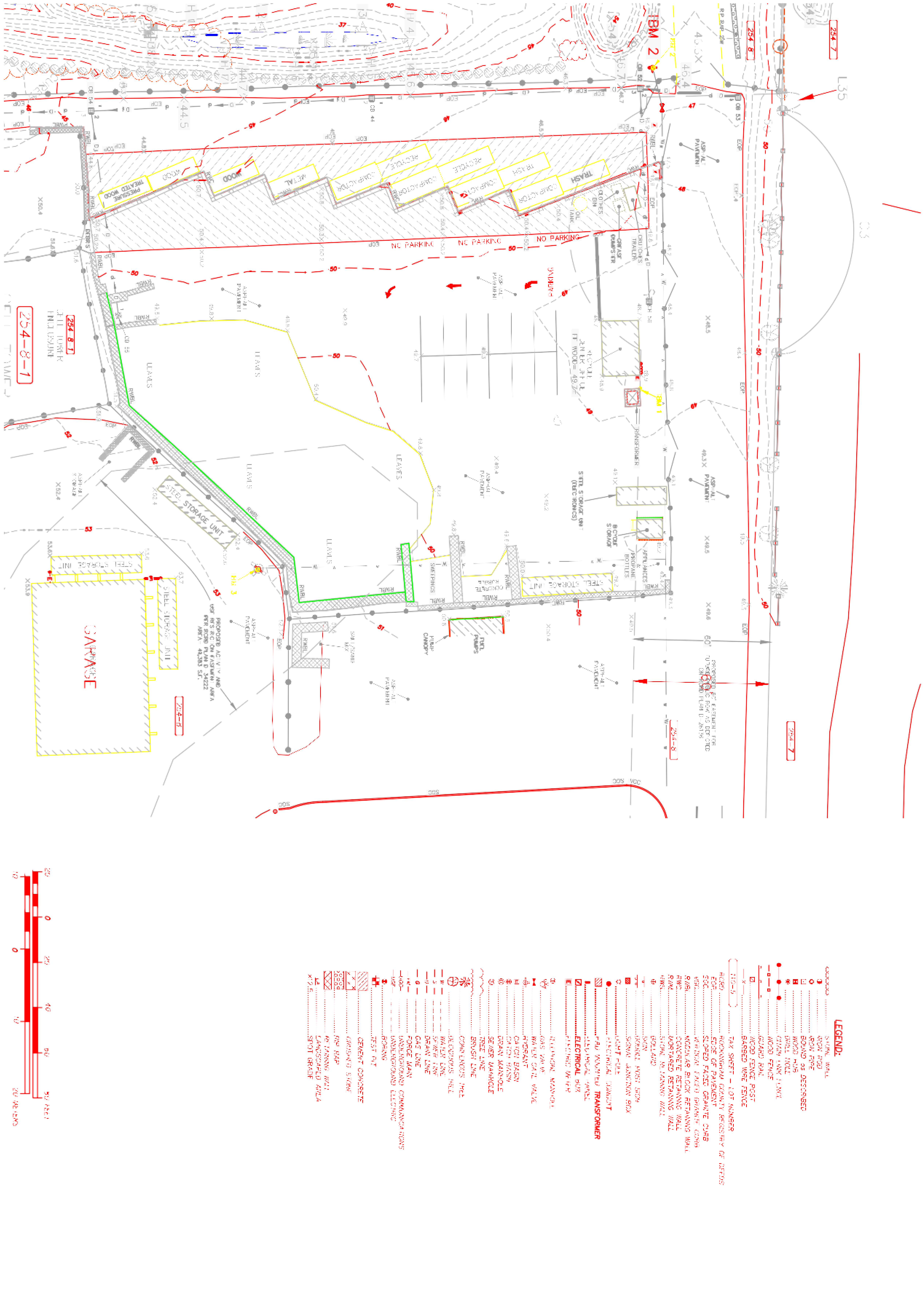
0 300' 600'
Scale: 1" = 300'

CMA ENGINEERS
Civil/Environmental/Structural
Portsmouth, NH Manchester, NH Portland, ME
603/431-6196 603/627-0708 207/541-4223
cmaengineers.com

no.	revision	date	by

drawing no. EC-1
sheet 1 of 8

R:\2018\18-1170\CAD\External References\DWG\1119-XREF-SURVEY.dwg, 1/14/2019 4:11:45 PM, 1:1, CEM, S. W. Cole Engineering, Inc.



NO PARKING
PRESSURE TREATED WOOD
WOOD
METAL
COMPACTOR
RECYCLE
TRASH
CLOTHES BIN
OIL TANK
GREASE DUMPSTER
CRUTCHES TRAILER
RECYCLE CENTER OFFICE FF WOOD= 49.7
TRANSFORMER
STEEL STORAGE UNIT (ELECTRONICS)
BICYCLE STORAGE
APPLIANCES & PROPANE BOTTLES
STEEL STORAGE UNIT
CONCRETE RUBBLE
SWEEPINGS
LEAVES
FUEL PUMPS
PUMP CANOPY
ASPHALT PAVEMENT
GARAGE
PROPOSED ACTIVITY AND USE RESTRICTION EASEMENT AREA PER RCRD PLAN D 34222 AREA= 44,383 S.F.
PROPOSED 60' EASEMENT FOR FUTURE PUBLIC ROW AS DEPICTED ON RCRD PLAN D-26136
TBM 1
TBM 2
TBM 3
254-8-1
254-8
254-7
L35
LEGEND:
STONE WALL
IRON ROD
IRON PIPE
BOUND as DESCRIBED
WOOD HUB
DRILL HOLE
CHAIN LINK FENCE
WOOD FENCE
GUARD RAIL
WOOD FENCE POST
BARBED WIRE FENCE
TAX SHEET – LOT NUMBER
ROCKINGHAM COUNTY REGISTRY OF DEEDS
EDGE OF PAVEMENT
SLOPED FACED GRANITE CURB
VERTICAL FACED GRANITE CURB
MODULAR BLOCK RETAINING WALL
CONCRETE RETAINING WALL
MORTARED RETAINING WALL
STONE RETAINING WALL
BOLLARD
SIGN
DOUBLE POST SIGN
SIGNAL JUNCTION BOX
LIGHT POLE
ELECTRICAL CONDUIT
PAD MOUNTED TRANSFORMER
ELECTRICAL PANEL
ELECTRICAL BOX
ELECTRIC METER
TELEPHONE MANHOLE
GAS VALVE
WATER GATE VALVE
HYDRANT
CATCH BASIN
CATCH BASIN
DRAIN MANHOLE
SEWER MANHOLE
TREE LINE
BRUSH LINE
CONIFEROUS TREE
DECIDUOUS TREE
WATER LINE
SEWER LINE
DRAIN LINE
GAS LINE
FORCE MAIN
UNDERGROUND COMMUNICATIONS
UNDERGROUND ELECTRIC
BORING
TEST PIT
CEMENT CONCRETE
CRUSHED STONE
RIP RAP
RETAINING WALL
LANDSCAPED AREA
SPOT GRADE

City of Portsmouth, New Hampshire
Department of Public Works
Portsmouth Transfer Station

Existing Conditions Plan

date: January 10, 2018	designed by: n/a
project no: 1122	drawn by: JCS
file name: 1119-XREF-SURVEY.dwg	approved by: JV
scale: 1"= 20'	

Scale: 1" = 20'

