



PROJECT MANUAL

Rolling Meadows and Hanafin Farms Water Main Interconnection

Contract – B - Rebid

Prepared for:
Hanafin Farms
Condominium Association
4 Belgian Way
Londonderry, NH 03053

Prepared by:
Verdantas
186 Granite Street
3rd Floor, Suite A
Manchester, NH 03101
603-314-0820

Verdantas Project No: 18898

April 2026



Steve H. Lewandowski, P.E.
Senior Project Manager

This page intentionally left blank.

Table of Contents

Section

- A. NHDES Front End Documents Section A: Bidding Requirements**
- B. NHDES Front End Documents Section B: Contract**
- C. NHDES Front End Documents Section C: General Conditions**
 - C.1 Special Conditions**
- D. Technical Specifications**
 - Section 01311 – Project Meetings
 - Section 01610 – Horizontal Directional Drilling
- E. Standard Specifications – Pennichuck Technical Specifications for Water Main, Hydrant, and Service Installations**
- F. Appendices**
 - A. Geotechnical Report

NHDES Front End Documents

Section A: Bidding Requirements

Section A: Bidding Documents

Advertisement for Bids	1
Information for Bidders	3
All Contracts	3
MANUFACTURER’S EXPERIENCE	4
PROJECT SIGN.....	4
SAFETY AND HEALTH REGULATIONS.....	4
NONDISCRIMINATION IN EMPLOYMENT	4
STATE INSPECTION	4
COPIES OF THE CONTRACT.....	5
NON-RESIDENT CONTRACTORS	5
BIDDERS’ QUALIFICATIONS	5
WITHDRAWAL OF BIDS	5
BIDDING DOCUMENTS.....	6
EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA AND SITE.....	6
PRE-BID MEETING	6
SITE AND OTHER AREAS	6
INTERPRETATIONS AND ADDENDA.....	6
CONTINGENT ITEMS.....	7
AWARD OF CONTRACT.....	7
SRF Contracts	8
AMERICAN IRON AND STEEL (AIS) PROVISIONS.....	8
DBE RULE PROGRAM REQUIREMENTS (MBEs and WBEs).....	8
SRF and SRF/ARPA Contracts	8
SUSPENSION AND DEBARMENT.....	9
PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT.....	10
CIVIL RIGHTS COMPLIANCE.....	10
ARPA Only Contracts (non-SRF)	10
DAVIS-BACON WAGE RATES	10
DOMESTIC PREFERENCES FOR PROCUREMENTS (2 C.F.R. § 200.322)	10
RESTRICTIONS ON LOBBYING.....	11
DRUG-FREE WORKPLACE	11
PROTECTION FOR WHISTLEBLOWERS.....	11
Bid	12
Bid Schedule.....	15
Bid Bond.....	16

Advertisement for Bids

Owner Name: Hanafin Farms Condominium Association		Project Number: 18898	
Project Address:	Old Nashua Road	Londonderry	NH 03053
	<i>Street # and name</i>	<i>City/Town</i>	<i>State ZIP</i>

Separate sealed BIDS for the construction of **Rolling Meadows and Hanafin Farms Water Main Interconnection – Contract B – Rebid** consisting of approximately 175 linear feet of 4” ductile iron water service, 755 linear feet of 1.5” polyethylene irrigation piping, and installation of a meter vault, will be received by Hanafin Farms Condominium Association care of Verdantas LLC at the office of 186 Granite Street Suite A, Manchester, NH 03101 until 2pm. Local Time on May 6th, 2026 where the bids will then be publicly opened and read aloud.

The project is funded through the PFAS Remediation Loan Fund (PFAS RLF).

1. Completion time for the project will be calculated as calendar days from the date specified in the “Notice to Proceed” as follows:
 - 170 calendar days for substantial completion.
 - 200 calendar days for final completion

Liquidated damages will be in the amount of \$500, for each calendar day of delay from the date established for substantial completion, and \$500 for each calendar day of delay from the date established for final completion.
2. Each General Bid shall be accompanied by a Bid Security in the amount of 5% of the Total Bid Price.
3. 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 their Bid.
4. Any contract or contracts awarded under this Advertisement for Bids are expected to be funded in whole or in part by: **(Select all appropriate.)**
 - A loan from the NH Clean Water State Revolving Fund.
 - A loan from the NH Drinking Water State Revolving Fund.
 - A loan from the NH Drinking Water and Groundwater Trust Fund.
 - A grant from the NH Drinking Water and Groundwater Trust Fund.
 - A State Aid Grant from the NH Department of Environmental Services (SAG).
 - A grant from the American Rescue Plan Act from the NH Department of Environmental Services (ARPA).
 - A loan or grant from USDA Rural Development.
 - A Community Development Block Grant (CDBG) from the NH Community Development Finance Authority.
- ~~5. The successful Bidder on this work is required to comply with the President's Executive Order No. 11246 entitled "Equal Employment Opportunity" as amended by Executive Order 11375, and amendments or supplements thereto, and as supplemented in Department of Labor Regulations (41 CFR Part 60). The requirements for bidders and contractors under this order are explained in the **Information for Bidders.**~~
- ~~6. Utilization of Minority and Women's Business Enterprises (MBEs and WBEs). The successful Bidder on this work must demonstrate compliance with the U.S. Environmental Protection Agency's MBE/WBE rule in order to be deemed a responsible bidder. The requirements for bidders and contractors covered by this rule are explained in the **Information for Bidders.**~~
- ~~7. The successful Bidder on this work is subject to U.S. Department of Labor's Davis Bacon wage provisions.~~
- ~~8. The successful bidder on this work is subject to the "**American Iron and Steel (AIS)**" requirements of the CWSRF and DWSRF programs.~~
9. No Bidder may withdraw a Bid within 60 days after the actual date of opening thereof.
10. Bidders may attend a non-mandatory pre-bid meeting on April 15th, 2026 at 1:00pm. The pre-bid meeting will be held at Verdantas, located at 186 Granite St, Manchester, NH 03101.

The Contract Documents may be examined at the following location:

Verdantas LLC, 186 Granite Street Suite A, Manchester, NH 03101

Verdantas Website: <https://bids.verdantas.com/>

The Contract Documents (but not the Bidding Package) may be viewed and/or downloaded at no charge via the internet at <https://bids.verdantas.com>. The bidder shall be responsible to check for Addenda and obtain same from the web site.

An electronic file of the Bidding Package may be obtained upon payment of \$45.00 to Verdantas, LLC. Documents may be ordered by registering and paying online at <https://bids.verdantas.com>. Please contact planroom@verdantas.com or call **(440) 530-2351** if you encounter any problems viewing, registering or paying for the documents.

Information for Bidders All Contracts

Bids will be received by: **Hanafin Farms Condominium Association** herein called the "OWNER" at:

Address: 186 Granite Street Suite A Manchester NH 03101

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

**Hanafin Farms Condominium Association care of Verdantas LLC,
186 Granite Street Suite A, Manchester, NH 03101**

Each sealed envelope containing a BID must be plainly marked on the outside as BID for **Rolling Meadow and Hanafin Farms Water Main Interconnection – Contract B - Rebid** 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 186 Granite Street Suite A, Manchester, NH 03101.

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.

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.

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 them from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID BOND payable to the OWNER in the amount of five percent (5%) of the total amount of the BID. As soon as the BID prices have been compared, the OWNER will return the BONDS of all except the three lowest responsive 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 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, 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 PAYMENT BOND and PERFORMANCE BOND within ten (10) 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 their 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 PAYMENT BOND, PERFORMANCE BOND 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 their 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 Owner deems 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 based on the Total Base Bid.

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 complete any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to their BID.

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

MANUFACTURER'S EXPERIENCE

Wherever it may be written that an equipment manufacturer must have a specified period of experience with their 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.

PROJECT SIGN

The Contractor shall construct a sign in accordance with the Detail included in these specifications. The sign shall be erected in a location selected by the Engineer or Owner in coordination with NHDES. The Contractor shall maintain the sign throughout the duration of the contract.

SAFETY AND HEALTH REGULATIONS

This project is subject to all 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 shall comply with the requirements of these regulations.

NONDISCRIMINATION IN EMPLOYMENT

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

STATE INSPECTION

Work performed on this project shall be subject to inspection by representatives of the New Hampshire Department of Environmental Services (NHDES). Such inspection shall in no sense make the State Government a party to this contract, unless said Government is also the Owner, and will in no way interfere with the rights of either party hereunder.

Representatives of NHDES shall be given Right of Access to all portions of the proposed work, including but not limited to actual work site, storage yards, offsite manufacturing and fabricating location and job records.

COPIES OF THE CONTRACT

There shall be at least five (5) executed copies of the Contract to be distributed as follows:

- a) One (1) copy each to the Owner, Engineer and Contractor.
- b) One electronic copy in PDF format to NHDES.
- c) Additional copies as required for other federal or state agencies contributing to or participating in project costs.

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 their true and lawful attorney upon whom all lawful processes in any actions or proceedings against them may be served; and in such writing, which shall set forth said attorney's place of residence, shall agree that any lawful process against them which is served on said attorney shall be of the same legal force and validity as if served on them and that the authority shall continue in force so long as any liability remains outstanding against them 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.

BIDDERS' QUALIFICATIONS

No award will be made to any Bidder who cannot meet all of the following requirements:

- A. The Bidder shall not have defaulted nor turned the work over to the bonding company on any contract within three years prior to the bid date.
- B. The Bidder shall maintain a permanent place of business.
- C. The Bidder shall have adequate personnel and equipment to perform the work expeditiously.
- D. The Bidder shall have suitable financial status to meet obligations incidental to the work.
- E. The Bidder shall have appropriate technical experience satisfactory to the Engineer and the Division in the class of work involved.
- F. The Bidder shall be registered with the Secretary of State to do business in New Hampshire.
- G. The Bidder shall have performed to the satisfaction of the Engineer and the Division on previous contracts of a similar nature.
- H. The Bidder shall not have failed to complete previous contracts on time, including approved time extensions.

WITHDRAWAL OF BIDS

Prior to Bid Opening, bids may be withdrawn upon written or telegraphic request of the Bidder provided confirmation of any telegraphic withdrawal over the signature of the Bidder is placed in the mail and postmarked prior to the time set for Bid Opening. Bid documents and security of any Bidder withdrawing their bid in accordance with the foregoing conditions will be returned.

BIDDING DOCUMENTS

Complete sets of the Bidding Documents may be obtained from the Engineer for the non-refundable payment stated in the Advertisement for Bid.

- A. The Engineer is Verdantas, LLC
- B. The Engineer's address is 186 Granite Street, 3rd Floor, Suite A, Manchester NH 03101.

Complete sets of the Bidding Documents shall be used in preparing bids. Neither the Owner nor Engineer assumes any responsibility for errors or misinterpretation resulting from the use of incomplete sets of the Bidding Documents

Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining bids for the Work and do not confer a license or grant for any other use.

EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA AND SITE

Before submitting a bid, each Bidder must thoroughly examine the Contract Documents and visit the site to become familiar with all local conditions that may in any way affect the performance of the work. Bidder must comply with all Federal, State, and local laws, ordinances, rules, and regulations affecting the performance of the work. Bidder must carefully correlate observations and determinations regarding the work to be performed with all of the requirements of the Contract Documents.

Before preparing and submitting a bid, each Bidder will, at Bidder's own expense, make such surveys, investigations, and evaluations as Bidder may deem necessary to determine Bidder's bid prices for performance of the work within the terms of the Contract Documents.

By the submission of a bid for the project work, the Bidder makes an incontrovertible representation that Bidder has complied fully with the requirements set forth above.

After bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of work or the nature of the work to be done.

PRE-BID MEETING

A pre-bid meeting will be held to afford Bidders the opportunity to examine the site of the project work and to discuss with the Owner and Engineer any appropriate items pertaining to the Contract Documents or the project.

The date, time and place for the pre-bid meeting shall be as stated in the Advertisement for Bid. If, due to safety recommendations or restrictions, the logistics for the pre-bid meeting must change following the issuance of the Advertisement for Bid, the Engineer shall so advise each Bidder by issuing an Addendum to the Advertisement for Bid.

No statements or discussions offered at the pre-bid meeting will in any way revise, supplement, or otherwise affect the project requirements as presented in the Contract Documents unless questions raised during the pre-bid meeting are answered by formal written Addenda issued to all parties recorded by the Engineer as having received the Bidding Documents. Such Addenda will become a portion of the Contract Documents and will be binding.

SITE AND OTHER AREAS

The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by the Contractor.

INTERPRETATIONS AND ADDENDA

All questions regarding the meaning or intent of the Contract Documents shall be submitted to the Engineer at in writing rminnick@verdantas.com. Interpretations or clarifications considered necessary by the Engineer in response to such questions will be issued by Addenda, and may be viewed and/or downloaded at no charge via the internet at <https://bids.verdantas.com>.

Questions received less than seven (7) calendar days prior to the scheduled date of opening of bids may not be answered.

Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications are not a part of the Contract Documents and will be without legal effect.

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 the Contractor from fulfilling any of the conditions of the Contract.

CONTINGENT ITEMS

The bid forms show estimates of quantities for contingent items that may be necessary for the project. All work under the contingent items will be performed only at the written direction of the Engineer. At the sole discretion of the Engineer and without jeopardy to the bid or the Agreement, the Engineer may reject unit prices bid for contingent items which Engineer considers unbalanced, unresponsive, or contrary to the best interest of the Owner.

AWARD OF CONTRACT

Owner reserves the right to reject any or all bids, including without limitation, nonconforming, non-responsive, unbalanced, or conditional bids. Owner further reserves the right to reject the bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

The Owner, with the assistance of the Engineer, will evaluate the bids, the qualifications of the Bidders, the qualifications and experience of the subcontractors, and the qualifications and capabilities of suppliers. The Owner will conduct such investigations as the Owner deems necessary to establish the responsibility, qualifications, and financial ability of the Bidders, proposed subcontractors and other persons and organizations to do the work in accordance with the Contract Documents to the Owner's satisfaction within the prescribed time. The Owner reserves the right to reject the bid of any Bidder deemed unqualified, as being non-responsive to the Invitation to Bid.

More than one bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one bid for the Work may be cause for disqualification of that Bidder and the rejection of all bids in which that Bidder has an interest.

In evaluating bids, Owner will consider whether or not the bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of subcontractors, suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of subcontractors, suppliers, and other individuals or entities must be submitted as indicated on the Bid Form or in the Supplementary Conditions.

Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed subcontractors, suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

SRF Contracts

NHDES has determined that the following Build America, Buy America provisions **do not** apply to this project.

NHDES has determined that the following Build America, Buy America provisions **do** apply to this project.

The successful bidder on this work is subject to the "**Build America, Buy America (BABA)**" requirements of the CWSRF and DWSRF programs, which require the use of iron and steel products, manufactured products, and construction materials that are produced in the United States.