drawing no. EC-1

sheet: 2 of 8

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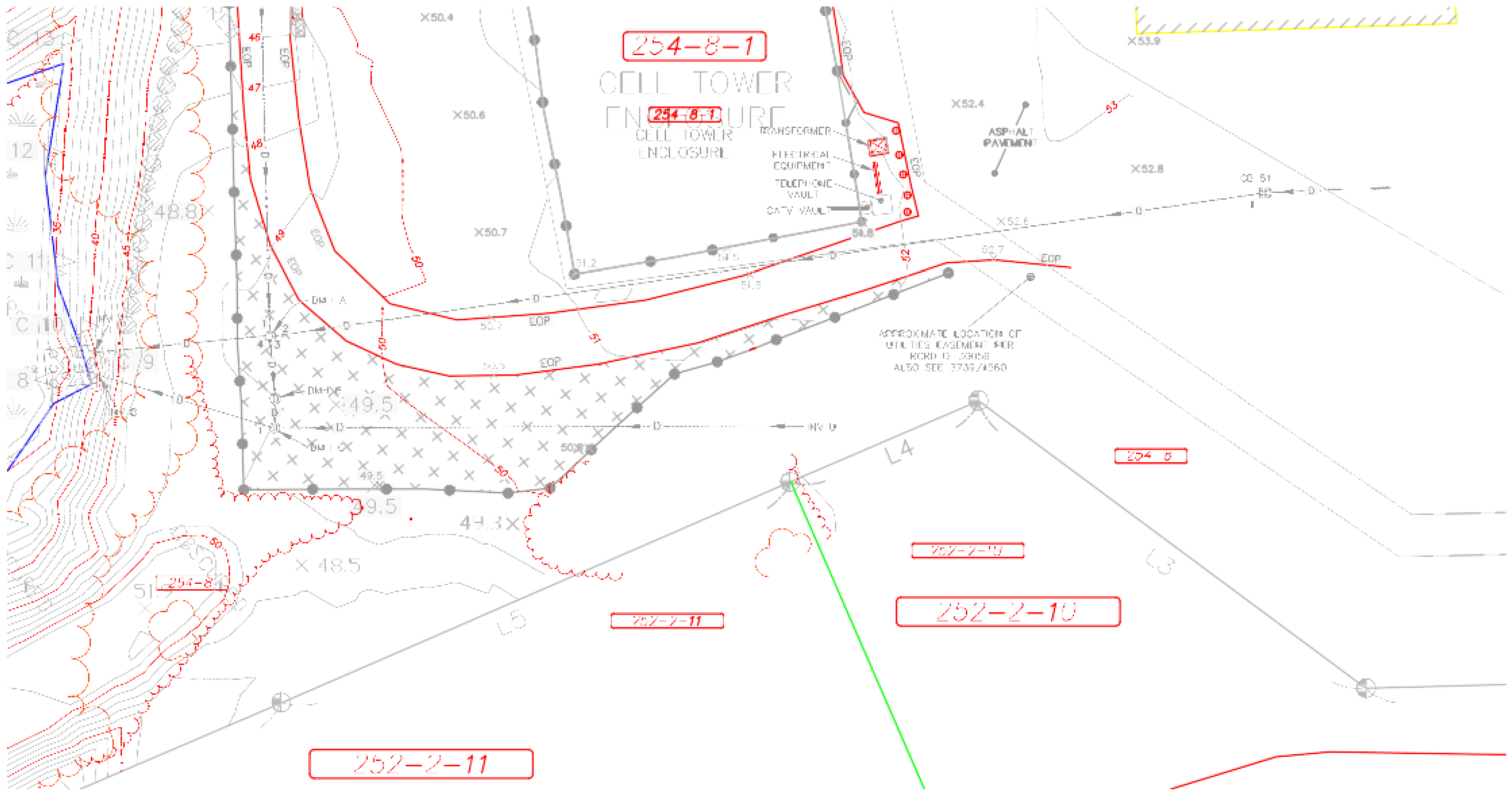
254-8-1
CELL TOWER ENCLOSURE
254-8-1
CELL TOWER ENCLOSURE
TRANSFORMER
ELECTRICAL EQUIPMENT
TELEPHONE VAULT
CATV VAULT
ASPHALT PAVEMENT
APPROXIMATE LOCATION OF UTILITIES EASEMENT PER RCRD D-30058 ALSO SEE 3735/1560
X50.4
X50.6
X50.7
X52.4
X52.8
X53.9
X48.5
EOP
L4
L5
L3
252-2-11
252-2-11
252-2-10
252-2-10
254-5

DRAIN & SEWER TABLE

CB 44
RIM EL= 45.55
(1) INV IN 15"HDPE= 42.40
(2) INV OUT 15"HDPE= 42.30

CB 52
RIM EL= 46.87
(1) INV IN 12"HDPE= 43.10
(2) INV IN 12"HDPE= 43.37
(3) INV OUT 15"HDPE= 43.67

CB 53
RIM EL= 46.69
(1) INV OUT 12"HDPE= 43.35

CB 54
RIM EL= 44.37
(1) INV IN 15"HDPE= 41.26
(2) INV IN 12"HDPE= 41.19
(3) INV OUT 15"HDPE= 41.10

CB 55
RIM EL= 49.67
(1) INV OUT 12"HDPE= 43.00

CB 56
RIM EL= 47.97
(1) INV OUT 12"HDPE= 44.05

CB A
RIM EL= 27.63
(1) INV IN 24"HDPE= 23.81
(2) INV OUT 24"HDPE= 23.73

CB B
RIM EL= 27.41
(1) INV IN 24"HDPE= 23.43
(2) INV OUT 24"HDPE= 23.41

CB C
RIM EL= 27.22
(1) INV IN 24"HDPE= 23.21
(2) INV OUT 24"HDPE= 23.26

SMH 3567
RIM EL= 52.38
(1) INV IN 4"PVC INV= 48.1±
(2) INV OUT 8"PVC= 47.7±

DMH A
RIM EL= 49.52
(1) INV IN 18"HDPE= 40.38
(2) INV IN 15"HDPE= 39.73
(3) INV OUT 18"HDPE= 40.08
BRICK WEIR FLOW LINE
FOR (4) = 41.23
(4) INV OUT 18"HDPE= 40.24

DMH B & DMH C ARE VORTECHNICS DRAINAGE TREATMENT STRUCTURES

DMH B
RIM EL= 48.89

DMH C
RIM EL= 49.03
TRAPEZOIDAL WEIR EL= 41.73
(1) INV OUT 18"HDPE= 39.88

DROP INLET 1
CONCRETE COVER EL= 51.58
2 SIDE INLETS 0.85 W x 0.70 H
INLET EL= 50.71
(1) INV OUT 18"HDPE= 46.26

INV A
INV OUT 18"HDPE= 40.0±

INV B
INV OUT 18"HDPE= 39.65

INV C1
INV OUT 24"RCP= 33.54

INV C2
INV OUT 24"RCP= 33.56

INV D
54"W X 42"H ARCHED CMP
INV IN= 22.31

INV E
54"W X 42"H ARCHED CMP
INV OUT= 21.90

INV F
INV OUT 24"HDPE= 23.06

INV G
INV IN 24"HDPE= 23.89

INV H (PERFORATED PIPE)
INV OUT 6"HDPE= 24.52

INV I (PERFORATED PIPE)
INV IN 6"HDPE= 30.63

INV J1
INV IN 15"HDPE= 31.83

INV J2
INV IN 15"HDPE= 31.78

INV K1
INV OUT 15"HDPE= 30.66

INV K2
INV OUT 15"HDPE= 30.90

INV L
INV OUT 18"HDPE= 45.80

INV M (UNDERDRAIN)
INV OUT 4"PVC= 46.63

INV N1
INV IN 18"HDPE= 45.26

INV N2
INV IN 18"HDPE= 45.23

INV N3
INV IN 18"HDPE= 45.23

INV O (UNDERDRAIN)
INV OUT 4"PVC= 46.05

INV P (UNDERDRAIN)
INV OUT 4"PVC= 46.15

INV Q1
INV OUT 15"HDPE= 44.90

INV Q2
INV OUT 15"HDPE= 44.92

INV Q3
INV OUT 15"HDPE= 44.84

INV R1
INV OUT 36"CMP= 27.33

INV R2
INV OUT 36"CMP= 27.32

INV S1
INV IN 36"CMP= 30.68

INV S2
INV IN 36"CMP= 30.64

INV T1
INV IN 24"RCP= 35.22

INV T2
INV IN 24"RCP= 35.47

INV U
INV IN 12"HDPE= 41.23

TBM TABLE

TBM 1
WESTERLY CORNER OF CONCRETE TRANSFORMER PAD
EL= 49.58

TBM 2
BOLT W/ "X" CUT
HYDRANT TOP FLANGE
EL= 48.63

TBM 3
BOLT W/ "X" CUT
HYDRANT TOP FLANGE
EL= 53.92

TBM 4
SURVEY SPIKE SET
IN BASE 30" PINE
EL= 47.40
(0.5' ABOVE GROUND)

TBM 5
MARKED BOLT
HYDRANT LOWER FLANGE
EL= 52.07

TBM 6
CHISELLED SQUARE FOUND
IN LEDGE OUTCROP
EL= 40.09
(AT GROUND EL.)

TBM 7
SPIKE FOUND
IN BASE 30" PINE
EL= 37.19
(0.5' ABOVE GROUND)

20 0 20 40 60 80 FEET
10 0 10 20 METERS

LEGEND:

STONE WALL
IRON ROD
IRON PIPE
BOUND as DESCRIBED
WOOD HUB
DRILL HOLE
CHAIN LINK FENCE
WOOD FENCE
GUARD RAIL
WOOD FENCE POST
BARBED WIRE FENCE
TAX SHEET – LOT NUMBER
RCRD ROCKINGHAM COUNTY REGISTRY OF DEEDS
EOP EDGE OF PAVEMENT
SGC SLOPED FACED GRANITE CURB
VGC VERTICAL FACED GRANITE CURB
RWBL MODULAR BLOCK RETAINING WALL
RWC CONCRETE RETAINING WALL
RWM MORTARED RETAINING WALL
RWS STONE RETAINING WALL
BOLLARD
SIGN
SINGLE POST SIGN
SIGNAL JUNCTION BOX
LIGHT POLE
ELECTRICAL CONDUIT
PAD MOUNTED TRANSFORMER
ELECTRICAL PANEL
ELECTRICAL BOX
ELECTRIC METER
TELEPHONE MANHOLE
GAS VALVE
WATER GATE VALVE
HYDRANT
CATCH BASIN
CATCH BASIN
DRAIN MANHOLE
SEWER MANHOLE
TREE LINE
BRUSH LINE
CONIFEROUS TREE
DECIDUOUS TREE
WATER LINE
SEWER LINE
DRAIN LINE
GAS LINE
FORCE MAIN
UNDERGROUND COMMUNICATIONS
UNDERGROUND ELECTRIC
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no.	revision	date	by