The **BIDDER'S BUILD AMERICA, BUY AMERICA (BABA) ACKNOWLEDGEMENT** shall be completed and signed by each Bidder and included with each bid. Additionally, CONTRACTOR shall certify and document to OWNER with each Application for Payment, and upon completion of the project that all iron and steel products, manufactured products, and construction materials subject to this provision have been produced in the United States.

Bidders shall refer to [PART D – SUPPLEMENTAL INFRASTRUCTURE, INVESTMENT AND JOBS ACT \(IIJA\) SECTION 70914\(a\) BUILD AMERICA, BUY AMERICA ACT](#) for additional information and guidance on BABA requirements.

AMERICAN IRON AND STEEL (AIS) PROVISIONS

The successful bidder on this work is subject to the "**American Iron and Steel (AIS)**" requirements of the CWSRF and DWSRF programs, which require the use of iron and steel products that are produced in the United States.

The **BIDDER'S AMERICAN IRON AND STEEL ACKNOWLEDGEMENT** shall be completed and signed by each Bidder and included with each bid. Additionally, CONTRACTOR shall certify and document to OWNER with each Application for Payment, and upon completion of the project that all iron and steel goods subject to this provision have been produced in the United States.

Bidders shall refer to [PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS](#) for additional information and guidance on AIS requirements.

DBE RULE PROGRAM REQUIREMENTS (MBEs and WBEs)

Bidders on this project are required to demonstrate compliance with the US Environmental Protection Agency's MBE/WBE rules in order to be deemed responsive. The existing Fair Share Goals are 2.25% MBE and 8.31% WBE. The MBE/WBE documentation, DBE Subcontractor Utilization Form and DBE Subcontractor Performance Forms shall be submitted with the bid.

The requirements for bidders and contractors are as follows:

State Revolving Fund loan recipients **and their contractors** must comply with the following DBE Rule requirements throughout the SRF loan project period:

- 1) Fair share objectives (MBE/WBE goals).
- 2) Good Faith Efforts.
- 3) Annual Reporting of MBE/WBE accomplishments.
- 4) Contract Administration Requirements.
- 5) Bidders List Requirements.
- 6) Record Keeping.

Bidders shall refer to [PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS](#) for additional information on MBE/WBE requirements.

SRF and SRF/ARPA Contracts

Further, the BIDDER agrees to abide by the requirements under Executive Order No. 11246, as amended, including specifically the provisions of the equal opportunity clause set forth in the GENERAL CONDITIONS.

Bidders shall, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of contract.

Successful bidders shall, if requested, submit a list of all subcontractors who will perform work on the project, and written signed statements from authorized agents of labor pools with which they will or may deal for employees on the work together with supporting information to the effect that such labor pools' practices and policies are in conformity with Executive Order No. 11246; that they will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under the contract or, a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish them prior to award of the contract.

Successful bidders must be prepared to comply in all respects with the contract provisions regarding non-discrimination.

~~DAVIS-BACON WAGE RATES~~ (Applies to all SRF and SRF/ARPA contracts)

This project is funded in whole or in part by a loan available through NHDES' Clean Water and/or Drinking Water SRF programs and hence is subject to federal Davis-Bacon wage provisions.

All laborers and mechanics employed by contractors or subcontractors on this project shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the U.S. Department of Labor (DOL) in accordance with Subchapter IV of Chapter 31 of Title 40, United States Code.

~~A copy of the applicable DOL wage determination(s) is included in PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS in these project documents.~~

If the applicable wage determination does not provide a rate for a classification of work to be performed, the Contractor must request additional classifications and wage rates to be added in conformance to the contract wage determination after contract award. You can find additional information on [DBA Conformances](#) in the US Department of Labor Learning Center.

If multiple wage determinations apply, the Contractor shall be responsible for keeping track of all work performed under each wage rate determination. The Contractor is responsible for designating which wage rates are applicable to each employee on each certified payroll, including subcontractor payrolls.

If the applicable wage determination does not provide a rate for a classification of work to be performed, the Contractor must request additional classifications and wage rates to be added in conformance to the contract wage determination after contract award.

Additional information on DBA Conformances is available from the [US Department of Labor Learning Center](#).

Bidders shall refer to the above referenced PART D for additional information on Davis-Bacon requirements.

SUSPENSION AND DEBARMENT

Bidders and contractors shall fully comply with Subpart C of 2 C.F.R. Part 180 entitled, "Responsibilities of Participants Regarding Transactions Doing Business With Other Persons," as implemented and supplemented by 2 C.F.R. Part 1532. subrecipient is responsible for ensuring that any lower tier covered transaction, as described in Subpart B of 2 C.F.R. Part 180, entitled "Covered Transactions," and 2 C.F.R. § 1532.220, includes a term or condition requiring compliance with 2 C.F.R. Part 180, Subpart C. Bidders and contractors are responsible for further requiring the inclusion of a similar term and condition in any subsequent lower tier covered transactions. Bidders and contractors acknowledge that failing to disclose the information required under 2 C.F.R. § 180.335 to NHDES may result in the delay or negation of this assistance agreement, or pursuance of administrative remedies, including suspension and debarment. Bidders and contractors may access the System for Award Management (SAM) exclusion list at "[System for Award Management \(SAM\)](#)" database to determine whether an entity or individual is presently excluded or disqualified.

By entering into this agreement, the Bidders and contractors certify that the Bidder and contractor is not debarred or suspended. Furthermore, the Bidder and contractors certify that no part of this contract will be subcontracted to a debarred or suspended person or firm.

Bidders shall refer to [PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS](#) for additional information on suspension and debarment requirements.

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. Bidders/contractors and their subcontractors must comply with the above provision when procuring or obtaining equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

Bidders shall refer to [PART D – PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT](#) for additional information on procuring or obtaining equipment, services, or systems using covered telecommunications equipment or services.

~~PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT~~

This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. Bidders/contractors and their subcontractors must comply with the above provision when procuring or obtaining equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

Bidders shall refer to [PART D – PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT](#) for additional information on procuring or obtaining equipment, services, or systems using covered telecommunications equipment or services.

CIVIL RIGHTS COMPLIANCE

The sub-grantee, contractor, subcontractor, successor, transferee, and assignee shall comply, and shall include in every contract or agreement funded with these funds this same requirement to comply, with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.

ARPA Only Contracts (non-SRF)

~~DAVIS-BACON WAGE RATES~~

(Does not apply to ARPA only contracts less than \$10M)

This project is funded in whole or in part by an American Rescue Plan Act grant through NHDES for a contract over \$10M and hence is subject to federal Davis-Bacon wage provisions.

All laborers and mechanics employed by contractors or subcontractors on this project shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the U.S. Department of Labor (DOL) in accordance with Subchapter IV of Chapter 31 of Title 40, United States Code.

A copy of the applicable DOL wage determination(s) is included in Attachment B in [PART D – FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS](#) in these project documents.

If the applicable wage determination does not provide a rate for a classification of work to be performed, the Contractor must request additional classifications and wage rates to be added in conformance to the contract wage determination after contract award. You can find additional information on [DBA Conformances](#) in the US Department of Labor Learning Center.

~~DOMESTIC PREFERENCES FOR PROCUREMENTS (2 C.F.R. § 200.322)~~

As appropriate and to the extent consistent with law, to the greatest extent practicable, there is a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

For the purposes of this section:

- 1) ~~“Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.~~
- 2) ~~“Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.~~

RESTRICTIONS ON LOBBYING

~~The Contractor shall comply with the terms of 15 CFR part 28 and 2 CFR Part 200 Subpart E which prohibit the use of federal Contract funds to influence (or attempt to influence) a federal employee, and requires the submission of Standard Form LLL ("Disclosure of Lobbying Activities") if nonfederal funds have been used to influence (or attempt to influence) a federal employee.~~

DRUG FREE WORKPLACE

~~The Contractor shall comply with the terms of 2 CFR part 1329 which require that as a condition of the Agreement, certification that they maintain a drug free workplace. By signing and submitting the Agreement, the Contractor certifies that they will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity associated with the Agreement.~~

PROTECTION FOR WHISTLEBLOWERS

~~The Contractor shall comply with the terms of 41 U.S.C. §471 regarding Whistleblower protections. As described in 41 USC §471 “an employee of a contractor, subcontractor, grantee, or subgrantee or personal services contractor may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing to a person or body described in paragraph (2) information that the employee reasonably believes is evidence of gross mismanagement of a Federal contract or grant, a gross waste of Federal funds, an abuse of authority relating to a Federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal contract (including the competition for or negotiation of a contract) or grant.”~~

BID FORMS

The bid forms are not available online. The bid forms are available only by purchasing a set of plans and specifications at the location indicated in the Advertisement for Bids/Public Notice to Bidders.

NHDES Front End Documents

Section B: Contract

Section B: Contract

Notice of Award 1

Acknowledgement of Notice 2

Agreement 3

Payment Bond..... 5

Performance Bond 7

Notice To Proceed..... 9

Acknowledgement of Notice 9

Change Order 10

Certificate of Substantial Completion 11

NHDES-W-09-015 CERTIFICATE OF FINAL COMPLETION 13

Contractors Affidavit..... 14

Contractor’s Final Release and Waiver of Lien 15

NOTICE OF AWARD

Dated: _____

TO: _____

ADDRESS: _____

Street Address

City/Town

State

ZIP

Project Number: _____ Owner Contract Number: Contract B - Rebid

Project Name: Rolling Meadows and Hanafin Farms Water Main Interconnection

Contract For: _____

Insert the name of the contract as it appears on 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:

Insert a brief description of the scope of work for the contract. Indicate total work, alternates or sections of work awarded.

The Contract Price of your contract is _____ dollars (\$_____). _____ 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 10 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) and (every) page.
2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Information for Bidders and General Conditions.
3. List all other conditions of 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 10 days after receipt of acceptable performance **BOND**, payment **BOND** 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.

Owner

Authorized Signature

Title

ACKNOWLEDGEMENT 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).

AGREEMENT

THIS AGREEMENT, made this ___ day of _____, 20___ by and between **Hanafin Farms Condominium Association**, hereinafter called "**OWNER**" and _____ doing business as _____ (an individual, 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 Rolling Meadows and Hanafin Farms Water Interconnection.
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 30 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:

170 calendar days for substantial completion.

200 calendar days for final completion.

Liquidated damages will be in the amount of \$500 for each calendar day of delay from the date established for the substantial completion and \$500 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. NOTICE OF AWARD.
 - f. AGREEMENT.
 - g. PAYMENT BOND.
 - h. PERFORMANCE BOND.
 - i. CERTIFICATE OF INSURANCE.
 - j. NOTICE TO PROCEED.
 - k. CHANGE ORDER(S).
 - l. CERTIFICATON OF SUBSTANTIAL COMPLETION.
 - m. CERTIFICATION OF FINAL COMPLETION.
 - n. CONTRACTOR'S AFFIDAVIT.
 - o. CONTRACTOR'S RELEASE.
 - p. GENERAL CONDITIONS.
 - q. SUPPLEMENTAL GENERAL CONDITIONS.
 - r. SPECIAL CONDITIONS.
 - s. FEDERAL PROVISIONS, RULES, REGULATIONS AND FORMS.
 - t. DRAWINGS prepared by: **Verdantas LLC** numbered G-1 through G-3, C-9, C-13, and C-26 and dated April 8, 2026.
 - u. SPECIFICATIONS prepared or issued by: **Verdantas LLC** and dated April 8, 2026.
 - v. STANDARD SPECIFICATIONS prepared or issued by: **Pennichuck Water Works** and dated February 28, 2025

w. ADDENDA

- No. _____ dated _____, 20__.
- 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 ___ copies, each of which shall be deemed an original on the date first above written.

OWNER: _____
 BY: _____
 NAME: _____

(SEAL)
 ATTEST: _____
 NAME: _____
 TITLE: _____

CONTRACTOR: _____
 BY: _____
 NAME: _____
 ADDRESS: _____

(SEAL)
 ATTEST: _____
 NAME: _____
 TITLE: _____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____, (contractor name),
_____, (contractor address), a
_____(corporation partnership, individual), hereinafter called
Principal, and _____, (surety name),
_____, (surety address) herein after called
surety, are held and firmly bound unto **Hanafin Farms Condominium Association**, (owner name), **4 Belgian Way,
Londonderry, NH 03053**, (owner address) 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
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 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 materialman
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 which shall be deemed an original this day of _____, 20__.

ATTEST:

BY: _____
(PRINCIPAL SECRETARY)

BY: _____
(WITNESS AS TO PRINCIPAL)

(ADDRESS)

(PRINCIPAL)
BY: _____

(ADDRESS)

(SURETY)

ATTEST:

BY: _____
(WITNESS TO SURETY)

BY: _____
(ATTORNEY IN FACT)

(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.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____, (contractor name),
_____, (contractor address), a
_____(corporation partnership, individual), hereinafter called
Principal, and _____, (surety name),
_____, (surety address) herein after called
surety, are held and firmly bound unto **Hanafin Farms Condominium Association**, (owner name), **4 Belgian Way,
Londonderry, NH 03053**, (owner address) 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 which shall be deemed an original this day of _____, 20__

ATTEST:

BY: _____
(PRINCIPAL SECRETARY)

BY: _____
(WITNESS AS TO PRINCIPAL)

(ADDRESS)

(PRINCIPAL)

BY: _____

(ADDRESS)

(SURETY)

ATTEST:

BY: _____
(WITNESS TO SURETY)

BY: _____
(ATTORNEY IN FACT)

(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.

NOTICE TO PROCEED

DATE: _____

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

ADDRESS: _____
OWNER'S PROJECT NO.: _____
PROJECT: Rolling Meadows and Hanafin Farms Water Main Interconnection
OWNER'S CONTRACT NO.: Contract B – Rebid
CONTRACT FOR: _____

You are notified that the Contract Time under the above contract will commence to run on _____, 20____. 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 Completion and Final Completion are _____, 20____ and _____, 20____, respectively.

Before you may start any Work at the site, paragraph 27 of the General Conditions provides that you and Owner must each deliver to the other (with copies to ENGINEER) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents. Also, before you may start any Work at the site, you must:

Copy to ENGINEER.
(Use Certified Mail, return receipt Requested).

OWNER: _____
BY: _____
Authorized Signature
NAME: _____
Title

ACKNOWLEDGEMENT OF NOTICE

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

(Contractor)

This the _____, day of 20____, by _____.

Employee Identification Number: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner Project No.: Contract B – Rebid Engineer Project No.: 18898
Project: Rolling Meadows and Hanafin Farms Water Main Interconnection
Contractor: _____
Contract For: _____ 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 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 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 the 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:



CERTIFICATE OF FINAL COMPLETION

Clean Water and Drinking Water State Revolving Fund



Owner Project No.: Contract B – Rebid Engineer Project No.: 18898

Project: Rolling Meadows and Hanafin Farms Water Main Interconnection

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 and NHDES, 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 the Engineer on: _____, 20____

(Engineer)

By: _____

CONTRACTOR accepts this Certificate of Final Completion on: _____, 20____

(Contractor)

By: _____

OWNER accepts this Certificate of Final Completion on: _____, 20____

(Owner)

By: _____

NHDES accepts this Certificate of Final Completion on: _____, 20____

(NHDES)

By: _____

CONTRACTORS AFFIDAVIT

STATE OF: _____
COUNTY OF: _____

Before me the undersigned a _____ (Notary Public, Justice of the Peace, Alderman) in and for said County and State Personally appeared _____ (Individual, partner or duly) who being duly sworn according to law 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 _____ (Owner) and _____ (Contractor) of _____ (Contractor Address) dated _____ for the construction of the _____ (Project Name) 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)

CONTRACTOR'S FINAL RELEASE AND WAIVER OF LIEN

Project Name: _____

Project Address: _____

<i>Street Name</i>	<i>City/Town</i>	<i>State</i>	<i>ZIP</i>
--------------------	------------------	--------------	------------

Owner Name: _____

Contractor Name: _____

Contractor Address: _____

<i>Street Name</i>	<i>City/Town</i>	<i>State</i>	<i>ZIP</i>
--------------------	------------------	--------------	------------

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__

_____	_____
<i>(Witness to Signature)</i>	<i>(Contractor)</i>
BY: _____	BY: _____
Title: _____	Title: _____

NHDES Front End Documents Section C: General Conditions

General Conditions

Section C: General Conditions

1. Contract and Contract Documents.....	1
2. Definitions.....	1
3. Additional Instructions and Detail Drawings.....	2
4. Shop or Setting Drawings.....	3
5. Materials, Services, Facilities and Workmanship.....	3
6. Contractor's Title To Materials.....	4
7. Inspection and Testing of Materials.....	4
8. "Or Equal " Clause, Substitutions and Contractor Options.....	5
9. Patents.....	6
10. Surveys. Surveys of land, property and construction.....	6
11. Contractor's Obligations.....	7
12. Weather Conditions.....	7
13. Protection of Work and Property shall be provided as follows:.....	7
14. Inspection of work for conformance with plans and specifications.....	8
15. Reports, Records and Data.....	8
16. Superintendence by Contractor.....	9
17. Extra Work and Change Orders.....	9
18. Time For Completion and Liquidated Damages.....	10
19. Defective Work.....	11
20. Differing Site Conditions.....	11
21. Claims For Extra Cost.....	11
22. Right of Owner to Terminate Contract.....	12
23. Construction Schedule and Periodic Estimates.....	13
24. Payments to Contractor.....	13
25. Acceptance and Final Payment.....	14
26. Payments by Contractor.....	16
27. Insurance.....	16
28. Contract Security.....	17
29. Additional or Substitute Bond.....	17
30. Assignments.....	17
31. Mutual Responsibility of Contractors.....	17
32. Subcontracting.....	18
33. Authority of the Engineer.....	18
34. Stated Allowances.....	19

General Conditions

35.	Use of Premises, Removal of Debris, Sanitary Conditions	19
36.	Quantities of Estimate.	19
37.	Lands and Rights-of-Way.	20
38.	General Guarantee.....	20
40.	Notice and Service Thereof.....	20
41.	Required Provisions Deemed Inserted.....	20
42.	Protection of Lives and Health.....	21
43.	OSHA Construction Safety Program.....	21
44.	Equal Employment Opportunity.	21
45.	Interest of Federal, State or Local Officials.....	22
46.	Other Prohibited Interests.	22
47.	Use and Occupancy Prior to Acceptance.	22
48.	Suspension of Work.	22
49.	[Reserved]	23
50.	[Reserved]	23
51.	[Reserved]	23
52.	Project Sign.	23
53.	[Reserved]	23
54.	Public Convenience and Traffic Control.....	23
55.	Pre-Construction Conference.	23
56.	Maintenance During Construction.....	23
57.	Cooperation with Utilities.....	24
58.	Work Performed at Night and on Sundays and Holidays.....	24
59.	Laws to be Observed.....	24
60.	Permits.	25
61.	Control of Pollution due to construction	25
62.	Use of Explosives.....	26
63.	Arbitration by Mutual Agreement.	26
64.	Taxes.	26
65.	Separate Contracts.....	26
	Project Sign Detail	28

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.

General Conditions

- 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.

General Conditions

- 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.

General Conditions

- 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.

General Conditions

- 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

General Conditions

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

General Conditions

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

General Conditions

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.

General Conditions

- 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 performing the work. On such work an additional 5 percent for reasonable cost will be paid to the Contractor for their work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs. If two or more tiers of Subcontractors are involved in the extra work, a maximum of 27 percent of the cost incurred by the Subcontractor actually performing the work will be allowed to be added to the reasonable cost of the work. The 27 percent maximum represents 15 percent added to the reasonable cost of the work allowed by the Subcontractor performing the work, an additional 5 percent allowed to the next tier higher subcontractor and 5 percent allowed to the Contractor for their work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs.
- 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.

General Conditions

- 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.

General Conditions

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 will notify the Owner and recommend an equitable adjustment. Contractor and Owner will enter into negotiations via the Engineer to 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.

General Conditions

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 approved by the engineer, 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

General Conditions

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 56.
- 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

General Conditions

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 or specified part thereof, has been completed to the extent that the Owner may occupy and/or make use of the work

General Conditions

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.

General Conditions

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.

General Conditions

- 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.

General Conditions

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

General Conditions

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.

General Conditions

- 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

General Conditions

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.

General Conditions

- 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.

General Conditions

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.

General Conditions

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.

General Conditions

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 or 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.

General Conditions

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

General Conditions

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.

General Conditions

EXHIBIT 1

Project Sign Detail

[Insert project sign detail here - Contact NHDES for appropriate detail]



WATER SUPPLY IMPROVEMENT

Project Number: PRLF-19

Hannafin Farms Water Main Interconnection

Hannafin Farms Condominium Association
Londonderry, NH

Funds Provided by
the PFAS Remediation Grant and Loan Fund

SC – SPECIAL CONDITIONS

SC-1. GENERAL CONDITIONS

A.1 The following Special 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.

A.2 Index 7. – Inspection and Testing of Materials

Replace the word “Inspection” with the word “Observation”

A.3 Index 14. – Inspection

Replace the word “Inspection” with the word “Observation”

A.4 GC-2 - Definitions

Insert the following after Section 2.28

2.29 “Standard Specifications” means part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship. The project Contract Drawings and Specifications, in the event of a discrepancy, shall supersede the Pennichuck Water Works Standard Specifications and Details.

A.5 GC-3 – Additional Instruction and Detail Drawings.

Insert the following after Section 3.

3.1 This Contract B is being constructed concurrent with two adjacent projects, Rolling Meadows and Hanafin Farms Water Main Interconnection – Contract A and Londonderry Water Main Extension High Range Road. Contractor is to coordinate work with Contract A.

Contractor shall coordinate Work with Contract A. Water for Contract B acceptance testing will be available upon completion of certain work in Contract A (not part of this Contract B). Contract A includes milestones for the completion of water main along Old Nashua Road, water is expected to be available on or before 08/01/2026 for Contract B testing and acceptance.

A.6 GC-7 – Inspection and Testing of Materials

Replace the word “Inspection” with the word “Observation” as it appears throughout Sections 7.1 – 7.9

Replace the word “Inspector” with the word “Engineer” as it appears in Section 7.6.c.

A.7 GC-14 – Inspection

Replace the word “inspection” with the word “observation” as it appears throughout Sections 14. – 14.3

A.8 GC-17 – Extra Work and Change Orders

Replace the word “Engineer” with the word “Contractor” as it appears in Sections 17.1.c and 17.2

A.9 GC-22 – Right of Owner to Terminate Contract

Insert “up to the date of written notice” to the end of the second sentence in Section 22.5

A.10 GC-25 - Acceptance and Final Payment

Insert “The Guarantee period shall be one year.” To the end of Section 25.1.d.

Insert the following after Article 25.4:

a. The Contractor shall not be given phased or staged substantial completion as work is completed. All new infrastructure appurtenances which are installed under this Contract, whether operating or not, shall remain in the full control and responsibility of the Contractor until the entire project reaches substantial completion.

A.11 GC-27 Insurance

Replace “\$100,000 each accident” with the words “\$500,000 each accident” as it appears in Section 27.1

Replace “\$100,000 disease – each employee” with the words “\$500,000 disease – each employee” as it appears in Section 27.1

Insert the following after the first sentence of Section 27.2

The Owner(s), Engineer, and Engineer’s Subconsultants shall be named as additional insured on the Contractor’s Commercial General Liability insurance policy.

Replace “except after 10 days written notice has been received by the Owner and the Engineer.” With the words “except after 30 days written notice has been received by the Owner and the Engineer.” As it appears in Section 27.6.

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.

27.7.2 Be written on a Builder’s Risk “all-risk” or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than caused by flood), and such other perils or causes of loss as may be specifically required herein;

27.7.3 At a minimum, the following should be named as additional insured:

- a. Hanafin Farms Condominium Association
- b. Verdantas LLC

Insert the following after the first sentence of Section 27.8

The Engineer, and Engineer's Subconsultants shall be named as additional insured on the Contractor's provided Owner's protective liability insurance.

Insert the following after Article 27.8:

27.9. Waiver of Rights: Owner and Contractor waive all rights against each other for all losses and damages caused by any of the perils covered by the policies of insurance provided in response to Paragraphs 27.2, 27.3 and 27.8 and any other property insurance applicable to the Work, and also waive all such rights against Subcontractors, Engineer, Engineer's consultants and all other parties named as insureds in such policies for losses and damages so caused. As required by Paragraph 27.4 each subcontract between Contractor and a Subcontractor will contain similar waiver provisions by the Subcontractor in favor of Owner, Contractor, Engineer, Engineer's consultants and all other parties named as insureds. None of the above waivers shall extend the rights that any of the insured parties may have to proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

27.10. Policy Provisions: OWNER and CONTRACTOR intend that any policies provided in response to Paragraphs 27.2 and 27.7 shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the parties named as insureds or additional insureds, and if the insurers require separate waiver forms to be signed by the ENGINEER or ENGINEER's consultant OWNER will obtain the same, and if such waiver forms are required of any Subcontractor, Contractor will obtain the same.

27.11 Certificates of Insurance

- a. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- b. Failure of Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- c. By requiring such insurance and insurance limits herein, Owner does not represent that coverage and limits will necessarily be adequate to protect Contractor and such coverage and limits shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

A.12 GC-28 - Contract Security

Insert the following paragraph after the first paragraph of Section 28:

The payment bond and performance bond furnished by the contractor shall be in the form of the bonds shown on Page B-3.1 and B-3.2 and B-4.1 and 4.2, 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.

A13 GC-35 - Use of Premises, Removal of Debris, Sanitary Conditions

Insert the words “and potable water” after the word “toilet” and before the word “accommodations”

Insert the words “, subcontractors and Engineer” after the words “use of his employees” and before the words “as may be necessary”

A.14 GC-36 - Quantities of Estimate

Delete Article 36 and Replace it with the following:

1. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
2. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer.
3. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor’s overhead and profit for each separately identified item.
4. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Article 21 if:
 - a. the Bid price of a particular item of Unit Price Work amounts to more than 5 percent of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
 - b. there is no corresponding adjustment with respect to any other item of Work; and
 - c. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

A.15 GC-39 - Errors and Inconsistencies in Contract Documents

Insert the following after Article 39.6:

- 39.7 For inconsistencies within drawings and/or technical specifications the more stringent requirement shall govern.

A.16 GC-44 - Equal Employment Opportunity

Delete paragraphs 44.3 through 44.7 in their entirety.

A.17 GC-58 - Work Performed at Night and on Sundays and Holidays

Insert the following after Article 58.2:

58.3 If not defined by the Owner, Holidays shall include the following. The Owner may have additional holidays:

- New Year's Day
- Presidents Day
- Memorial Day
- Independence Day
- The day before Independence Day if Independence Day is on a Tuesday. The day after Independence Day if Independence Day is on a Friday.
- Labor Day
- Columbus Day
- Vetrans Day
- Thanksgiving
- Day after Thanksgiving
- Day before Christmas
- Christmas
- Day before New Years Day

A.18 GC-60 Permits

Insert the following after Section 60.1g.:

- h. The Contractor shall secure and pay for all permits and licenses required for a complete and finished job for the water main extension project in Londonderry, New Hampshire, in accordance with the bid documents, contract, and specifications.

SC-B STANDARD SPECIFICATIONS

B.1 The Pennichuck Water Works "Technical Specifications for Water Main, Hydrant, and Service Installations" last revised February 28, 2025 and "Standard Details" last revised 2023 shall govern work and materials which are not specified or modified herein or on the project Contract Drawings. The project Contract Drawings and Specifications, in the event of a discrepancy, shall supersede the Pennichuck Water Works Standard Specifications and Details. <https://pennichuck.com/engineering/>

B.2 The following Special Conditions modify, change, delete, or add to the "Standard Specifications". Where any part of the Standard Specification is modified or voided by these Sections, the unaltered provisions of that part shall remain in effect.

B.3 Master Table of Contents

Remove the following Sections 01525, 01550, 01660, 01670, 01680, 02250,

B.4 Section 02700 Measurement and Payment

Remove **ITEM NO – 1-1-4: 4" Ductile Iron Class 52 Water Main**

Insert **ITEM NO – 1-1-4: 4" Ductile Iron Class 52 Water Main**

1. Method of Measurement:

- a. The length of pipe for water mains shall be measured by the linear foot along the horizontal centerline of the pipe including fittings and valves.

2. Basis of Payment:

- a. The unit prices for the furnishing and installing of watermain, fittings and buried valves, shall include clearing and grubbing of the surface, cutting and removal of pavement, excavation, removal, storage, rehauling and replacement of all materials encountered during excavation of the trench, bedding, disposal and screening of excess material not suitable for refill or in excess of the quantities required for refill, furnishing and placing all concrete thrust blocking, temporary pavement if required by local or state entity, furnishing and placing of all pipe fittings and jointing materials, placing and removal of sheeting and bracing, pumping or other disposal of water, accommodation and maintenance or travel, the support and protection of all utilities and structures and their restoration in case of damage, the restoration of mailboxes, road signs, drainage structures, replacement of damaged driveways, walkways, sidewalk curbs, and gutters, compacted refill, topsoil, topsoiling, seeding and mulching unpaved areas, testing and other incidental work. Payment will be made for ninety (90) percent of the contracted price upon completion of installation, and the remaining ten (10) percent upon completing satisfactory testing subject to other retainages as set forth in the Contract Documents.

- b. The unit price for this item shall be paid based on a 3-foot-wide trench.