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City of Portsmouth, New Hampshire
Department of Public Works
Portsmouth Transfer Station

Existing Conditions
Plan

date: January 10, 2018	designed by: n/a
project no: 1122	drawn by: JCS
file name: 1119-XREF-SURVEY.dwg	approved by: JV
scale: 1"= 20'	

0 20' 40'
Scale: 1" = 20'

drawing no. EC-1
sheet 3 of 8

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TP-5

PARCEL 254-8 IS SUBJECT TO AN EASEMENT FOR DRAINAGE AND FLOWAGE OF SURFACE WATERS – SEE RCRD BOOK 3065, PAGE 1170

PROPOSED 60' EASEMENT FOR FUTURE PUBLIC ROW AS DEPICTED ON RCRD PLAN D-26136

PERMANENT ROADWAY EASEMENT PER RCRD PLAN D-28607 ALSO SEE RCRD BOOK 3533, PAGE 2110

PEVERLY HILL ROAD (PUBLIC WAY)

GARAGE

254-8-1

CELL TOWER

City of Portsmouth, New Hampshire Department of Public Works Portsmouth Transfer Station Existing Conditions Plan	date: January 10, 2018	designed by: n/a	CMA ENGINEERS Civil/Environmental/Structural Portsmouth, NH Manchester, NH Portland, ME 603/431-6196 603/627-3708 207/541-4223 cmaengineers.com
	project no: 1122	drawn by: JCS	
	file name: 1119-XREF-SURVEY.dwg	approved by: JV	
	scale: 1"= 40'	0 40' 80' Scale: 1" = 40'	

no.	revision	date	by

sheet 4 of 8

drawing no. EC-1

B-3
B-4
B-7
TP-2
TP-3
B-6
SHEET 6 MATCH LINE SHEET 5
SHEET 8 MATCH LINE SHEET 5
SHEET 5 MATCH LINE SHEET 4

City of Portsmouth, New Hampshire Department of Public Works Portsmouth Transfer Station Existing Conditions Plan	date: January 10, 2018 project no: 1122 file name: 1119-XREF-SURVEY.dwg designed by: n/a drawn by: JCS approved by: JV scale: 1"= 40'

EC-1
sheet 5 of 8

0 40' 80'
Scale: 1" = 40'

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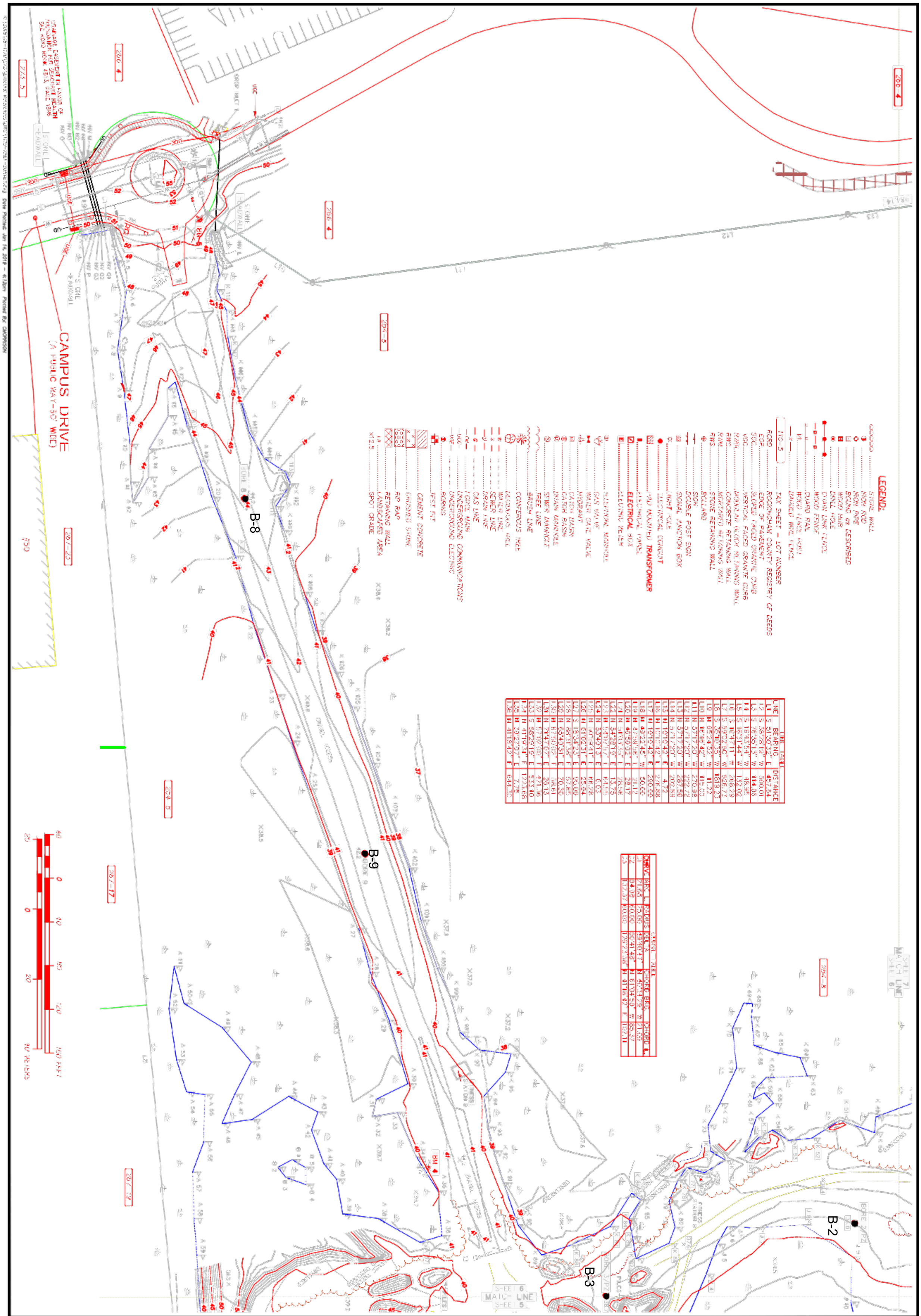
no.	revision	date	by



City of Portsmouth, New Hampshire
Department of Public Works
Portsmouth Transfer Station

Existing Conditions Plan

date: January 10, 2018
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EC-1

sheet 6 of 8

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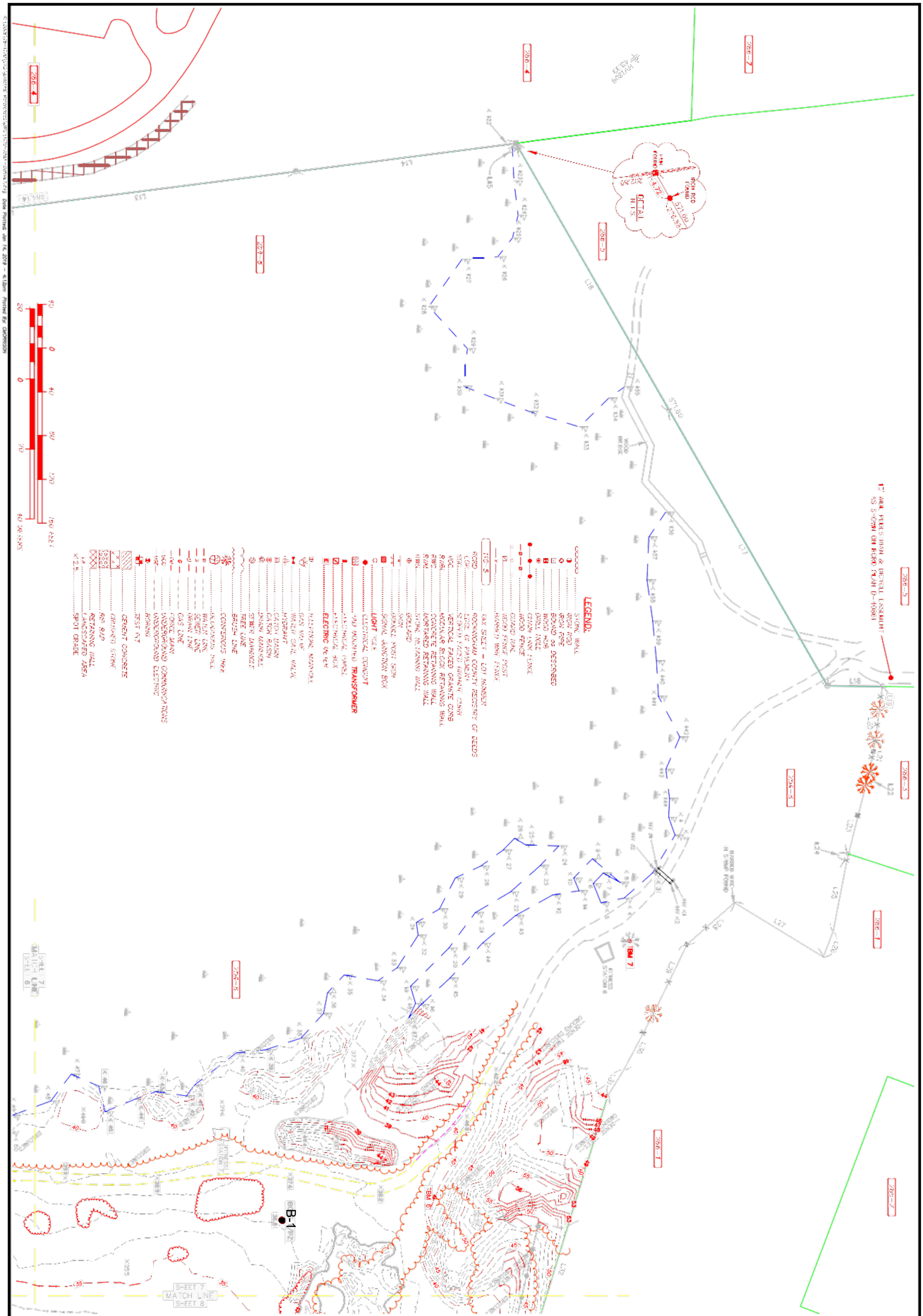

City of Portsmouth, New Hampshire Department of Public Works Portsmouth Transfer Station	date: January 10, 2018	designed by: n/a	CMA ENGINEERS CIVIL/ENVIRONMENTAL/STRUCTURAL Portsmouth, NH Manchester, NH Portland, ME 603/431-6196 603/627-3708207/541-4223 cmaengineers.com
	project no: 1122	drawn by: JCS	
	file name: 1119-XREF-SURVEY.dwg	approved by: JV	
Existing Conditions Plan	scale: 1"= 40'		

EC-1 — sheet 7 of 8

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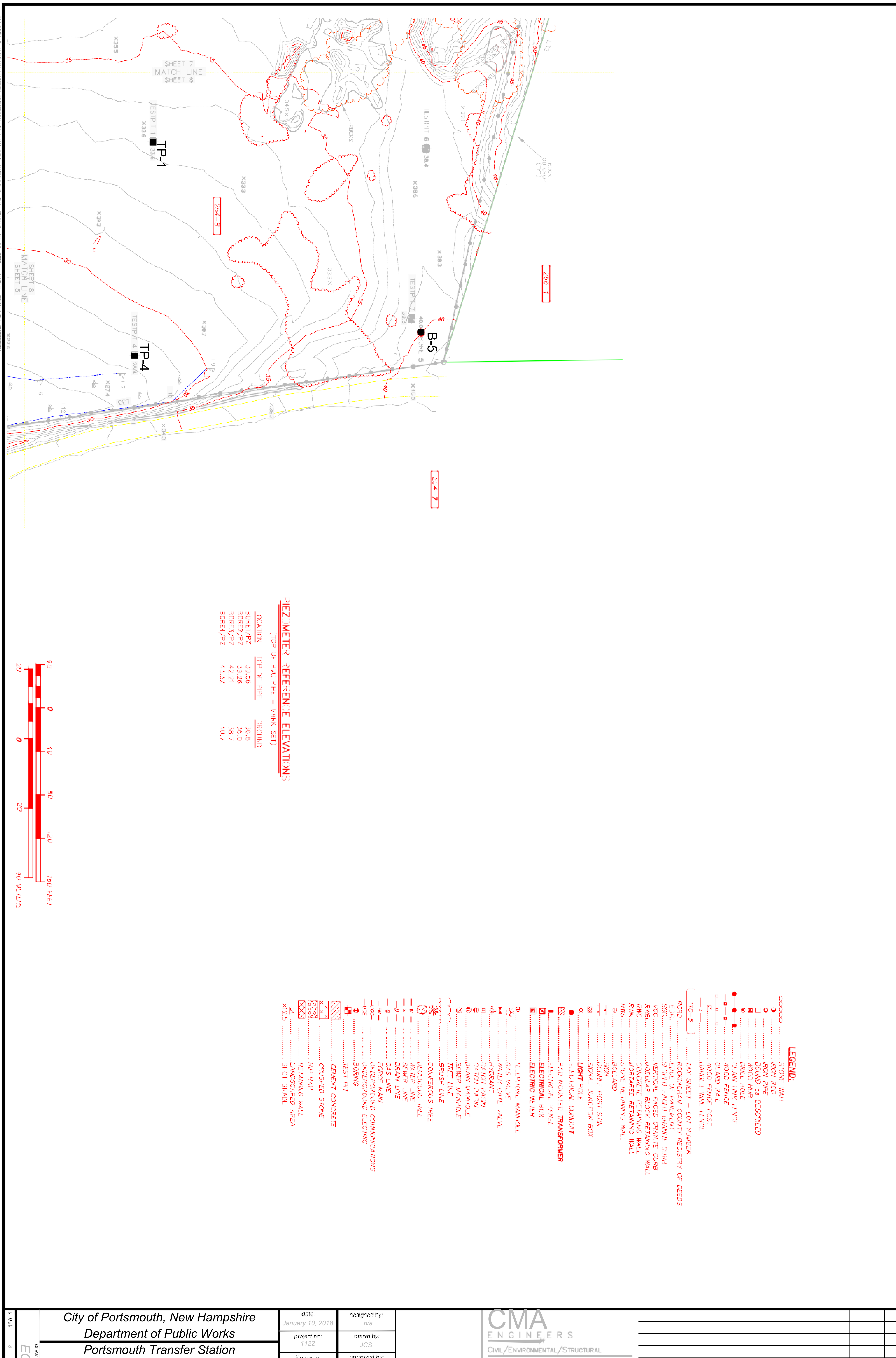

City of Portsmouth, New Hampshire
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date: January 10, 2018	designed by: n/a
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no.	revision	date	by

drawing no. EC-1
sheet 8 of 8

APPENDIX C

Exploration Logs and Key

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-1
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 36.8' Surveyed **TOTAL DEPTH (FT):** 7.8 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▼ 7.6 ft 12/5/2018
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin W alled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	W ell Diagram
			1D		0-2	24/6	3-6-3-6			Medium dense, brown Gravelly Silty SAND with asphalt (Fill)		Auger Cuttings
35			2D		2-4	24/1	7-19-8-10					
	5											Filter Sand
			3D		5-7	24/2	20-11-9-11			5.0 Medium dense, brown Silty Gravelly SAND (Possible Fill)	▼	
30												

Refusal at 7.8 feet
(Probable Boulder or Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: B-1

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-2
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 36' Surveyed **TOTAL DEPTH (FT):** 11.3 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▼ 0.9 ft 12/5/2018
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	W ell Diagram
35			1D		0-2	24/14	2-4-7-8			Medium dense, brown Gravelly Silty SAND with asphalt and wood (Fill)	▼	Auger Cuttings
										1.5 Medium,brown-gray SILT and CLAY		
			2D		2-4	24/12	5-6-2-2					
	5											
30			3D		5-7	24/14	2-1-1-1					Filter Sand
	10											
25			4D		10-11.3	16/18	WOH-WOH-50/4"			11.0 Possible Glacial Till		

Refusal at 11.3 feet
(Probable Boulder or Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-3
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 38.7' Surveyed **TOTAL DEPTH (FT):** 12.0 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▼ 1.2 ft 12/5/2018
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin W alled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	W ell Diagram
			1D		0-2	24/12	10-14-11-10			Medium dense, brown Silty Gravelly SAND (Fill)	▼	Auger Cuttings
			2D		2-4	24/2	7-8-8-10					
35	5		3D		5-7	24/18	5-1-2-2			5.0 Medium, gray-brown SILT and CLAY		Filter Sand
30	10		4D		10-12	24/18	3-1-2-2					

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-4
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 40.7' Surveyed **TOTAL DEPTH (FT):** 12.0 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▼ 5.5 ft 2/5/2018
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin W alled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	W ell Diagram
40			1D		0-2	24/12	8-7-14-12			Medium dense, brown-gray Silty SAND and GRAVEL with brick (Fill)		Auger Cuttings
										1.5 Medium dense, gray SILT and fine SAND		
			2D		2-4	24/12	10-10-14-15	w =20.6 %				
	5		3D		5-7	24/8	16-15-13-14	w =5.2 %		5.0 Medium dense, gray Silty SAND and GRAVEL (Glacial Till)	▼	Filter Sand
35												
	10		4D		10-12	24/12	10-12-12-13	w =8.8 %				
30												

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-5
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 40' Surveyed **TOTAL DEPTH (FT):** 4.2 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
W ater Level
At time of Drilling
At Completion of Drilling
After Drilling
D = Split Spoon Sample
U = Thin W alled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = W eight of Rods
WOH = W eight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/18	3-5-18-19			Medium dense, brown Gravelly Silty SAND with asphalt and brick (Fill)		
			2D		2-4	24/12	18-18-21-20					

Refusal at 4.2 feet
(Probable Boulder or Bedrock)

▽

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-6
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 28.8' Surveyed **TOTAL DEPTH (FT):** 4.1 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/6	4-4-4-3			Loose, brown Gravelly Silty SAND (Fill)		
			2D		2-4	24/6	3-12-14-14			2.0 Medium dense, brown SILT and SAND some gravel (Possible Fill)		
25												

Refusal at 4.1 feet
(Probable Boulder or Bedrock)