Remove **ITEM NO – 1-3-1.5: 1.5” PE DR 7 Irrigation Piping**

Insert **ITEM NO – 1-3-1.5: 1.5” PE DR 7 Irrigation Piping**

1. Method of Measurement:

- a. The length of pipe for irrigation piping shall be measured by the linear foot along the horizontal centerline of the pipe including fittings and valves.

2. Basis of Payment:

- a. The unit prices for the furnishing and installing of irrigation piping, and fittings, shall include clearing and grubbing of the surface, cutting and removal of pavement, excavation, removal, storage, rehauling and replacement of all materials encountered during excavation of the trench, bedding, disposal and screening of excess material not suitable for refill or in excess of the quantities required for refill, furnishing and placing all concrete thrust blocking, temporary pavement if required by local or state entity, furnishing and placing of all pipe fittings and jointing materials, placing and removal of sheeting and bracing, pumping or other disposal of water, accommodation and maintenance or travel, the support and protection of all utilities and structures and their restoration in case of damage, the restoration of mailboxes, road signs, drainage structures, replacement of damaged driveways, sidewalk curbs, and gutters, compacted refill, topsoil, topsoiling, seeding and mulching unpaved areas, testing and other incidental work. Payment will be made for ninety (90) percent of the contracted price upon completion of installation, and the remaining ten (10) percent upon completing satisfactory testing subject to other retainages as set forth in the Contract Documents.

- b. The unit price shall be paid based on a 1-foot-wide trench.

Remove **ITEM NO – 6-3-1: Trench Ledge Excavation and Disposal**

Insert **ITEM NO – 6-3-1: Trench Ledge Excavation and Disposal**

1. Method of Measurement:

- a. Compute cubic yardage of solid rock excavation and disposal on the basis of in place volume of rock occurring within the stipulated payment limits shown on the Drawings and as specified below. Rock greater than 2 cubic yards that are removed using means and methods compliant with normal excavation practices shall be classified as unsuitable material. Rock removed using blasting, drilling, picking, fracking or any means outside of the normal means and methods of excavation shall be classified as rock excavation and shall be measured as follows:
 - a. Depth – Measure depths from the rock surface, as determined from profiles and cross-sections made by Contractor and approved by Engineer to 6 inches below pavement subgrade, pipe bedding subgrade, structure subgrade, topsoil subgrade or elevations specified, shown on the Drawings, or directed by Engineer.
 - b. Width – Measure 12 inches beyond and parallel to outside face of structure footings per stipulated payment limits shown on the Drawings or as authorized by the Engineer in writing. Measurement for 4-inch water main trench width shall be 3'-0" and irrigation piping trench width shall be 1'-0".
 - c. Length – Measure length as actual length removed.

2. Basis of Payment:

- a. Payment shall be per cubic yard of solid rock authorized to be removed. Include cost of exploratory subsurface investigations, pre-blast survey and all necessary temporary facilities and controls. Excavated material under this item which has not been disposed of shall not be included for payment. The cost of refill with common borrow shall be included. The cost of granular fill-gravel subpavement rock excavation refill shall be included. Include in the bid for other items involving excavation, the cost of doing the entire excavation as earth. The price for this item being intended to cover the difference between the cost of rock excavation and the cost of earth excavation.

Remove **ITEM NO – 6-3-2: Boulder Excavation and Disposal**

Insert **ITEM NO – 6-3-2: Boulder Excavation and Disposal**

1. Method of Measurement:

- a. Boulder Excavation and Disposal shall be measured on a cubic yard basis, as uncovered in the field. Payment shall only be made for boulders measuring greater than one cubic yard in volume.
- b. Cubic yards shall be measured by taking the average length, width, and depth of the boulder as measured by the Engineer.

2. Basis of Payment:

- a. This pay item shall include all means necessary to remove and dispose of all boulders. This pay item shall also incorporate the costs of backfilling the voids left by boulder removal.

Remove **ITEM NO – 6-4-1-1: Unsuitable Materials**

Insert **ITEM NO – 6-4-1-1: Unsuitable Materials**

1. Method of Measurement:

- a. In place volume in cubic yards of unsuitable material removed, disposed, and refilled as observed and directed by the Engineer.

2. Basis of Payment:

- a. Payment for removing and disposing of unsuitable material and material refill shall be at the unit price per cubic yard as stated in the bid schedule. Payment shall be full compensation for traffic control/flagging, excavation, dewatering, shoring, removal disposal, directed refill, compaction and all work incidental to the satisfactory completion of the item for which payment is not provided under other items.

Remove **ITEM NO – 7-1-1: Preconstruction Video Documentation**

Insert **ITEM NO – 7-1-1: Preconstruction Video Documentation**

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis as stated in the Bid Schedule.

2. Basis of Payment:

- a. Payment for this item will be made upon acceptance of the Video Documentation by Pennichuck after review and confirmation that the video clearly depicts the entire proposed work area.
- b. The quantities of labor associated with this work shall be compensated for in this payment item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

Remove **ITEM NO – 7-1-2: Mobilization and Demobilization**

Insert **ITEM NO – 7-1-2: Mobilization and Demobilization**

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis.
- b. This payment item shall include all costs associated with obtaining the required insurances, building permits, street permits, traffic signage and mobilizing/demobilizing equipment and materials to/from the job site.

2. Basis of Payment:

- a. This item shall not exceed 5% of the total project bid. Should the value of this item exceed 5% of the total project bid, the amount greater than the 5% will be paid upon final completion.

- b. Payment shall be made as follows: 75% of this bid item value (within the 5%) can be released upon initial mobilization, less retainage. After substantial completion, 100% of this bid item (within the 5%) will be released, less the retainage.

Remove **ITEM NO – 7-3-2: Master Meter Pit**

Insert **ITEM NO – 7-3-2: Master Meter Pit**

1. Method of Measurement:

- a. This item shall be measured and paid for as a lump sum price.

2. Basis of Payment:

- a. The lump sum price for this item shall include all labor, materials, and equipment necessary to install a master meter pit including coordinating, purchasing, and installing the water meter from Pennichuck Water Works.
- b. The lump sum price for this item shall include all labor materials, and equipment necessary for installing electrical conduit and feeders, and confirming electrical source.
- c. The lump sum price for this item shall include backfill with common fill, imported common fill, stone, or sand as shown on the plans; restoration to grade, loam and seed; restore disturbed landscaping and other work required for completion of this item.
- d. The lump sum price for this item shall include all labor, materials and equipment necessary to repair the disturbed area to its pre-construction conditions including loam and seed, landscaping remediation, and tree and shrub replacement.
- e. The lump sum price limit for the 4-inch water main shall be at the exterior wall.

Insert the following after ITEM NO. 7-11-1 in Section 7 Miscellaneous

ITEM NO 7-12: Hanafin Farms HDD Installation for Irrigation Piping Under Belgian Way

1. Method of Measurement:

- a. This item shall be measured and paid for on a lump sum basis and shall be installed as shown on the Drawings and detailed in the Specifications.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials, and equipment necessary to verify location of existing utilities, excavate, shore and dewater the directional drill pits, install 1.5-inch PE DR 7 irrigation piping using HDD installation method, backfill and restore to pits to grade, restore disturbed landscaping and other work required or incidental to completion of this item.

D. Technical Specifications



SECTION 01311

PROJECT MEETINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conference.
 - 2. Pre-Installation Conferences.
 - 3. Coordination Meetings.
 - 4. Progress Meetings.

1.2 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after the Effective Date of the Contract and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Engineer and their consultants, the Contractor and its superintendent, major subcontractors, funding agency representative, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Designation of responsible personnel
 - 2. Owner authority and responsibilities
 - 3. Contractor authority and responsibilities
 - 4. Engineer authority and responsibilities
 - 5. Distribution of Contract Documents
 - 6. Office, Work, and storage areas
 - 7. Tentative construction schedule
 - 8. Temporary utilities
 - 9. Subcontractors
 - 10. Equipment deliveries and priorities
 - 11. Schedule of Values
 - 12. Preliminary Progress Schedule, critical Work sequencing
 - 13. Submittals
 - 14. Procedures for processing Applications for Payment
 - 15. Preparation of record documents
 - 16. Procedures for processing field decisions and Change Orders

17. Use of the premises, staging, storage
18. Safety procedures, first aid
19. Security
20. Housekeeping
21. Working hours
22. Project permits
23. Quality control and testing
24. Work of other contractor(s) that Contractor needs to coordinate with to complete the Work
25. Progress meetings

1.4 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow shall attend the meeting. Advise the Engineer of scheduled meeting dates.
 1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
 - a. Contract Documents
 - b. Options
 - c. Related Change Orders
 - d. Purchases
 - e. Deliveries
 - f. Shop Drawings, Product Data and quality control Samples
 - g. Possible conflicts
 - h. Compatibility problems
 - i. Time schedules
 - j. Weather limitations
 - k. Manufacturer's recommendations
 - l. Compatibility of materials
 - m. Acceptability of substrates
 - n. Temporary facilities
 - o. Space and access limitations
 - p. Governing regulations
 - q. Safety
 - r. Inspection and testing requirements
 - s. Required performance results
 - t. Recording requirements
 - u. Protection

2. Record significant discussions and agreements and disagreements of each conference along with the approved schedule. Promptly distribute the record of the meeting to everyone concerned including the Owner and Engineer.
3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

- A. Conduct monthly progress meetings at the Project site at regularly scheduled intervals. Notify the Owner, Engineer, and other concerned parties of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Contractor, Owner, Engineer, and funding agency representative each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
 1. Contractor's Construction Schedule: Review progress since the last meeting. Determine the status of each activity in relation to the Contractor's construction schedule, whether on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 2. Review the present and future needs of each entity present, including such items as:
 - a. Interface requirements
 - b. Time
 - c. Sequences
 - d. Deliveries
 - e. Off-site fabrication problems
 - f. Access
 - g. Site utilization
 - h. Temporary facilities and services
 - i. Hours of work
 - j. Hazards and risks
 - k. Housekeeping
 - l. Quality and work standards
 - m. Change orders

- n. Documentation of information for payment requests
 - o. Inspection and acceptance of equipment
 - p. Requirements for equipment start-up
- 3. Status of submittals
 - 4. Status of progress payments
 - 5. Any conflicts, discrepancies, or other difficulties requiring resolution
- D. Reporting:** No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- 1. **Schedule Updating:** Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

End of Section

SPECIFICATIONS

SECTION 01610 - HORIZONTAL DIRECTIONAL DRILLING

PART1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Project Specifications.

1.2 SUMMARY

- A. This Section includes installation of force main pipe using the horizontal directional drilling method. The work includes
 - 1. Installation
 - 2. Testing
 - 3. Restoration of underground utilities
 - 4. Environmental protection and restoration.
- B. Related Standard Specification Sections include the following:
 - 1. Section 01300 "Clearing and Grubbing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Section 02500 "Managing Water Flow during Construction" disposing of ground water during construction.
 - 3. Section 02200 "Loam & Seed" for finish grading, including preparing and placing topsoil and planting soil for lawns.
 - 4. Section 01600 "Water Main Pipe and Fittings", for installing underground utilities.

1.3 PERFORMANCE REQUIREMENTS

- A. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have at least two years directional drilling experience.
- B. A competent and experienced supervisor representing the Contractor and drilling subcontractor shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the job site during the actual directional bore operation. The Contractor and subcontractor shall have a sufficient number of competent workers on the job at all times to insure the directional bore is made in a timely and satisfactory manner.

1.4 SUBMITTALS

- A. Shop Drawings: For the following:
 - 1. Pipe & Fittings
 - 2. Specifications and Material Safety Data Sheets for any proposed drilling fluid additives and mixtures
- B. Equipment Specifications: Submit specifications demonstrating that the equipment to be used will be adequate to complete the project. Submit complete specifications for machine to be used per AREMA Chapter 1 Part 5.7.2.1 . Equipment specifications shall include but not be limited to:

SPECIFICATIONS

1. Drilling rig
 2. Mud system and mud motors (if applicable)
 3. Downhole tools
 4. Guidance system, including calibration records
 5. Rig safety systems
- C. Work Plan: Submit a work plan detailing the procedures and schedule to be used to execute the work. Include a proposed work schedule, proposed safety and traffic control measures, proposed environmental protection measures and contingency plans for possible problems.
- D. Bore plan: Submit a scale drawing of the pilot bore plan for review and approval. Show finished grade, deflection and radius of the pilot bore, all existing utilities with minimum vertical and horizontal clearances. Address the location of the drill rig setups and for multiple bores, the lengths of each bore based on soil conditions, equipment used, topography, etc. The proposed vertical and horizontal clearances between the bored pipe and any existing/proposed conflicting pipes, conduits or obstructions shall exceed the guidance system accuracy tolerance by a minimum of 100%.
- E. Record Information: Submit daily logs of drilling operations and guidance system data after the installation is completed. Furnish plan and profile drawings based on the recorded data showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Use ropes, fabrics or rubber protected slings and straps handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped into rocky or unprepared ground.
- C. Store pipes on level ground, preferably turf or sand, free of sharp objects that could damage the pipe. Limit stacking of pipe to a height that will not cause excessive deformation of the bottom layers under anticipated temperature conditions. Where necessary due to ground conditions, store the pipe on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.
- D. Handle the assembled pipeline in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Slings for handling the pipeline shall not be positioned at pipe joints. Remove and replace sections of the pipes with cuts and gouges or excessive deformation.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Utility Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of service without Engineer's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

SPECIFICATIONS

- A. The following piping system shall be used for horizontal directional drilling applications on this Project:
 - 1. HDPE DIPS (Ductile Iron pipe size) DR11 pressure pipe and molded fittings with butt-fused joints for 4" to 24", refer to Drawings for pipe size.
 - 2. HDPE IPS (Iron pipe size) DR11 pressure pipe and molded fittings with butt-fused joints for 1/2" to 3", refer to Drawings for pipe size.
- B. DIP Restrained-Joint Pressure Pipe and Fittings
 - 1. Pipe: Conform to AWWA C151/A21.51-91, Class 52
 - 2. Joints: Conforms to AWWA C153.
 - 3. Gaskets: AWWA C111, rubber
- C. HDPE Pressure Pipe and Fittings
 - 1. HDPE pressure pipe: Materials used for the manufacturing of polyethylene pipe and fittings shall be PE 4710 High Density Polyethylene meeting the ASTM D 3350 cell classification of 445474C. The material shall have a minimum hydrostatic design basis (HDB) of 1600 psi at 73 degrees F when tested in accordance with PPI TR-3, and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4. HDPE pipe shall be manufactured in accordance with ASTM F 714, AWWA C 906 and NSF 61.
 - 2. Molded fittings shall be manufactured in accordance with either ASTM D2683 (socket fused) or ASTM D3261(butt fused) and shall be so marked.
 - 3. Mechanical fittings used with HDPE pipe shall be specifically designed for, or tested and found to be acceptable for use with polyethylene pipe by the fitting manufacturer. Mechanical fittings designed other materials shall not be used unless authorized by the mechanical fitting manufacturer.