▽

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-7
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 37' Estimated **TOTAL DEPTH (FT):** 17.0 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Soils appear saturated below 10 feet
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; At time of Drilling; At Completion of Drilling; After Drilling
D = Split Spoon Sample; U = Thin W alled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_U = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
35			1D		0-2	24/12	5-9-11-9			Medium dense, brown Gravelly Silty SAND with asphalt (Fill)		
			2D		2-4	24/12	5-11-8-14					
	5		3D		5-7	24/6	5-12-7-5					
30										6.0 Medium dense, brown SILT and fine SAND		
	10		4D		10-12	24/24	WOH-WOH-WOH-WOH	q_P=0.5 - 1.0 ksf		10.0 Medium, gray SILT and CLAY		
25					11-							
	15		5D		15-17	24/24	WOH-WOH-WOH-WOH	q_P=0.5 - 1.0 ksf				
20					16-							

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-8
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 44.2' Surveyed **TOTAL DEPTH (FT):** 12.0 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Soils appear saturated below 5 feet
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; At time of Drilling; At Completion of Drilling; After Drilling
D = Split Spoon Sample; U = Thin W alled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/18	16-31-37-30			0.5 Very dense, dark brown-black Silty Gravelly SAND (Fill)		
			2D		2-4	24/16	19-23-31-20			Very dense, brown Silty SAND and GRAVEL (Fill)		
40	5		3D		5-5.4	5/1	50/5"			5.0 Very dense, brown Gravelly Silty SAND		
35	10		4D		10-12	24/12	4-5-8-21			10.0 Medium dense, gray SILT and fine SAND		

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, NH

BORING NO.: B-9
SHEET: 1 of 1
PROJECT NO. 18-1170
DATE START: 11/15/2018
DATE FINISH: 11/15/2018

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 42.2' Surveyed **TOTAL DEPTH (FT):** 12.0 **LOGGED BY:** Tyler Demers
DRILLING CO.: S.W.Cole Explorations, LLC **DRILLER:** Matt Leonard **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Soils appear saturated below 5 feet
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: W ater Level; At Time of Drilling; At Completion of Drilling; After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = W eight of Rods; WOH = W eight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/18	18-29-29-47			0.5 Very dense, dark brown-black Silty Gravelly SAND (Fill)		
										Very dense, brown Silty SAND and GRAVEL (Fill)		
40			2D		2-4	24/18	47-29-23-12	w =3.8 %				
	5		3D		5-7	24/12	5-6-6-5			5.0 Black SILT and SAND with organics		
										5.2 Medium dense, gray-brown Silty SAND some gravel		
35												
	10		4D		10-12	24/18	WOH-2-3-2			10.0 Loose, gray SILT and fine SAND		

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. W ater level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

TEST PIT LOGS

PROJECT NO.: 18-1170
LOGGED BY: Tony Hersh
CONTRACTOR: William Spencer
EQUIPMENT:

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, New Hampshire

TEST PIT TP-1

DATE: 11/26/2018 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 33.6' Surveyed **COMPLETION DEPTH (FT):** 6.0
WATER LEVEL DEPTHS (FT): Seepage at 2 feet +/-

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Topsoil					
0.7		Brown silty SAND and GRAVEL with cobbles, boulders, apparent blast rock spoils, wood, roots (FILL)					
5		Refusal at 6.0 feet Boulder					

TEST PIT TP-2

DATE: 11/26/2018 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 30.4' Surveyed **COMPLETION DEPTH (FT):** 4.0
WATER LEVEL DEPTHS (FT): Seepage at 1.5 ft +/-

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Topsoil					
0.9		Brown silty gravelly SAND with roots (FILL)					
1.8		Brown gravelly silty SAND with cobbles, boulders					
		Bottom of Exploration at 4.0 feet Refusal at 2'-4', Probable Bedrock					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:

Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

PROJECT NO.: 18-1170
LOGGED BY: Tony Hersh
CONTRACTOR: William Spencer
EQUIPMENT:

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, New Hampshire

TEST PIT TP-3

DATE: 11/26/2018 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 39.9' Surveyed **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): Seepage at 4 ft +/-, soils moist 2.5ft +/-

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		-0.3 Topsoil Brown gravelly silty SAND with cobbles, boulders, brick, roots (FILL)					
		-4.0 Dark brown silty SAND with roots (APPARENT RELIC TOPSOIL)					
5		-5.0 Layers of gray silty SAND and clayey SILT					
		Bottom of Exploration at 7.0 feet					

TEST PIT TP-4

DATE: 11/26/2018 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 28.3' Surveyed **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): Heavy seepage at 6.5 ft +/-

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Topsoil					
		-0.5 Brown silty gravelly SAND with roots (FILL)					
		-1.5 Red-brown silty SAND, some gravel (FILL)					
		-2.5 Brown gravelly silty SAND with cobbles, brick, wood (FILL)					
5							
		Bottom of Exploration at 7.0 feet					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

PROJECT NO.: 18-1170
LOGGED BY: Tony Hersh
CONTRACTOR: William Spencer
EQUIPMENT:

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields and Transfer Station
LOCATION: , Portsmouth, New Hampshire

TEST PIT TP-5

DATE: 11/26/2018 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 35.3' Surveyed **COMPLETION DEPTH (FT):** 5.0
WATER LEVEL DEPTHS (FT): Soils moist below 3 ft +/-

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Dark brown to brown silty SAND and GRAVEL with cobbles, boulders, brick, metal debris (FILL - Test pit excavated near base of filled bank)					
2.5		Dark brown silty gravelly SAND with organics (FILL)					
4.0		Brown gravelly silty SAND with cobbles					
5		Refusal at 5.0 feet Probable Bedrock					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

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KEY TO THE NOTES & SYMBOLS
Test Boring and Test Pit Explorations

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
"Y"	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16" thickness
Seam:	1/16" to 1/2" thickness
Layer:	½" to 12" thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock

APPENDIX D

Laboratory Test Results

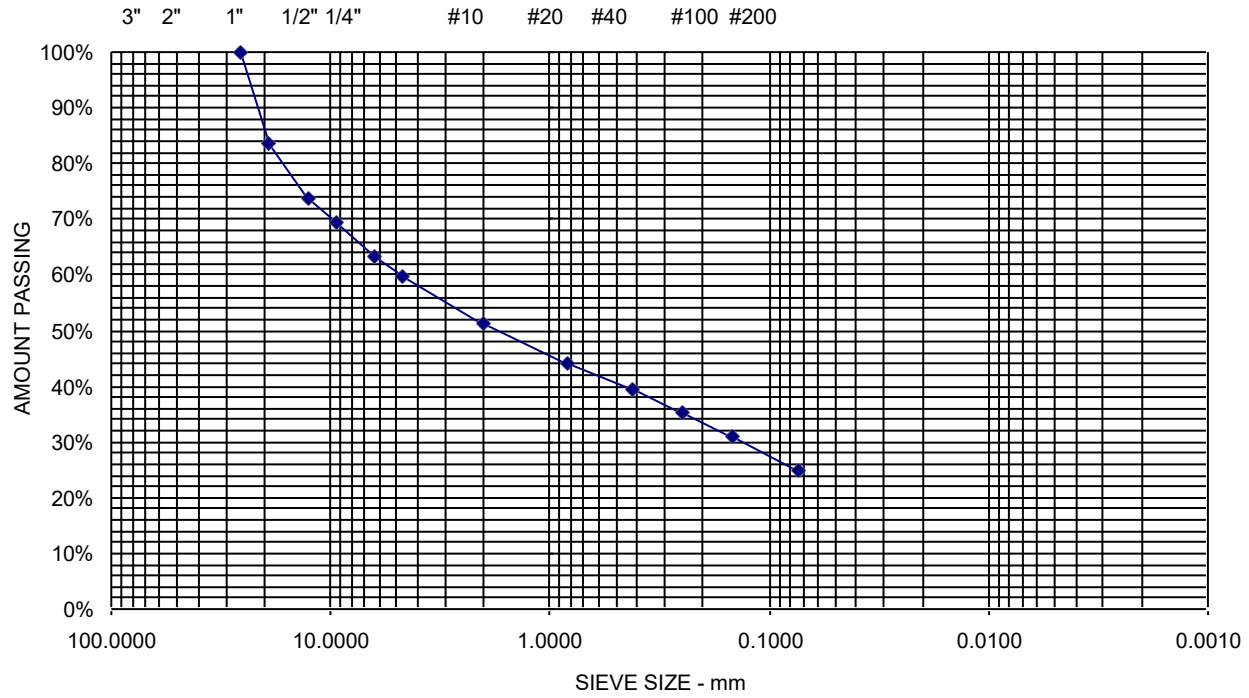
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - TRANSFER STATION AND ATHLETIC FIELD - GEOTECHNICAL ENGINEERING SERVICES	Project Number	18-1170
Client	CMA ENGINEERS	Lab ID	17967S
Exploration	**B-4**	Date Received	12/28/2018
Material Source	**3D, 5'-7'**	Date Completed	1/7/2019
		Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**84**	
12.5 mm	**1/2"**	**74**	
9.5 mm	**3/8"**	**70**	
6.3 mm	**1/4"**	**63**	
4.75 mm	**No. 4**	**60**	40.1% Gravel
2.00 mm	**No. 10**	**51**	
850 um	**No. 20**	**44**	
425 um	**No. 40**	**39**	34.9% Sand
250 um	**No. 60**	**35**	
150 um	**No. 100**	**31**	
75 um	**No. 200**	**25.0**	25% Fines



Comments: Moisture Content = 5.2%

Sheet

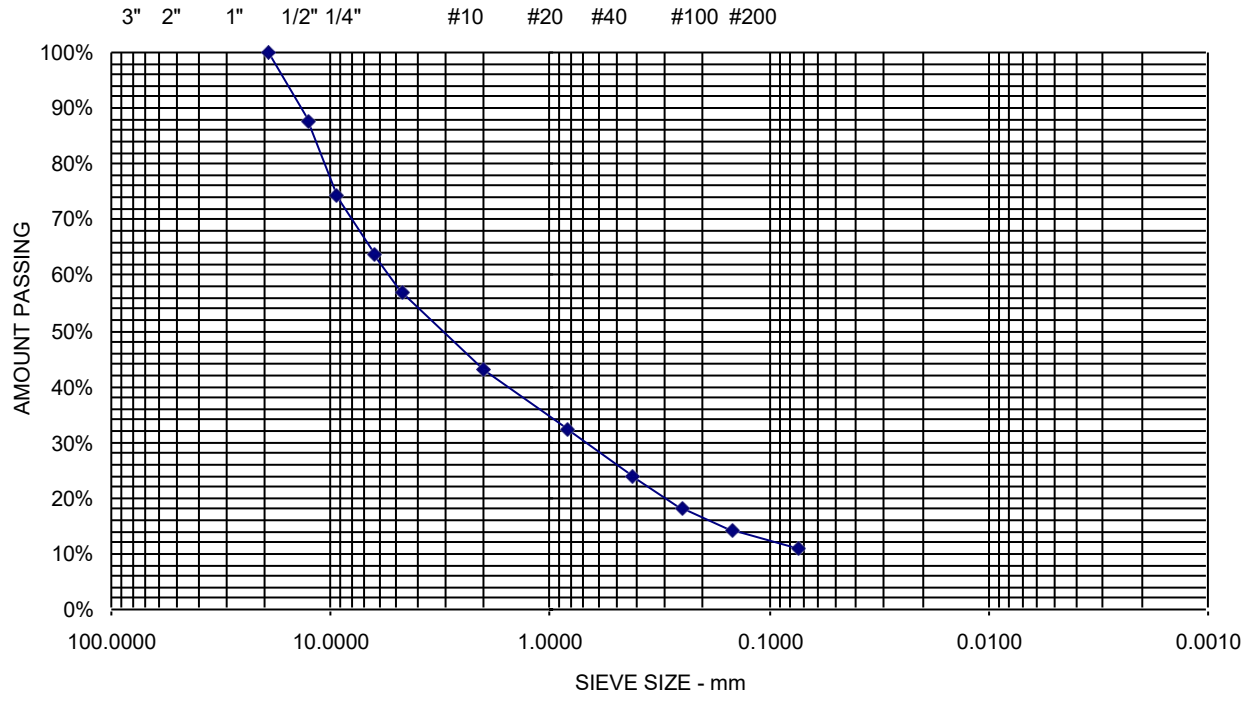
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - TRANSFER STATION AND ATHLETIC FIELD - GEOTECHNICAL ENGINEERING SERVICES	Project Number	18-1170
Client	CMA ENGINEERS	Lab ID	17969S
Exploration	**B-9**	Date Received	12/28/2018
Material Source	**2D, 2'-4'**	Date Completed	1/7/2019
		Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**88**	
9.5 mm	**3/8"**	**75**	
6.3 mm	**1/4"**	**64**	
4.75 mm	**No. 4**	**57**	42.9% Gravel
2.00 mm	**No. 10**	**43**	
850 um	**No. 20**	**32**	
425 um	**No. 40**	**24**	45.9% Sand
250 um	**No. 60**	**18**	
150 um	**No. 100**	**14**	
75 um	**No. 200**	**11.2**	11.2% Fines



Comments: Moisture Content = 3.8%

Sheet

18-1170.1 S

August 28, 2019

CMA Engineers
Attention: Mr. Phillip A. Corbett, P.E.
35 Bow Street
Portsmouth, NH 03801

Subject: Letter Report
Test Pit Observation and Infiltration Testing Services
Proposed Athletic Fields
Portsmouth, New Hampshire

Dear Phil:

In accordance with our Agreement dated July 24, 2019, we have performed test pit observation and field infiltration testing services for the subject project. The findings are subject to the limitations included in Attachment A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to coordinate and log test pit explorations, perform field infiltration testing on select test pits, and to report the results. Our scope of services has included 18 test pits, 8 field infiltration tests, and preparation of this letter report.

1.2 Project Understanding

We have previously undertaken subsurface exploration work and provided geotechnical engineering services pertaining to athletic field design and construction at the site, generally located on the southerly side of Banfield Road and northerly side of West Road. We understand the scope of work undertaken herein is for the use of CMA Engineers in further planning and design.

2.0 TEST PITS AND INFILTRATION TESTING

2.1 Test Pits

Eighteen test pits (TP-6 through TP-23) were made at the site from July 31, 2019 to August 2, 2019 by the City of Portsmouth NH. The test pit locations were selected by CMA Engineers and established in the field by S. W. Cole Engineering, Inc. (S.W.COLE) using a mapping grade GPS unit. The approximate exploration locations are shown on the "Test Pit Location Plan" in Attachment B provided by CMA Engineers. Logs of the test pits and a key to the notes and symbols used on the logs are attached in Attachment C.

2.2 Field Testing

S.W.COLE performed field infiltration testing at the site from July 31, 2019 to August 2, 2019. Test pit location and infiltration testing elevations were selected by CMA Engineers. The test was performed using a Guelph Permeameter in accordance with the NHDES analysis method. The following table depicts the testing results.

FIELD INFILTRATION TESTING RESULTS			
Location	**Material**	**Depth (ft)**	**Rate (in/hour)**
TP-6	Gravelly Loamy SAND(FILL)	0.5	0.5
TP-9	Very Gravelly Loamy SAND(FILL)	1.0	1.9
TP-13	Gravelly Loamy SAND with debris (FILL)	0.5	0.3
TP-14	Gravelly Loamy SAND with debris (FILL)	1.0	0.9
TP-17	Gravelly Loamy SAND with debris (FILL)	0.7	1.0
TP-21	Gravelly Loamy SAND with debris (FILL)	0.4	0.01
TP-22	Gravelly Loamy SAND with debris (FILL)	2.0	0.3
TP-23	Loamy SAND (FILL)	0.5	2.2

The results above are the direct value from the field testing and no safety factor has been applied.

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

With the exception of Test Pits TP-15, TP-16, and TP-19, the test pits encountered fills that were typically granular, but containing various amounts of construction debris and organics to the target depths requested by CMA Engineers or refusals. Test Pit TP-11 was terminated in stump fill at a depth of approximately 7.5 feet.

Test Pit TP-16 encountered native sand overlying silty clay that, in turn overlies glacial till at a depth of approximately 5.5 feet. Test pit TP-15 encountered a relatively thin layer of native gravelly sand.

Test Pits TP-6 through TP-9, TP-13, TP-15, TP-16 and TP-22 encountered refusals on what is likely bedrock at depths varying from about 1.6 to 6.2 feet. A bedrock outcrop was present in the TP-19 location.

Not all the strata were encountered at each exploration; refer to the logs in Attachment C for more detailed subsurface information.

3.2 Groundwater

The soils encountered at the test pits were moist to wet from the ground surface. Saturated soils and free water was encountered at depths varying from 3.9 to 6.2 feet. Several test pits did not encounter free water. Long term groundwater information is not available. It should be anticipated that groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

Due the fills present at the site seasonal high water table (SHWT) could not be estimated at most of the test pit locations. Redoximorphic features, indicating SHWT, were observed on TP-16 at a depth of 4.2 feet.

4.0 CLOSURE

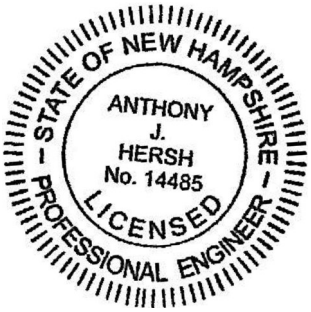
We trust this letter report meets your current needs. If you have any questions, please do not hesitate to contact us.

Sincerely,

S. W. Cole Engineering, Inc.

Antonio J. Santiago
Geotechnical Engineer

AMthoMlj Hersh



Anthony J. Hersh, P.E.
Senior Geotechnical Engineer

AJS:ajh

Attachment A
Limitations

This report has been prepared for the exclusive use of CMA Engineers for specific application to the Proposed Athletic Fields in Portsmouth, New Hampshire. S. W. Cole Engineering, Inc. has endeavored to conduct the work in accordance with generally accepted soil engineering and testing practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The infiltration test results only represent the specific test location. Variations in subsurface conditions such as soil composition and density may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it may be necessary to evaluate their nature and provide supplemental infiltration testing to reflect the differing conditions.