2.2 DIRECTIONAL DRILLING EQUIPMENT

- A. General:
 - 1. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system.
 - 2. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
- B. Drilling Rig:
 - 1. The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power the drilling operations. The hydraulic system shall be free of leaks.

SPECIFICATIONS

2. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm that automatically sounds when an electrical current is detected.
3. The drill head shall be steerable by changing its rotation and shall provide necessary cutting surfaces and drilling fluid jets.
4. Mud Motors (if required) shall be of adequate power to turn the required drilling tools.
5. Drill Pipe shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tools joints should be hardened to 32-36 RC.

C. Guidance System

1. General: An electronic “walkover” tracking system or a Magnetic Guidance System (MGS) probe or proven (non-experimental) gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face azimuth (horizontal direction) and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer’s specifications of the vertical depth of the borehole at sensing position at depths up to fifty feet and accurate to 2-feet horizontally.
2. Components: Supply all components and materials to install, operate and maintain the guidance system.
3. The MGS shall be set up and operated by personnel trained and experienced with the system. The Contractor shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

D. Drilling Fluid (Mud) System

1. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water, and appropriate additives. The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be minimum of 1,000 gallons. Mixing system shall continually agitate the drilling fluid during drilling operations.
2. Drilling Fluids: Drilling fluid shall be composed of potable water and bentonite clay. Water shall be from a authorized source with a pH of 8.5 – 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. No additional material may be used in drilling fluid without prior approval from Engineer.
3. The bentonite mixture used shall have the following minimum viscosity, as measured by a March funnel:
 - a. Rocky Clay 60 seconds
 - b. Hard Clay 40 seconds
 - c. Soft Clay 45 seconds
 - d. Sandy Clay 90 seconds
 - e. Stable Sand 80 seconds
 - f. Loose Sand 110 seconds
 - g. Wet Sand 110 seconds
4. These viscosities may be varied to best fit the soil conditions encountered, or as determined by the operator.
5. Delivery System: The drilling fluid pumping system shall have a minimum capacity of 35-500 GPM and be capable of delivering the drilling fluid at a constant minimum pressure of 1200 psi. The delivery system shall have filters in-line to prevent solids from being pumped into drill pipe. Used drilling fluid and drilling fluid spilled during operations shall be contained and conveyed to the drilling fluid recycling system or shall be removed by vacuum trucks or other methods acceptable to Engineer and UTILITY. A berm, minimum of 12-inches high, shall be maintained around drill rigs drilling fluid

SPECIFICATIONS

mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumping equipment and/ or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from containment areas to storage and recycling facilities or disposal.

2.3 OTHER EQUIPMENT

- A. Detectable Pipeline wire shall be insulated (green color) solid copper, #8 AWG, 600 volt, of not less than 90% conductivity, conforming to ASTM Designation B.58. Splicing of wires shall be by a solderless, split-bolt lug connector, Type IK-8, by ILSCO or equal
- B. Pipe Rollers: Pipe rollers shall be used for PVC pipe assembly during final product pull back.
- C. Restrictions: Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system shall maintain line and grade within the tolerances prescribed by the particular conditions of the project.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Notify the Engineer a minimum of 14 days in advance of starting work. All necessary permits and approvals must be in place prior to commencement of work. The Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such time as appropriate without causing undue hardship by reason of delay to the Contractor. A copy of the approved construction drawing shall be on the job site during construction.
- B. All work under this specification affecting the New Hampshire Department of Transportation (NHDOT) property, right-of-way or facilities shall be carried out to the full satisfaction of the NHDOT authorized representative. The Contractor shall fully inform himself of all NHDOT requirements pertaining to specific project and shall conduct all his work accordingly.
- C. All equipment used by the Contractor on Owner's property and right-of-ways may be inspected by the Owner or the Owner's Representatives and shall not be used if considered unsatisfactory by Owner or Owner's Representatives.
- D. The Contractor shall be fully responsible for all damages arising from his failure to comply with all applicable regulations and the requirements of these Specifications.
- E. All work under this specification shall be performed in accordance with Pennichuck Water Works standards and shall be carried out to the full satisfaction of Pennichuck Water Works authorized representative.
- F. All work under this specification shall be performed in accordance with Tennessee Gas Company and shall be carried out to the full satisfaction of Tennessee Gas Company authorized representative.

3.2 DIRECTIONAL DRILLING OPERATION

SPECIFICATIONS

- A. Provide all material, equipment, and facilities required for directional drilling. Maintain proper alignment and elevation of the borehole consistently throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits.
- B. Accurately survey the entire drill path and place entry and exit stakes the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, survey the drill path for any surface geo-magnetic variations or anomalies.
- C. Adhere to all applicable environmental regulations. Place silt fence between all drilling operations and any drainage system, well-field, wetland, waterway or other area designated for such protection if required by documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures.
- D. Record all readings after the advancement of each successive drill pipe (not more than 10'). Plot the readings on a scale drawing of 1" = 2' vertical and 1" = 20' horizontal. Provide access to all recorded readings and plan and profile information to the Engineer, or his representative at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.
- E. Contain all drilling fluids and loose cuttings in pits or holding tanks for recycling or disposal. No fluids shall enter any unapproved areas or natural waterways. Upon completion of the directional drill project, dispose of the drilling mud and cuttings at an approved dump site.
- F. Drill the pilot hole on a bore path with no deviations greater than 5% of depth over the length of the bore unless previously agreed to by the Engineer. Notify the Engineer in the event that pilot hole does deviate from the bore path more than 5% of depth over the length of the bore. Engineer may require Contractor to pull back and re-drill from the location along bore path before the deviation. In the event of a drilling fluid fracture, inadvertent returns, or returns loss during pilot hole drilling operations, cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and wait another 30 minutes. If mud fracture or returns loss continues, discuss additional options with the Engineer. Proceed with the option approved by the Engineer.
- G. Submit a complete set of "as-built" records in duplicate to the Engineer upon completion of pilot hole phase of the operation. These records shall include copies of the pilot bore path plan and profile record drawing, as well as directional survey reports as recorded during the drilling operation.
- H. Upon approval of the pilot hole location by the Engineer, begin the hole opening or enlarging phase of the installation. Increase the bore hole diameter to accommodate the pullback operation of the required size of carrier pipe. Determine the type of hole opener or back reamer to be utilized in this phase based on the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. Select the proper reamer type with the final hole opening being a maximum of 1.5 times the largest outside diameter pipe system component to be installed in the bore hole.
- I. Stabilize the open bore hole by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry shall be in a homogenous / flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. Calculate the volume of bentonite mud required for each pullback based on soil conditions, largest diameter of the pipe system component, capacity of the bentonite mud pump, and the speed of pullback as recommended by the bentonite drilling fluid manufacturer. Contain the bentonite slurry at the exit or entry side of the directional bore in pits

SPECIFICATIONS

or holding tanks. Recycle the slurry for reuse in the hole opening operation, or haul it to an approved dump site for proper disposal.

- J. Join the pipe sections together according to manufacturer's specifications. The gaskets and the ends of pipe shall be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand. The pipe shall be free of any chips, scratches, or scrapes.
- K. Attach a pulling eye to the pulling head on the lead end of the pipe and in turn attach to a swivel on the end of the drill pipe.
- L. Attach detectable pipeline wire to the pulling eye and to the crown of the pipe with duct tape at 24" on center and a minimum of two full wraps around the pipe.
- M. Elevate PVC restrained joint product pipe to the approximate angle of entry and support by means of a side boom with roller arm, or similar equipment, to allow for the "free stress" situation as the pipe is pulled into the exit hole toward the drill rig. Conduct the product pipe pullback phase of the directional operation in a continuous manner until the pipe reaches the original entry side of the bore.

3.3 TESTING

- A. Clean and flush the installed pipe to obtain a clear and debris free product.
- B. Test all directionally drilled pipe after pullback. Maintain an average pressure of 150 psi for two hours. The test pump and water supply shall be arranged to allow accurate measurements of the water required to maintain the test pressure. Any material showing seepage or the slightest leakage shall be replaced as directed by the Engineer at no additional expense to the Owner.
- C. The pipe manufacturer's recommendations on pipe stretch allowances, bending radius, tensile strength, allowable test leakage allowance, and magnitude and duration of test pressure shall be observed.
- D. All new service lines connected to the new main and installed with new pipe shall be pressure tested along with the newly installed main.
- E. Pressure testing shall not be required for directionally drilled pipe intended to be used as a casing for a finished product pipe.

3.4 SITE RESTORATION

- A. Following drilling operations, de-mobilize equipment and restore all areas, structures, plants, pavements, facilities, and features to not less than the pre-existing conditions.
- B. Backfill and compact all excavations in accordance with Section 01400 "Earth Excavation, Backfill, Fill and Grading."
- C. Topsoil, seed, and mulch non-paved areas in accordance with Section 02200 "Loam and Seed."

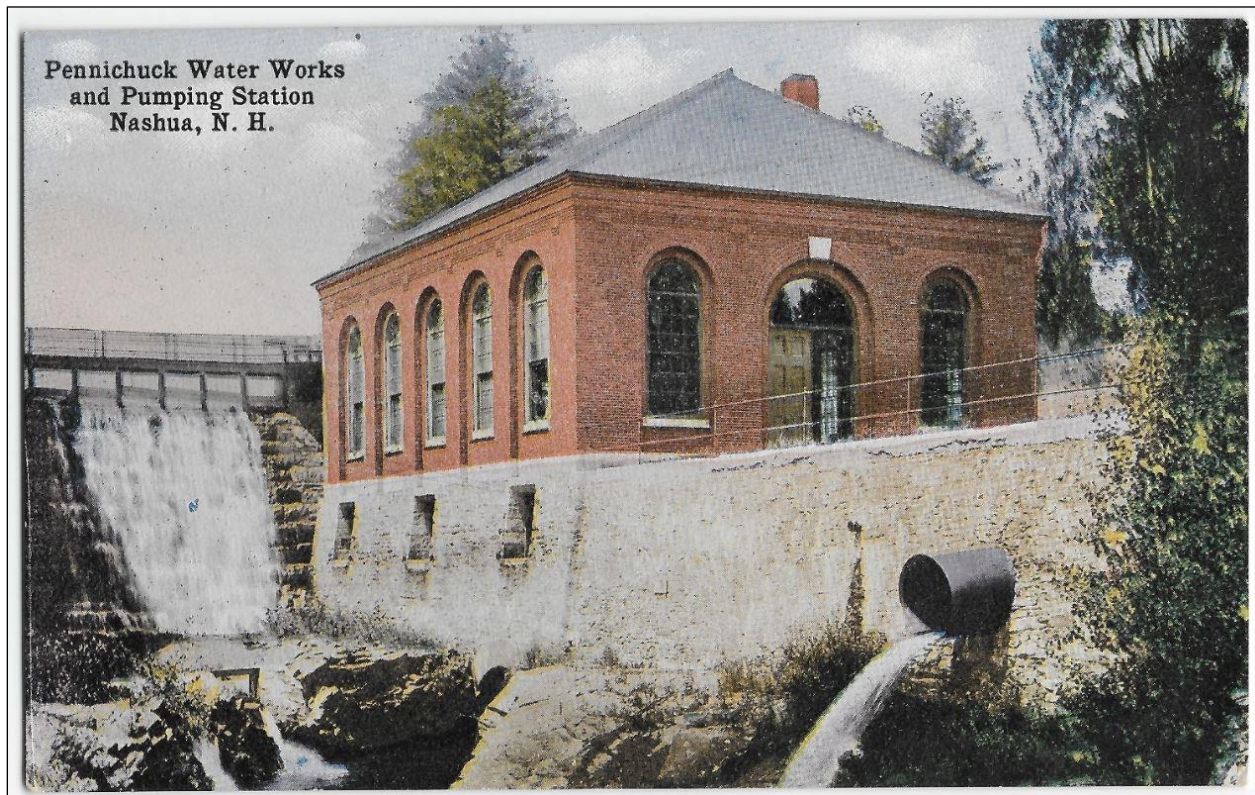
END OF SECTION 01610

E. Standard Specifications



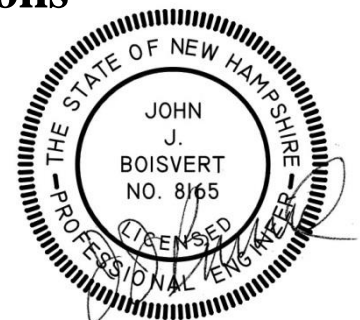
PENNICHUCK WATER WORKS

Nashua, New Hampshire



Technical Specifications for Water Main, Hydrant, and Service Installations

Revision – February 28, 2025



Foreword

These *Technical Specifications for Water Main, Hydrant, and Service Installations* are the standards for construction for Pennichuck Water Works Contract Administrators in the administration of Pennichuck construction projects. The Pennichuck companies are: Pennichuck Water Works (PWW) and Pennichuck Water Service Company (PWSC).

These are techniques and methods that will assist Pennichuck personnel in accomplishing the satisfactory completion of water works projects in accordance with the controlling Drawings, Specifications, and other Contract documents, and in ensuring proper quality and quantity control.

These *Technical Specifications for Water Main, Hydrant, and Service Installations* are a compilation of the best water line construction practice based on the experience of Pennichuck Water Works Engineers. Only after the Drawings and Specifications have been read and understood will the Specifications serve their purpose. Each water works employee and Contractor will be expected to become thoroughly familiar with the contents of these Specifications and to study them carefully to achieve a well-rounded knowledge of the operations employed by the industry and good judgment in applying these Specifications in the administration of Pennichuck Water Works Contracts.

General Note: These *Technical Specifications for Water Main, Hydrant, and Service Installations* reference the latest version of the State of New Hampshire, Department of Transportation, NHDOT Standard Specifications for Road and Bridge Construction. Wherever the NHDOT Specifications are referenced by section or subsection, that section or subsection of the NHDOT Specifications shall be considered part of these Pennichuck Water Works *Technical Specifications for Water Main, Hydrant, and Service Installations*.

Technical Specifications for Water Main, Hydrant, and Service Installations

Master Table of Contents

Section 01000 Special Conditions

Section 01100 General Specifications

Section 01200 Temporary Facilities

Section 01300 Clearing and Grubbing

Section 01400 Earth Excavation, Backfill, Fill, and Grading

Section 01500 Rock Excavation and Disposal

Section 01525 Blasting

Section 01550 Vibration, Seismic, and Acoustic Monitoring

Section 01600 Water Main Pipe and Fittings

Section 01625 Polyethylene Encasement

Section 01650 Water Service and Air Release Materials

Section 01660 Clean and Lining – Cast Iron Water Mains

Section 01670 Asbestos Cement Pipe

Section 01680 Temporary Water Mains and Services

Section 01800 Crushed Gravel

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

Section 02000 Common Borrow

Section 02100 Sand

Section 02200 Loam & Seed

Section 02250 Chain Link Fencing

Section 02300 Paving

Section 02400 Concrete Thrust Blocks

Section 02450 Styrofoam Insulation

Section 02500 Managing Water Flow during Construction

PENNICHUCK WATER WORKS

Section 02550 Dust Control
Section 02600 Clean Up
Section 02700 Measurement and Payment
Appendix A..... Hydrant and Valve Opening Direction

SECTION 01000
Special Conditions

Table of Contents

A..... GENERAL
B..... RESOLVING CONFLICTS OR INCONSISTENCIES
C..... TRAFFIC CONTROL
D..... PAVING OPERATIONS
E..... INSURANCE COVERAGE
F..... CURRENT RECORD DRAWINGS
G..... PRE-CONSTRUCTION VIDEO
H..... SPECIAL INSTALLATION OF WATER MAIN

A

GENERAL

1. Water Main and Water Service Shutdowns

The Contractor must notify the Engineer a minimum of 72 hours before shutting down any water main and 24 hours before shutting down any water service.