S. W. Cole Engineering, Inc.'s scope of work was limited to conducting and providing field infiltration results. It is the responsibility of the design engineer to appropriately incorporate the test results into the design and follow applicable local and federal permitting and design regulations.

Attachment B
Test Pit Location Plan

TP#16
N:199204
E:1220192

EXCAVATE TEST PITS TO 8' BELOW SURFACE OR BEDROCK WHICH EVER IS LESS.
NO INFILTRATION TESTS.

TP#15
N:199309
E:1220260

TP#14
N:199333
E:1220633

EXCAVATE TEST PITS WITHIN HATCH AREA TO 7' BELOW SURFACE OR TO DEPTH OF SHWT, WHICH EVER IS LESS.
PERFORM INFILTRATION TESTS IMMEDIATELY BELOW TOP SOIL IF A MINIMUM OF 1' ABOVE SHWT AND BEDROCK.
A MINIMUM OF FOUR (4) INFILTRATION TESTS.

TP#17
N:199239
E:1220693
TENTATIVE

TP-23 (Shallow test pit for infiltration test)

TP#13
N:199240
E:1220779

EXCAVATE TEST PITS WITHING HATCH TO 6' BELOW SURFACE OR BEDROCK WHICH EVER IS LESS.
NO INFILTRATION TESTS.

TP#11
N:199510
E:1221188

WETLAND EDGE

TP#12
6 FT DEEP
N:199329
E:1221162

TP#10
N:199609
E:1221245

TP#9
N:199794
E:1221606

TP#8
N:199694
E:1221634

TP#6
N:199740
E:1221663

TP#7
N:199703
E:1221712

TP#22
BOP:34.90
N:200041
E:1221613

EXCAVATE TEST PITS #6 - #9 TO A DEPTH OF 6' BELOW SURFACE OR DEPTH OF SHWT OR BEDROCK, WHICH EVER IS LESS.
PERFORM INFILTRATION TESTS WITHIN HATCH AREA AT 1' ABOVE SHWT OR BEDROCK, WHICHEVER IS LESS, AND ONLY IF BELOW TOPSOIL. A MINIMUM OF TWO (2) INFILTRATION TESTS.

TP#21
BOP: 33.0
N:199894
E:1221820

TP#18
N:199088
E:1221059

EXCAVATE TEST PIT TO 5' BELOW SURFACE OR TO SHWL, WHICH EVER IS LESS.
NO INFILTRATION TESTS.

TP#19
N:199607
E:1221654

EXCAVATE TEST PIT TO 6' BELOW SURFACE OR BEDROCK WHICH EVER IS LESS.
NO INFILTRATION TESTS.

TP#20
N:199805
E:1221890

EXCAVATE TESTS PIT TO 7' BELOW SURFACE OR BEDROCK WHICH EVER IS LESS.
NO INFILTRATION TESTS.

Pike Industries

TEST PIT NOTES:
1. TEST PITS 6-9, 13-14, &17, & 21-22: PROFILE DESCRIPTIONS SHALL BE WRITTEN IN ACCORDANCE WITH THE DESCRIPTIVE PROCEDURES, TERMINOLOGY AND INTERPRETATIONS FOUND IN *THE FIELD BOOK FOR DESCRIBING AND SAMPLING SOILS*, VERSION 3.0, NRCS, 2012, AVAILABLE AS NOTED IN APPENDIX B OF THE NHDES RULES, ENV-WQ1500.
2. TEST PITS NOT STATED IN ITEM #1 ABOVE SHALL BE FOR EARTHWORK PURPOSES.
3. THE SEASONAL HIGH WATER LEVEL SHALL BE ESTIMATED FOR ALL TEST PITS.

NOTE:
EXCAVATE TEST PITS 21 & 22 TO 5' BELOW BOTTOM OF PRACTICE (BOP) OR SHWT OR BEDROCK, WHICH EVER IS LESS.
PERFORM 1 INFILTRATION TEST AT BOP OR 1' ABOVE SHWL, WHICHEVER IS LESS, AND ONLY IF BELOW TOPSOIL.

Portsmouth Multi-purpose Recreation Fields

Subsurface Investigation Plan

0 60 120

July 16, 2019
Revised 07/30/2019

B#	Existing Boring	TP#	Proposed Test Pits (Starts at #6)
PZ/B#	Existing Piezometer		Wetlands Boundary
TP#	Existing Test Pit		

CMA ENGINEERS

Weston & Sampson

Attachment C
Exploration Logs

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP- 6

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 31' +/- **COMPLETION DEPTH (FT):** 1.6
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmat					
		0.5 Brown, Medium Gravelly Loamy SAND (Fill)					Field Saturated Hydraulic Conductivity = 0.5 in./hr.

Bucket Refusal at 1.6 feet
Probable Bedrock

TEST PIT TP- 7

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 31' +/- **COMPLETION DEPTH (FT):** 3.0
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		0.2 Topsoil and Rootmat					
		Brown, Gravelly Loamy SAND (Fill)					

Bucket Refusal at 3.0 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

KEY TO NOTES & SYMBOLS
Test Boring and Test Pit Explorations

Stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
"Y"	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16" thickness
Seam:	1/16" to 1/2" thickness
Layer:	½" to 12" thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP- 8

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 31' +/- **COMPLETION DEPTH (FT):** 3.6
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmat					
		0.6 Brown, Very Gravelly Loamy SAND (Fill)					

Bucket Refusal at 3.6 feet
Probable Bedrock

TEST PIT TP- 9

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 31' +/- **COMPLETION DEPTH (FT):** 3.0
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Very Gravelly Loamy SAND (Fill)					Field Saturated Hydraulic Conductivity = 1.9 in./hr.

Bucket Refusal at 3.0 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT 18-1170.1.GPJ SWCE TEMPLATE.GDT 8/14/19

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Tyler Demers
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-10

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 27' +/- **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): ▽5 ft Free water at 5 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		6 inches Topsoil					
		0.5 Brown-dark brown, Gravelly Silty SAND with metal (Fill)					
5		5.0 Gray, Clayey Sandy SILT	▽ 5				

Bottom of Exploration at 7.0 feet

TEST PIT TP-11

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 27' +/- **COMPLETION DEPTH (FT):** 7.5
WATER LEVEL DEPTHS (FT): ▽4.5 ft Free water at 4.5 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		4 inches Topsoil					
		0.3 Brown-dark brown, Gravelly Silty SAND with wires and wood (Fill)					
5		4.5 Gray, Gravelly SILT and fine SAND with brick (Fill)	▽ 4.5				
		7.0 Stump Fill					

Bottom of Exploration at 7.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT 18-1170.1.GPJ SWCE TEMPLATE.GDT 8/14/19

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-12

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 28' +/- **COMPLETION DEPTH (FT):** 6.0
WATER LEVEL DEPTHS (FT): ▽ 5 ft Seepage at 5 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		3 inches Topsoil					
		0.3 Brown, gravelly SAND some silt frequent cobbles with organics various debris (Fill)					
		4.0 Gray, silty SAND some gravel with boulders cobbles and various debris (Fill)					
5			▽ 5				

Bottom of Exploration at 6.0 feet

TEST PIT TP-13

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 30' +/- **COMPLETION DEPTH (FT):** 4.3
WATER LEVEL DEPTHS (FT): ▽ 4 ft Free water observed at 4 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmat					
		0.5 Brown, Gravelly Loamy SAND with Various Debris (Fill)					Field Saturated Hydraulic Conductivity = 0.3 in./hr.
		2.3 Gray, Silt LOAM (Fill)					
		2.8 Brown, Gravelly Loamy SAND with Various Debris (Fill)					
			▽ 4				

Bucket Refusal at 4.3 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT 18-1170.1.GPJ SWCE TEMPLATE.GDT 8/14/19

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-14

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 30' +/- **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): ▽ 4 ft Free water observed at 4 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmat					
		0.5 Brown, Gravelly Loamy SAND with Various Debris (Fill)					Field Saturated Hydraulic Conductivity = 0.9 in./hr.
			▽ 4				
5							

Bottom of Exploration at 7.0 feet

TEST PIT TP-15

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 39' +/- **COMPLETION DEPTH (FT):** 2.0
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		3 inches Topsoil and Forest Duff					
		0.3 Brown, gravelly SAND some silt with cobbles					

Bucket Refusal at 2.0 feet
Probable Bedrock

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-16

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 38' +/- **COMPLETION DEPTH (FT):** 6.2
WATER LEVEL DEPTHS (FT): SHWT at 4.2 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Topsoil and Forest Duff					
		0.4 Brown, SAND some silt some gravel					
		2.0 Varved, brown Silty CLAY and tan silty fine SAND					
5		5.5 Tan, silty SAND some gravel (Till)					

Bucket Refusal at 6.2 feet
Probable Bedrock

TEST PIT TP-17

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 30' +/- **COMPLETION DEPTH (FT):** 4.0
WATER LEVEL DEPTHS (FT): ▽3.9 ft Free water observed at 3.9 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmat					
		0.8 Brown, Gravelly Loamy SAND with Various Debris (Fill)	▽ 3.9				Field Saturated Hydraulic Conductivity = 1 in./hr.