Pennichuck will provide the necessary crews at no cost to the Contractor to operate the water valves required for each water main shutdown and for the reactivation of the water main. In no case shall a water main be shut down for more than 12 hours. If an emergency or anticipated shut down requires that a water main be shut down for more than 12 hours, the Contractor shall provide 2 gallons of bottled water to each affected resident.

2. Permits

Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permit types may include the following:

- Construction Dewatering Permit
- EPA Dewatering Permit
- Municipal Street Opening Permit
- Municipal Emergency Permit
- Notice of Intent (NOI) to discharge wastewater from construction sites
- Stormwater Pollution Prevention Plan (SWPPP)
- Asbestos Cement Pipe

3. Conforming to Plans and Specifications

All work shall conform to these Specifications and/or the accompanying Project Drawings.

4. Site Visits

Before submitting a bid, the Contractor shall visit the work site or sites. These work sites shall be available for viewing at the Contractor's convenience. During such visits, the Contractor shall examine the existing conditions and thoroughly acquaint themselves with the obstacles and advantages of performing the work.

The Contractor shall also study the construction documents and compare them with the information gathered during the site examination. No extra compensation will be authorized for extra work caused by the Contractor's unfamiliarity with the site, the construction documents, or conditions that may be unusual to the project.

5. Submittals

The Contractor shall submit digital copies of complete and acceptable shop Drawings to the Owner for approval a minimum of two weeks before the intended use for the following Items:

- All pipe, fittings, and valves
- Construction schedule (If required)

The schedule shall present a critical path with dates for critical phases of the work.

If required, the Contractor shall submit compliance certification for the American Iron and Steel (AIS) provision that State and Federal Funding Programs require.

AIS compliance certifications must include the following information:

- Project name
- Specific product description
- Nation of origin
- Reference to AIS requirements
- Manufacturer or vendor representative's signature

B

RESOLVING CONFLICTS OR INCONSISTENCIES

If there are any conflicts or inconsistencies between the provisions of the Special Conditions and the provisions of the other Contract Documents, the provisions of the Special Conditions shall prevail. If there is any conflict or inconsistency between the provisions of the Agreement and the provisions of any of the Contract Documents other than the Special Conditions, the conditions of the Agreement shall prevail. In all cases, the judgement of the Pennichuck representative shall supersede all other conditions.

C

TRAFFIC CONTROL

- All traffic control will be provided by municipal Police Departments or by others approved by the municipal Police Department.
- Flaggers shall to be certified by the ATSSA (American Traffic Safety Services Association) or a comparable organization. Flaggers must provide proof of certification upon request. Flagging organizations should provide copies, up front, of their employee certifications with other submittals.
- Flaggers must be equipped with PPE, traffic control signage, flags, barriers, barricades and any other required MUTCD devices for traffic control purposes. Flaggers must be provided with appropriate breaks for lunch, relief from weather conditions, and other necessities.
- The work hour schedule shall be in accordance with municipal requirements.
- Signage shall be in accordance with the Drawings or as approved by the municipal Police Department, the municipal Public Works Department, and the Manual of Uniform Traffic Control Devices (MUTCD).

D

PAVING OPERATIONS

1. Paving Restoration

All paving restoration shall be carried out in accordance with the Drawings and Specifications.

2. Dust Control

The Contractor shall always provide dust control for each street during construction and shall be responsible for maintaining the road in a level, passable condition. Upon completion of the base asphalt pavement, the Contractor will only be responsible for dust control and sweeping due to their construction-related activities.

3. Asphalt Cement Price Adjustments

Adjustments for increases or decreases in Asphalt Cement prices for Pennichuck Water Works capital projects only will be carried out in accordance with the latest NH DOT *Special Attention with regards to Asphalt Cement Adjustment* as posted on the NH DOT web site on the day of the bid opening.

E

INSURANCE COVERAGE

The local municipality and Pennichuck shall be provided with insurance certificates, naming both parties as additional named insured in accordance with general conditions. For Developer projects, insurance coverage requirements are specified in the main Extension Agreement.

F

CURRENT RECORD DRAWINGS

During the Work, the Contractor and applicable Subcontractors shall continually maintain a set of legibly-marked prints, Drawings, and sketches showing any changes made during the construction process. This set of prints shall be incorporated into one complete set of full D-size paper Drawings

by the Contractor following completion of work. The Contractor shall make any revisions required by the Engineer to make the Record Drawings complete and up-to-date.

After acceptance by the Engineer, the full-size paper Drawings shall be given to the Engineer. These record Drawings shall be completed in every way with attention given to properly delineating concealed work which would be difficult to measure later. Change orders, addenda Items, and field changes should be noted where applicable. Additional specific requirements relative to Record Drawings may be called for in the individual sections of these Specifications.

G

PRE-CONSTRUCTION VIDEO

Prior to any excavation or disturbance, the Contractor shall video all potential areas to be disturbed by the proposed project. It is encouraged, if possible, to perform the video after a significant rain event. The Contractor shall provide three copies of this video on USB flashdrives or upload to the Pennichuck Sharefile site. Pre-construction video will be approved after review by Pennichuck that the video clearly depicts the entire proposed work area and any potential areas that could be disturbed due to Contractor activities related to the project.

H

SPECIAL INSTALLATION OF WATER MAIN

Water main shall be installed in accordance to the Specifications and Drawings.

1. Suspended to a Bridge

Suspension of a water main to a bridge is not a preferred method and will only be accepted by Pennichuck Water when there are no other practical methods or options available. Cost is not the primary consideration in determining a practical method or option.

SECTION 01100
General Specifications

Table of Contents

A..... DEFINITIONS

B..... ABBREVIATIONS

C..... HANDLING AND DISTRIBUTING MATERIALS

D..... SAMPLING AND INSPECTING MATERIALS

E..... CONTRACTOR’S SHOP AND WORKING DRAWINGS

F..... OCCUPYING PRIVATE LAND

G..... INTERFERENCE WITH AND PROTECTION OF STREETS

H..... STORING MATERIALS AND EQUIPMENT

I..... SAFETY MEASURES

J..... SANITARY REGULATIONS

K..... ESTABLISHING LINES, GRADES, AND MEASUREMENTS

L..... DIMENSIONS OF EXISTING STRUCTURES

M..... CONFORMING TO LINES, LEVELS, AND GRADES

N..... PIPE AND FITTING LOCATIONS

O..... LIMITS OF NORMAL EXCAVATION

P..... COMPUTING QUANTITIES

Q..... PLANNING AND PROGRESS SCHEDULES

R..... PRECAUTIONS DURING ADVERSE WEATHER

S..... ELECTRIC POWER

T..... PRE-CONSTRUCTION ASSESSMENT

U..... NHDOT SPECIFICATION REFERENCES

A

DEFINITIONS

Wherever the words defined in this section or pronouns used in their stead occur in the Contract Documents, they shall have the meanings herein given.

Wherever in the Contract Documents, or on the Drawings, the words “As directed,” “As ordered,” “As requested,” “As required,” “As permitted,” or words of like import are used, it shall be understood that the direction, order, request, requirement, or permission of the Owner’s Representative is intended. Similarly, the words “approved,” “acceptable,” “suitable,” “satisfactory,” and words of like import shall mean approved by, acceptable to, suitable to, or satisfactory to the Owner’s Representative.

1. Elevation

The figures given on the Drawings or in the other Contract Documents after the word “elevation” or abbreviation of it shall mean the distance in feet above the datum specified by the Owner’s Representative.

2. Rock

The word “rock,” wherever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding one cubic yard in volume, or solid ledge rock which, in the opinion of the Owner’s Representative, requires for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which may be removed with a hand pick or power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as “rock.”

3. Earth

The word “earth”, wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as previously defined.

4. Owners

Pennichuck Water Works (Pennichuck Water Works) or Pennichuck Water Service Company (PWSC).

5. Owner’s Representative

A Manager, Engineer, or Field Inspector employed by Pennichuck Water Works with delegated responsibility for the project.

6. Contractor

The company responsible for the installation of the water main, services, and appurtenances.

7. Engineer

The Engineer of Record for the project.

8. Developer

A transitional owner of a project requiring the installation of a water main or water services.

B

ABBREVIATIONS

Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth as follows:

- 125-lb. ANS..... American National Standard for Cast-iron
- 250-lb. ANS..... American National Standard for Pipe Flanges and Flanged Fittings
(*Designation B16.1-1975*, for the appropriate class)
- AASHTO..... American Association of State Highway and Transportation Officials
- AC..... Asbestos Cement
- ACI..... American Concrete Institute
- AISC American Institute of Steel Construction
- AIS American Iron and Steel – Provisions

PENNICHUCK WATER WORKS

ANS	American National Standard
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gauge
BV	Butterfly Valve
CL	ANSI Pipe Thickness Class
CMP	Corrugated Metal Pipe
CT	Copper Tubing
CTS	Copper Tubing Sized
DI	Ductile Iron
DIPCL	Ductile Iron Pipe Cement-Lined
DIPS	Ductile Iron Pipe Sized
GV	Gate Valve
HDPE	High-Density Polyethylene Pipe
IP	Iron Pipe
IPS	Iron Pipe Sized
L.A.R.O.W.	Limited Access Right-of-Way
MJ	Mechanical Joint
NHDOT	New Hampshire Department of Transportation
NPT	National Pipe Thread
OL	Open Left
OR	Open Right
OS & Y	Outside Screw and Yoke
PE	Polyethylene Pipe
PJ	Pack Joint

PRV..... Pressure Reducing Valve
PVC..... Polyvinyl Chloride
RS..... Resilient Seat
SS Stainless Steel
TOP..... Top of Pipe

C

HANDLING AND DISTRIBUTING MATERIALS

The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the Work, as necessary or required. They shall provide suitable and adequate storage room for materials and equipment during the progress of the Work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by them, and those provided by the Owner for use by the Contractor, until the Final Completion date and acceptance of the Work.

Facilities and labor for the storage, handling, and inspection of all materials and equipment shall be furnished by the Contractor. Defective materials and equipment shall be removed immediately from the site of the Work.

Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

D

SAMPLING AND INSPECTING MATERIALS

Unless otherwise expressly provided on the Drawings or in any of the other Contract Documents, only new materials and equipment shall be incorporated in the Work. All materials and equipment furnished by the Contractor to be incorporated in the Work shall be subject to the inspection of the Owner's Representative. No material shall be processed or fabricated for the Work or delivered to the Work site without prior concurrence of the Owner's Representative.

PENNICHUCK WATER WORKS

As soon as possible after execution of the Agreement, the Contractor shall submit to the Owner's Representative the names and addresses of the manufacturers and suppliers of all materials and equipment that they propose to incorporate into the Work. When Shop and Working Drawings are required as specified below, the Contractor shall submit data in sufficient detail to enable the Owner's Representative to determine whether the manufacturer and/or the supplier have the ability to furnish a product meeting the Specifications. Once the manufacturer and/or supplier have been approved, the Contractor shall then submit their Shop and Working Drawings.

As requested, the Contractor shall also submit data relating to the materials and equipment that they propose to incorporate into the Work in sufficient detail to enable the Owner's Representative to identify and evaluate the particular product and to determine whether it conforms to the Contract requirements. Such data shall be submitted in a manner similar to that specified for submission of Shop and Working Drawings.

If the Owner's Representative so requires, either prior to or after commencement of the Work, the Contractor shall submit samples of materials for such special tests as the Owner's Representative deems necessary to demonstrate that they conform to the Specifications. Except as otherwise expressly specified, the Owner shall plan for, and pay for, these tests.

All samples shall be properly packed so that they reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the work and location for which the material is intended, and the name of the Contractor submitting the sample. To ensure consideration of samples, the Contractor shall notify the Owner's Representative that the samples have been shipped and shall properly describe the samples.

The Contractor shall submit data and samples, or place their orders, sufficiently early to permit consideration, inspection, and testing before the materials and equipment are needed for incorporation in the Work. The consequences of their failure to do so shall be the Contractor's sole responsibility.

When required, the Contractor shall furnish to the Owner's Representative duplicate sworn copies of manufacturer's shop or mill tests (or reports from independent testing laboratories) relative to materials, equipment performance ratings, and concrete data.

After review of the samples, data, etc., the materials and equipment used on the Work shall in all respects conform to these Specifications.

E

CONTRACTOR'S SHOP AND WORKING DRAWINGS

The Contractor's Shop and Working Drawings shall be submitted as designated in each Specification section.

F

OCCUPYING PRIVATE LAND

In the absence of written consent from the proper parties, the Contractor shall not enter or occupy with personnel, tools, materials, or equipment, any land outside the rights-of-way, or property of the Owner. A copy of the written consent shall be submitted to Pennichuck Water Works.

Pennichuck Water Works will not be responsible for any restoration costs or fees associated with land subject to the written consent agreement.

G

MAINTAINING ACCESS TO THE TRAVELLED RIGHT-OF-WAY

The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefore from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, they shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.

Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefore.

The Contractor shall comply fully with all NHDOT and/or local municipality standards and Specifications for posting of roadways as related to the type of work. Areas requiring stripping of pavement shall also be posted and reconstructed in accordance with NHDOT and/or local municipality standards and Specifications.

H

STORING MATERIALS AND EQUIPMENT

All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

Confinements such as erosion control measures shall also be employed where required by the Owner's Representative at no extra cost to the Owner.

I

SAFETY MEASURES

The Contractor shall take all necessary precautions and provide all necessary safeguards to prevent personal injury and property damage. The Contractor shall provide protection for all persons including but not limited to their employees and employees of other Contractors or subcontractors; members of the public; and employees, agents, and representatives of the Owner, the Owner's Representative, and regulatory agencies that may be on or about the Work. The Contractor shall provide protection for all public and private property including but not limited to structures, pipes, and utilities, above and below ground.

The Contractor shall provide and maintain all necessary safety equipment such as fences, barriers, signs, lights, walkways, guards, and fire prevention and fire-fighting equipment, and shall take such other action as is required to fulfill their obligations under this subsection.