Bottom of Exploration at 4.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-18

DATE: 8/1/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 36' +/- **COMPLETION DEPTH (FT):** 5.0
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		4 inches Topsoil					
		0.3 Brown, gravelly SAND some silt with organics and various debris (Fill)					
		3.0 Gray-brown, sandy SILT some gravel with organics and various debris (Fill)					
5		Bottom of Exploration at 5.0 feet					

TEST PIT TP-19

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 30' +/- **COMPLETION DEPTH (FT):** 0.0
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Bedrock Outcrop					
		Bottom of Exploration at 0.0 feet Bedrock Outcrop at surface					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-20

DATE: 7/31/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 32' +/- **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): ▽6.2 ft Free water observed at 6.2 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		0.2 2 inches Topsoil and Rootmat					
		Brown, silty SAND some gravel with organics, asphalt pieces, and various debris					
		2.5 Gray, silty SAND some gravel with various construction debris					
5			▽ 6.2				

Bottom of Exploration at 7.0 feet
Excavation Caving at 4 Feet

TEST PIT TP-21

DATE: 8/2/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 33' +/- **COMPLETION DEPTH (FT):** 4.0
WATER LEVEL DEPTHS (FT): ▽4 ft Free water observed at 4 feet **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmat					
		0.5 Brown, Gravelly Loamy SAND with Various Debris (Fill)					Field Saturated Hydraulic Conductivity = 0.01 in./hr.
			▽ 4				

Bottom of Exploration at 4.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

CLIENT: CMA Engineers
PROJECT: Proposed Athletic Fields
LOCATION: 680 Peverly Hill Rd, Portsmouth, New Hampshire

PROJECT NO.: 18-1170.1
LOGGED BY: Antonio Santiago
CONTRACTOR: City of Portsmouth
EQUIPMENT: CAT Backhoe

TEST PIT TP-22

DATE: 8/2/2019 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 39' +/- **COMPLETION DEPTH (FT):** 6.0
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmatt					
		0.5 Brown, Gravelly Loamy SAND with Various Debris (Fill)					Field Saturated Hydraulic Conductivity = 0.3 in./hr.
5							
		Bucket Refusal at 6.0 feet Probable Bedrock					

TEST PIT TP-23

DATE: 8/1/2029 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 31' +/- **COMPLETION DEPTH (FT):** 0.5
WATER LEVEL DEPTHS (FT): No free water observed **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, Loamy SAND and Rootmatt					
		Bottom of Exploration at 0.5 feet					Field Saturated Hydraulic Conductivity = 2.2 in./hr.

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT 18-1170.1.GPJ SWCE TEMPLATE.GDT 8/14/19

APPENDIX B

CITY OF PORTSMOUTH BLASTING ORDINANCE

PUBLIC WORKS DEPARTMENT

CITY OF PORTSMOUTH
680 Peverly Hill Road
Portsmouth N.H. 03801
(603) 427-1530 FAX (603) 427-1539

CITY OF PORTSMOUTH
BLASTING RULES AND. PROCEDURES

1.0 General

All blasting work shall comply with the following regulations:

- City Ordinance Article VII: Section 5:02;
  State of. New Hampshire Department of Transportation Standard
- Specifications for Road and Bridge Construction – 1997
- Storage and Transportation of explosives shall be in accordance with State of New Hampshire Code of Administrative Rules: Chapter/Part Saf-c 1600. in case of conflict, the more stringent regulation shall govern

2.0 Insurance

2.1 The blasting contractor shall procure and maintain $5,000,000 of personal injury & property damage liability insurance covering the permitted blasting operations, or such an amount as may be determined necessary by extraordinary circumstances.

2.2 The Certificate shall name the City as an additional insured.

3.0 Permit Process

3.1 The blasting contractor shall apply in person at the Department of Public Works for a permit to perform blasting operations before commencing the pre-blast survey procedure.

3.2 At the time of application, the blasting. Contractor shall provide the following items:

a) Plan showing location and extent and purpose o f proposed blasting operations

b) Copy of valid Use and Transportation License for the blasting company as required by Article VII, Section 5:702.

c) Copy· of valid Insurance Certificate as required by Article VII, Section 5:702 and defined in Section 2 of these rules and procedures.

4.0 Pre-Blast **C**ondition Surveys

4.1 Pre-blast surveys shall be performed as required in City Ordinance Article VII: Section 5:02 and the following procedures.

4.2 The pre-blast condition survey shall consist of a written description of the interior and exterior condition of each of the structures examined. Descriptions shall locate any existing cracks, damage or other defects and shall include such information so as to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exist, or for defects too complicated to describe in words, photographs shall be taken. A good quality videotape survey with appropriate audio description of locations, and conditions, and defects can be used.

4.3 The Pre-Blast Contractor shall send a pre-blast survey_ letter by regular mail to all abutters within a 500 foot radius of the blasting site, with copies of the letter sent also to:

Deputy Director of Public Works
680 Peverly Hill Rd.
Portsmouth, NH 03801

City Manager
1 Junkins Avenue
Portsmouth NH 03801

Fire Chief
170 Court Street
Portsmouth, NH 03801

Chief of Police
3 Junkins Avenue
Portsmouth NH 03801

Zoning Officer, Housing Code Inspector
City Hall, Legal Dept.
1 Junkins Avenue
Portsmouth, NH 03801

Chief Building Inspector
City Hall
1 Junkins Avenue
Portsmouth, NH 03801

4.4 The pre-blast survey company shall make at least three attempts over a minimum 1-week period to contact a property owner before that property is listed as non-respondent.

4.5 Copies Of the Pre-blast Condition .Survey shall be made available to the Department of Public Works and/or the property owner upon request. The blasting company shall' maintain copies of all pre-blast survey records for a period of no less than one year from the completion of the blasting operations.

4.6 Before the issuance of a Blasting Permit, The blasting contractor shall submit to the Department of Public Works a list of all properties within the 500-foot radius of the blasting. The list shall include names, addresses, with tax map and lot numbers of all abutters within the 500-foot radius and the status of the survey, whether completed, refused or non-respondent.

5.0 Blasting Permit

5.1 The blasting contractor shall submit to the Engineering Division of the Public Works Department all items described in sections 2, 3 and 4 of these procedures. The blasting contractor will be authorized to proceed with the mailing blasting notification letter described in Article VII Section 5: 702 B upon approval of the submitted material.

5.2 A copy of the certified mail recipients of the blasting notification letter shall be submitted prior to issuance of the permit. Copies of the certified letter shall also be sent the Deputy Director of Public Works, Chief of Police, Building Inspector, and Fire Chief, indicating when the blasting is scheduled to begin.

6.0 Blasting Operations

6.1 All blasting operations shall be conducted in accordance with State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction- 1997.

6.2 All blasting operations shall require vibration measuring equipment meeting the following minimum requirements:

a) Measure, display, and provide a permanent record on a strip chart of particle velocity components.

b) Measure three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.

c) Have a velocity frequency response of 2Hz to 150 Hz and be capable of measuring Peak Particle Velocity (PPV) of up to 250 mm/s (10 in/s)

d) All seismographs. used shall display the date of the most recent calibration.

e) Calibration must *have* been performed within the last 12 months and must be performed to a standard traceable to the National Institute of Standards and Technology.

6.3 The blasting contractor shall maintain daily logs of all blasting activities. Those records, including seismic monitoring records shall be made available to the City of Portsmouth for a period of 5 Years.

ARTICLE VII: BLASTING

Section 5:702 BLASTING PERMIT REQUIRED

No person shall perform or cause to be performed any blasting within the City limits unless a Blasting Permit is obtained from the City Engineer. This permit shall not be issued until the following terms and conditions have been satisfied by the applicant:

A. All abutters within five hundred (500) feet of the area where the blasting will occur shall receive notice by certified mail two full business days (excluding Saturday> Sunday and holidays) in advance of the blasting. The term "abutter" shall be defined in the manner used for the notification of zoning abutters. (Amended 9/17/2001)

B. That the City Engineer>s office as well as the Building inspector shall receive the same notice> also sent by certified mail> at least two full business days (excluding Saturday> Sunday and holidays) in advance of the blasting.

C. The name and address of the blasting company be provided.

D. The name of a company representative be provided and the twenty-four (24) hour telephone number of the representative; such representative being a person who IS capable of responding to claims and issues arising from the blasting performed.

E. A pre-blast survey shall-be completed by the blasting company for an area within five hundred (500) feet of the proposed blasting. (Amended 9il7/2001)

F. Any reports, measurements or video tapes made in connection with this· pre-blast survey or with the subsequent blasting shall be made available upon request to all abutters within five hundred (500) feet of the area.· (Amended 9/17/2001)

G. That the cost of such a pre-blast survey shall be borne by the blasting company.

H. The Use and Transport License of the hauler shall be designated.

I. The route of removing blasting material shall be designated.

J. The location of the blasting shall be designated.

K. The blasting shall take place within the hours of8:00 A.M. to 5:00 :P.M. Monday through Friday.

L. An Insurance Certificate shall be posted with the City Engineer in an amount and type deemed appropriate by the City Engineer and the City Attorney. (Amended 9/20/93)

M. The Public Works Director is hereby authorized to promulgate blasting rules consistent with the intent of this ordinance; such rules shall become effective on acceptance by the City Council. (Item M. adopted 9/17/2001