The Contractor shall comply with all applicable Federal, State and local laws, ordinances, rules and regulations and lawful orders of all authorities having jurisdiction for the safety of persons and protection of property. This includes, but is not limited to, current excavation shoring standards as outlined by OSHA, the use of hard hats, safety vests, etc.

All such safety equipment will be provided and maintained in “good” condition by the Contractor at no expense to the Owner. Failure to comply with current safety standards and requirements subjects the Contractor to immediate suspension of Work and requires them to pay of any and all fines, penalties, and assessments levied against them by the party having jurisdiction.

Contractors employed by the owner will be subject to immediate suspension of work when unsafe working conditions on the work site are present or indicated. Safety violations shall be documented for contractors not employed by the owner who are involved with unsafe working conditions on the work site.

The Contractor shall designate a responsible member of their organization at the site whose duty shall be the implementation of safety measures and prevention of accidents. This responsible person shall have the authority to take immediate action to correct any unsafe or hazardous conditions and to enforce all safety precautions and programs.

J

SANITARY REGULATIONS

The Contractor shall provide adequate sanitary facilities for the use of those employed on the project. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers at such points and in such manner as may be required by the Owner’s Representative.

The Contractor shall always maintain the sanitary facilities in a satisfactory and sanitary condition and shall enforce their use. They shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or any adjacent property.

K

ESTABLISHING LINES, GRADES, AND MEASUREMENTS

The Contractor shall employ a competent person to establish all lines, elevations, reference marks, batter boards, etc., needed by the Contractor during the progress of the Work, and from time-to-time, to verify such marks by instrument or other appropriate means.

The Contractor is responsible for all layout including, but not limited to, clearing limits and re-staking the centerline. The Owner's Representative shall always be permitted to check the lines, elevations, reference marks, batter boards, etc., set by the Contractor, who shall correct any errors in lines, elevations, reference marks, batter boards, etc., disclosed by such a check.

However, this evaluation shall not be construed to be an approval of the Contractor's work and shall not relieve or diminish in any way the responsibility of the Contractor for the accurate and satisfactory construction and completion of the entire Work.

The Contractor shall produce, verify, and be responsible for all measurements and dimensions necessary for the proper construction of the Work and the prevention of any misalignments in the pipe run.

L

DIMENSIONS OF EXISTING STRUCTURES

Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

M

CONFORMING TO LINES, LEVELS, AND GRADES

During its progress and on its completion, the Work shall conform truly to the lines, levels, and grades indicated on the Drawings or given by the Owner's Representative. The Work shall be built in a thoroughly substantial and workmanlike manner, in strict accordance with the Drawings, Specifications, other Contract Documents, and the directions given from time-to-time by the Owner's Representative.

All work done without instructions having been given by the Owner's Representative, without proper lines or levels, or performed during the absence of the Owner's Representative, will not be estimated or paid for except when such work is authorized by the Owner's Representative in writing. Work so done may be ordered uncovered or taken down, removed, and replaced at the Contractor's expense.

N

PIPE AND FITTING LOCATIONS

Exterior pipelines will be located as indicated on the Drawings, but the right is reserved to the Owner's Representative to make such modifications in location as may be found desirable to avoid interference with existing structures or for other appropriate reasons.

Where fittings, etc., are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve them from laying and jointing different or additional Items where required. Grades shown are for control purposes. Deflections shown on the Drawings are approximate and may vary in the field. The Contractor shall always maintain the cover specified over the top of pipe.

O

LIMITS OF NORMAL EXCAVATION

The normal excavation limits are subject to the discretion of the Contractor, based on their safety, environmental, and Contract obligations. The normal excavation width for the water main shall be a maximum of 6 feet, as measured from the vertical planes which constitute the trench sidewalls unless otherwise designated on the Plans. The normal trench depth shall be as detailed on the Plans and as measured from the existing pavement at the roadway shoulder.

Pipes shall be installed within the confines of this trench as detailed on the Plans.

For concrete placed directly against undisturbed earth, the normal width and depth of the excavation for such concrete shall be measured to the neat lines of the concrete as indicated on the Drawings or as ordered. No excavation outside of the limits of normal excavation for concrete shall be made without permission of the Owner's Representative.

For concrete placed against rock surfaces resulting from rock excavation, the normal width and depth of the excavation shall be measured to 4 inches outside the neat lines of the concrete as indicated on the Drawings or as ordered. No excavation outside of the limits of normal excavation for concrete shall be made without permission of the Owner's Representative.

Ledge excavation may be authorized beyond the limits of the normal trench width as requested by the Owner's Representative to remove broken or loose rock.

For other appurtenances, such as branch lines, hydrants, and additional services, the normal width shall be measured between vertical planes 1 foot outside the neat lines of the appurtenances, except that the width shall not be less than 4 feet. The normal depth shall be determined in the same manner as that specified above. No extra payment shall be made for these appurtenances even where excavation occurs outside the normal trench limits.

P

COMPUTING QUANTITIES

The computation of the volume of prisms shall be by the method of average end-areas.

Q

PLANNING AND PROGRESS SCHEDULES

Before starting the Work and from time-to-time during its progress, as the Owner's Representative may request, the Contractor shall submit to the Owner's Representative a written description of the methods they plan to use in doing the Work and the various steps they intend to take.

Within five days after the date of formal execution of the Agreement, the Contractor shall prepare and submit to the Owner's Representative a written schedule fixing the dates on which additional Drawings, if any, will be needed by the Contractor and a written schedule fixing the respective dates for the start and completion of various parts of the Work. Each such schedule shall be subject to review from time-to-time during the progress of the Work.

R

TAKING PRECAUTIONS DURING ADVERSE WEATHER

During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper shelters, or other suitable means.

S

ELECTRIC POWER

The Contractor shall make all necessary applications and arrangements and pay all fees and charges for electric power and lighting necessary for the proper completion of the Work and during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.

T

PRE-CONSTRUCTION ASSESSMENT

Prior to the deployment of any equipment or materials to the project site, the Contractor shall conduct a project-wide assessment of conditions, noting any existing damage and deficiencies within the right-of-way and on private property immediately adjacent to the right-of-way.

The Contractor shall compile a detailed digital video recording of each street, made at a walking pace to ensure that all conditions are comprehensively documented. The Contractor shall also endeavor to make a digital video recording immediately following a significant rain event to document any existing drainage issues in the area that may occur. The digital video recording shall be date and time stamped. The Contractor shall provide the owner with a copy of the digital video recording and a copy of the Contractor's assessment of pre-construction conditions.

U

NHDOT SPECIFICATION REFERENCES

These Specifications reference the latest version of the State of New Hampshire, Department of Transportation, Standard Specifications for Road and Bridge Construction. Wherever the State of New Hampshire Specifications are referenced by Section, that Section of the Specification shall be considered part of these Specifications.

SECTION 01200
Temporary Facilities

Table of Contents

A..... GENERAL
B..... TEMPORARY FACILITY WATER SUPPLY
C..... TEMPORARY FACILITY ELECTRICITY
D..... TEMPORARY FACILITY SANITARY ACCOMMODATIONS
E..... SIGNAGE
F..... BARRICADES AND GUARD LIGHTS
G..... CONTRACTOR'S BUILDING

A

GENERAL

The Contractor shall provide all temporary facilities necessary for the proper completion of the Work, as necessary and as specified. The Contractor shall adhere to the requirements of the General Specifications specified under “Sanitary Regulations”, “Precautions During Adverse Weather”, and “Electrical Energy.”

B

TEMPORARY FACILITY WATER SUPPLY

The Contractor, with the approval of the Owner, may make connection to a fire hydrant within the project area and use this supply for construction purposes. The Contractor shall bear the cost of water used for construction purposes. The Owner shall install a water meter on the fire hydrant that the Contractor intends to use. Meter size options are either 3” or 1”. The Contractor shall furnish and install a backflow preventer on this connection.

The Contractor must first obtain approval for making the hydrant connection from Pennichuck by contacting Meter Department Supervisor at (603) 913-2388 and requesting the “Construction Hydrant Water Meter” form. The Contractor shall return this completed form to Pennichuck with a deposit in the amount of \$1000.00 for a 3” meter, \$850.00 of which is refundable when the meter is returned in acceptable condition when operations have concluded. A deposit of \$330.00 is required for a 1” meter with a refund amount of \$200.00 when the meter is returned in acceptable condition. Pennichuck reserves the right to charge the Contractor for additional costs if a meter is damaged and requires repair or replacement costs greater than the initial deposit. Invoices for water usage shall be submitted to the Contractor each month. Contractor is responsible for the monthly meter fee. Monthly meter rates and water usage rates can be found at www.pennichuck.com ; follow the General Information & Rate Information links. The Contractor will also be required to provide a 2.5” NST/fire hose swivel adaptor as well as a Reduce Pressure Zone (RPZ) backflow device. Pennichuck reserves the right to remove a construction meter if the Contractor fails to use the required backflow device and the Contractor will be prohibited from using water for construction purposes until the proper backflow device has been installed.

The time limit for the use a of construction meter is 90 days. If the Contractor requires use of the hydrant connection past 90 days, they shall contact Customer Service again to request additional time.

All connections required for temporary water shall be furnished by the Contractor at their expense. Refer to *Standard Detail T01* for more information.

C

TEMPORARY FACILITY ELECTRIC POWER

The Contractor shall arrange for, furnish, maintain, and pay for the electricity used for pumping, lighting, powering tools, and the electrification of the field offices, up to the time of final acceptance.

D

TEMPORARY FACILITY SANITARY ACCOMMODATIONS

Sanitary accommodations for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers, in such a manner, and at such locations deemed acceptable to the Owner's Representative. The contents shall be removed and disposed of in a manner and at a frequency acceptable to the public health agency having jurisdiction. The proper maintenance of sanitary conveniences shall be the obligation and responsibility of the Contractor until the completion of the Work.

E

SIGNAGE

All signs required by regulatory agencies shall be furnished, installed, and maintained by the Contractor. Any permits required to erect signs shall be obtained by the Contractor. The Contractor shall submit copies of signage plans as required in the Special Conditions section of these Specifications.

F

INSTALLING BARRICADES AND GUARD LIGHTS

Barricades, signs, fences, and similar safety and warning devices shall be provided as required to ensure the protection of the public, as well as employees of the Contractor, the Owner, and the Owner's Representative. Guard lights shall be furnished and installed at all barricades, obstructions in streets and sidewalks, and at all trenches and pits adjacent to public roads. All directional and warning devices furnished shall conform with the MUTCD.

G

PROVIDING TEMPORARY CONTRACTOR FACILITIES

The Contractor shall provide temporary office, storage, and fabrication facilities for their use as required and obtain all necessary applicable permits and/or approvals required for their use. The location or locations of such buildings shall be the responsibility of the Contractor and shall be completely removed at the completion of work.

Any costs due to relocation shall be the responsibility of the Contractor.

Drinking water, satisfactorily cooled, shall also be provided by the Contractor at the temporary facility.

SECTION 01300
Clearing and Grubbing

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... EXECUTION

A

GENERAL

This work by the Contractor shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits shown on the Plans or as specified below, except such objects as are designated to remain or are to be removed in accordance with the other sections of these Specifications. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill, and Grading

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

Section 02200 Loam & Seed

C

EXECUTION

1. Removing Trees and Shrubs

All trees, shrubs, and stumps shall be removed from within the grubbing areas as designated on the Plans. No trees or shrubs shall be removed from outside the designate clearing area without the written consent of the Owner's Representative. Any trees or shrubs located outside of the clearing limits which are cut or scarred during the construction process shall be painted with an approved wound dressing or treated per other accepted arboricultural practices.

2. Removing Stumps and Large Roots

All stumps and large roots within the clearing area shall be removed to a depth of 6 inches below the invert of the water main. All stumps and large roots must be removed completely under areas to be backfilled with structural fill.

3. Properly Disposing of Solid Waste

All stumps, roots, branches, brush, weeds, and other grubblings shall be removed from the site and disposed of by an approved method. The Contractor's attention is directed to New Hampshire *Revised Statute § 149-M:4** regarding the fact that stumps and roots from grubbing operations have been classified as solid waste. As such, these stumps shall be disposed of in permitted sites through firms having facilities and the ability to process the stumps and roots in accordance with NHDES regulations. It is the responsibility of the Contractor to obtain all permits required to comply with the New Hampshire Solid Waste Rules and Design standards in effect at the time of the disposal.

4. Filling Excavated Areas

All excavated areas outside the limits of the structural fill placement resulting from grubbing operations shall be filled with common borrow. Borrow shall be placed and compacted to conform to the surrounding ground.

5. Wood Harvesting Rights

The property owner shall have the first right of refusal for any useful wood harvested during any wood-clearing operations.

* *2015 New Hampshire Revised Statutes, Title X - PUBLIC HEALTH, Chapter 149-M - SOLID WASTE MANAGEMENT, Section 149-M:4 – Definitions.*

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01400

Earth Excavation, Backfill, Fill, and Grading

Table of Contents

A..... GENERAL
B..... RELATED PRODUCTS
C..... QUALITY ASSURANCE
D..... SAFETY
E..... PRODUCTS
F EXECUTION

A

GENERAL

Pipe trench excavations shall be made to the depth and width specified in the Drawings and Details. Excavation work shall also include backfilling such excavations, making miscellaneous earth excavations, and performing miscellaneous grading.

B

RELATED WORK

- Section 01000 Special Conditions
- Section 01300 Clearing and Grubbing
- Section 01500 Rock Excavation and Disposal
- Section 01525 Blasting
- Section 01600 Ductile Iron Pipe Installation
- Section 01800 Crushed Gravel
- Section 01900 Gravel Aggregate for Road Base and Water Main Backfill
- Section 02000 Common Borrow
- Section 02200 Loam and Seed
- Section 02400 Concrete Thrust Blocks

C

QUALITY ASSURANCE

1. Determining Soil Compaction

Wherever a percentage of compaction is indicated or specified, use percent of maximum density at optimum moisture as determined by the requirements of *ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))*.

2. Open Trench Length

The length of trench open at any one time will be controlled by conditions and subject to any limits that may be prescribed by the Owner's Representative. In general, open lengths of trench will be kept to a minimum.

3. Underground Utilities

There may be pipes, drains, and other utilities in certain locations not indicated on Drawings. The completeness or accuracy of information given is not guaranteed.

Important: Final confirmation of all underground utilities and their location on public property is the responsibility of the Contractor and shall be confirmed through the Dig Safe System, Inc. notification process. If a utility is not a member of "Dig Safe," then the Contractor shall confirm utility locations through the municipality, or the third party that either owns or maintains the utility. The Contractor is also responsible for locating utilities on private property.

4. Preventing Damage to Existing Items

All existing pipes, poles, wires, fences, curbing, property line markers, and other structures which the Owner's Representative decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such items be damaged, they shall be restored by the Contractor, without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

5. Previously Unknown Structures

Whenever the Contractor encounters certain existing structures within the normal scope of work not previously identified (as described below and is so ordered in writing), they shall do the whole or such portions of the work as he may be directed to change the location of, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work the Contractor shall be paid under such Items of work as may be applicable, otherwise it shall be reimbursed as Extra Work.

These previously unknown structures may include pipes, wires, and other structures which meet all of the following criteria:

- The structures are not indicated on the Drawings or otherwise provided for.
- The structures encroach upon or are encountered near and substantially parallel to the edge of the excavation.
- The structures, in the opinion of the Owner's Representative, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

6. New Materials

In removing existing pipes or other structures, the Owner's Representative shall include for payment only those new materials which, in his judgment, are necessary to replace those unavoidably damaged.

7. Restoring Existing Property

Restoration of existing property or structures shall be done as promptly as practicable. All disturbed drives, walkways and roadways shall be returned to service at the end of each workday unless otherwise approved by the Owner's Representative.

8. Disposing Surplus Materials

Surplus excavated materials not needed as specified above shall be hauled away and dumped by the Contractor, at their expense, to locations approved by authorities having jurisdiction and in accordance with arrangements made by the Contractor.

9. Minimizing the Generation and Dispersion of Dust

During progress of work, Contractor shall conduct their operations and maintain their area of activities, including sweeping and sprinkling of streets as necessary, to minimize the generation and dispersion of dust.

10. Temporary Roadway Structures

The Contractor shall, at their own expense, provide suitable and safe temporary roadway structures, such as bridges and other crossings, where required for accommodation of travel. The Contractor shall provide access to private property during construction activities, and shall remove any temporary roadway structures thereafter.

11. Using Temporary Steel Plate Trench Bridging

The use of temporary steel plate trench bridging shall be governed by the requirements of the local municipality.

12. Managing Cut and Fill Materials

In general, and unless other material is indicated on Drawings or specified, material used for backfilling trenches and excavations around structures shall be material which was previously removed while making the construction excavations. Excavated materials shall not be stockpiled on or within the travelled way.

Important: These excavated materials may be used only if they meet or exceed the Specifications for common borrow.

The nature of the excavated material will govern both its acceptability for backfill, and methods best suited for its placement and compaction in backfill. If sufficient suitable material is not available from the excavations, the backfill material shall be structural gravel, gravel aggregate, or common borrow as directed by the Owner's Representative.

13. Unsuitable Materials

Replacement materials for unsuitable materials shall be utilized only when directed by the Owner's Representative and shall be a clean dry porous gravel aggregate (NHDOT 304.2) or crushed stone. Materials shall be in accordance with local, municipal and NHDOT requirements.

D

SAFETY

The Contractor shall supply all necessary safety equipment for the work, including trench boxes, shields, vests, hard hats, ladders, and any additional safety-related equipment, instructions, and materials required to comply fully with all current State, Federal and local laws and ordinance regarding safety in excavation projects. The Owner's Representative may stop work at any time, without written notice, to correct safety violations and substandard conditions.

Note: Any losses incurred by the Contractor as a direct result of a work stoppage because of safety issues will be at the sole liability of the Contractor with no additional compensation forthcoming from the Owner.

E

PRODUCTS

All material, whether from excavations or from borrow, after being placed and properly compacted, shall make a dense stable fill that contains no vegetation, no individual roots more than 10 inches long or more than ½ inch in diameter, no stones over 6 inches in diameter, or any porous matter. Organic matter of any type is not acceptable.

Refer to the appropriate Specification Sections for definitions of structural gravel aggregate for base and gravel aggregate for sub-base and around main and common borrow.

F

EXECUTION

1. Description

- a. The Contractor shall conduct their excavation operations, including any de-watering, sheeting, or bracing, in such a manner as to eliminate all possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.
- b. The Contractor shall excavate to the width dimensions specified on the Drawings for laying and jointing piping, and furnishing and placing all sheeting, bracing, and supports. The Contractor shall conduct proper coffer dam operations, including pumping, draining, and rendering the bottom excavation surfaces firm, dry, and acceptable in all respects.
- c. The Contractor shall not use machinery to plow, scrape, or dig earth near to finished subgrade that may result in disturbance of any material below subgrade, unless indicated or specified. Before placing pipe, masonry, or other structures, any additional material to be excavated shall be carefully removed by hand with pick and shovel.
- d. The Contractor shall conduct all excavation operations in the open, except as otherwise specified or permitted.

2. Removing Pavement and Topsoil

- a. The Contractor shall remove only the amount of existing pavement that is necessary for prosecution of the Work.
- b. The Contractor shall carefully remove loam and topsoil from excavated areas and store these materials separately for further use or they must furnish equivalent loam and topsoil.

3. Installing Bracing and Trench Boxes

- a. The Contractor shall furnish, install, and maintain trench boxes, bracing, etc., as may be necessary to provide for personnel safety when working in the excavated area. This includes the prevention of any soil movement which could diminish the width of the excavation to less than that necessary for proper construction operations, proper support for the sides of the excavation, and the avoidance any conditions that could otherwise endanger adjacent structures, cause personnel injury, or delay work.

Important: All bracing and trench boxes shall comply with current OSHA requirements.

Neglect or improper implementation of bracing or trench boxes on the part of the Contractor may result in the Owner's Representative immediately stopping the progress of work. Any losses incurred by the Contractor as a direct result of a work stoppage because of bracing or trench box safety issues will be at the sole liability of the Contractor with no additional compensation forthcoming from the Owner.

- b. The Contractor shall carefully remove all sheeting and bracing not to be left in place so as not to compromise the construction operations or other structures. Voids left or caused by the withdrawal of sheeting shall be immediately backfilled using suitable materials as specified and properly compacted.

4. Drainage Discharge

- a. The Contractor shall provide and maintain suitable water pumping units and employ any other means necessary to intercept and/or promptly remove and properly dispose of all water entering trenches and other excavations. Excavations shall be kept dry until the pipes, appurtenances, and structures to be built therein have been completed to such an extent that they will not be floated or otherwise damaged by water intrusions. The Contractor shall have spare pumping units ready for immediate use in case of any unanticipated mechanical breakdowns.
- b. The Contractor shall dispose of all pumped or drained water without causing undue interference to other work, or damage to pavements, other surfaces, or property. The Contractor shall provide suitable temporary pipes, flumes, or channels for water that may flow along or across the work site. Drainage shall be discharged in accordance with all State and EPA regulations.

5. Trench Excavation Work

- a. The Contractor shall use machinery to excavate each trench to the specified subgrade. If material below the subgrade is significantly disturbed, the Owner's Representative may require the Contractor to compact the disturbed material before the placement of any backfill.
- b. The Contractor shall excavate trenches to the elevations indicated on Drawings, and at uniform slopes between indicated elevations. The Owner's Representative may modify the trench dimensions to accommodate field conditions as the work progresses.
- c. The Contractor shall excavate trenches per the Details indicated the Drawings with approximately vertical sides for pipes, unless otherwise specified. The Contractor shall not widen the pipe trench by scraping or loosening materials from the sides. They shall make every effort to ensure that the sides of trench remain firm and undisturbed until backfilling has been completed and consolidated.

6. Excavation Work near Existing Structures

When excavation operations occur near existing pipes, conduits, or other underground structures, the Contractor shall discontinue mechanical digging. Any additional material to be excavated shall be carefully removed by hand with pick and shovel. Manual excavation shall be included in work to be done, when incidental to normal excavation and under Items involving normal excavation.

7. Property Restoration

- a. The Contractor shall ensure that trees to be retained adjacent to the work site will not be injured by any excavation operations, especially their overhanging branches and limbs. The Contractor shall also ensure that materials and equipment are not stored adjacent to the work site such that trees are damaged.
- b. The Contractor shall ensure that all branches, limbs, and roots are cut smoothly and neatly, without splitting or crushing. Grafting wax or other types of tree healing paint shall be applied to injured cuts when directed.
- c. The Contractor shall ensure that cultivated hedges, shrubs, and plants to be retained on or adjacent to the work site will not be injured by any excavation operations. If necessary, hedges, shrubs, and plants shall be removed and properly stored and cared for. Once excavation operations are complete, they shall be replanted in their original locations and cared for until growth has been reestablished.

Hedges, shrubs, and plants that have been injured to such a degree that their growth has been curtailed or their beauty or usefulness have been diminished shall be replaced by the same Items, equal in kind and quality. The vegetation at the work site shall be left in the condition that existed at the start of the work.

- d. The Contractor shall properly restore all surfaces which have been disturbed by their excavation operations to a condition at least equal to that in which they were found immediately before work commenced. Suitable materials and methods shall be used for such restoration.

8. Backfilling Excavations Made Beyond the Project Limits

If, during their operations, the Contractor takes the bottom of an excavation beyond the specified project limits, the excavation shall be backfilled with thoroughly compacted gravel aggregate to a minimum Proctor of 95% as required by *ASTM D1557*. Any losses incurred by the Contractor as a direct result of a work beyond the excavation limits will be at the sole liability of the Contractor with no additional compensation forthcoming from the Owner.

9. Disposing Surplus Excavated Materials

The Contractor shall use surplus excavated materials suitable for backfill to backfill pipe trenches in areas requiring "Common Borrow" as referenced by the Trench Details located on the Drawings. Excess excavated material must be properly disposed of by the Contractor, as previously approved, with no additional compensation forthcoming from the Owner.

10. General Backfilling Parameters

- a. The Contractor shall not use any frozen materials when conducting backfilling operations, nor shall they place backfill on any frozen material. Any previously frozen material shall either be removed and disposed of or properly thawed before any new backfill is placed.
- b. The Contractor shall place backfill material in maximum 12 inch lifts and compacted to the specified percent Proctor indicated on the Plans and in the Specifications. The Owner may test each lift to ensure that the specified level of compaction has been achieved, with the testing cost borne by the Owner.

- c. The Contractor shall use only suitable quantities of stones and rock fragments in backfill material. As part of the work done under the Items involving earth excavation and rock excavation as appropriate, they shall furnish and place all other necessary backfill material. The Contractor shall ensure that larger stones and lumps do not become “nested” and that all voids between stones are properly filled with fine material regardless of compacting method.
- d. The Contractor shall completely backfill all voids left by removal of sheeting with suitable backfill materials and ensure their proper compaction.

11. Placing and Compacting Pipe Trench Backfill Materials

- a. The Contractor shall start placing backfill as soon as practicable after the pipeline has been laid, and structures such as thrust blocks have had sufficient time to cure, and then proceed until backfilling operations are complete.
- b. The Contractor shall use mechanical rolling or tamping to compact the backfill above the zone around the pipeline in accordance with nature of the backfill material and the compaction requirements for the remainder of trench. The Contractor shall backfill the zone around the pipe with materials that adhere to the limits indicated on the Drawings, compacting the material to 95% Proctor as indicated on the Plans and in the Specifications.
- c. The Contractor shall deposit and spread backfill material in uniform parallel layers with a thickness not exceeding 12 inches when the material is to be compacted by tamping or rolling. Before next layer is placed, the new layer shall be tamped as required to obtain a thoroughly compacted mass. The Contractor shall ensure that the backfill material close to the bank, as well as in all other portions of trench, is thoroughly compacted. The Contractor may compact the backfill material using approved rollers, tractors, or similar powered equipment instead of tamping when the trench width and the depth allow their effective use without damaging or dislodging the pipeline.
- d. The Contractor shall wet backfill material by sprinkling with water when necessary to ensure its proper compaction by tamping or rolling. However, the Contractor shall conduct no compaction operations when the backfill material is too wet from either rain or over-application of water to be compacted properly. Work shall be postponed until new and previously placed materials have dried out sufficiently to permit proper compaction, or other actions have been implemented to obtain proper compaction.

- e. The Contractor shall not place stone or rock fragments larger than 6 inches in the backfill nor drop large masses of backfill material into the trench. Pieces of bituminous pavement shall not be permitted for use in backfill.
- f. The Contractor is required to backfill and compact the entire trench as part of the scope of work. If an issue such as a leaking pipe joint is discovered upon testing the pipe after the trench has been backfilled and compacted, it shall be the Contractor's responsibility to re-excavate, expose, and repair the leaking joint, and then backfill and compact the trench to the original Specifications. The Contractor shall consider this situation to be part of the "normal scope of work." Any losses incurred by the Contractor as a direct result of a work to re-excavate a trench will be at the sole liability of the Contractor with no additional compensation forthcoming from the Owner.
- g. The Contractor shall leave all bracing, trench boxes, and other safety measures in place until the Owner has satisfactorily completed compaction testing.

12. Placing and Compacting Embankment Materials

- a. Once the subgrade has been prepared as specified, the Contractor shall place and build up embankment materials in successive layers until the material has reached the required elevation.
- b. The Contractor shall place embankment materials in layers with a thickness not exceeding 12 inches before compaction and having a slight downward slope away from structures. In other embankments, layers shall be placed with a slight downward slope away from the center of the embankment. In general, finer and less pervious materials should be placed against structures or in the center, and coarser and more pervious materials to be placed on the outer parts of embankments.
- c. The Contractor shall compact each layer of embankment material using rollers or other approved means to secure a dense, stable, and thoroughly compacted mass. Places that cannot be reached by mobile mechanical equipment shall be compacted thoroughly by suitable power-driven tampers.

PENNICHUCK WATER WORKS

- d. The Contractor shall wet embankment material by sprinkling with water when necessary to ensure its proper compaction by tamping or rolling. However, the Contractor shall conduct no compaction operations when the embankment material is too wet from either rain or over-application of water to be compacted properly. Work shall be postponed until new and previously placed materials have dried out sufficiently to permit proper compaction, or other actions have been implemented to obtain proper compaction.
- e. The Contractor shall ensure that all other embankment materials are compacted to 95% Proctor as indicated on the Plans and in the Specifications.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01500
Rock Excavation and Disposal

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... EXECUTION

A

GENERAL

Rock excavation work in ledge includes the removal of ledge and rock required for the installation of pipes and/or structures.

"Ledge" and "rock" includes any natural compound, natural mixture, and chemical element required to be excavated that, in the opinion of the Engineer, can be removed from its existing position and state only by blasting, drilling and blasting, wedging, drilling and wedging, wedging and breaking with power hand tools or pneumatic excavator attachment(s), or by extending the use of an approved excavating machine beyond normal and design wear and tear. No boulder, ledge, slab, or other single piece of excavated material less than one 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.

The Contractor shall furnish all labor, materials, tools, and equipment necessary to do all excavation of rock where encountered, and to ensure conformance with the lines and grades indicated on the Drawings or as directed. The Contractor shall properly dispose of the unsuitable excavated material and shall furnish acceptable material for backfill material in place of the excavated rock as specified.

Important: The Contractor is responsible for obtaining any permits required by local, State and Federal regulations in disposing of excavated material.

The Contractor shall excavate rock in pipe trenches to allow a clearance of not less than 12 inches from the bottom of the pipe and not less than 12 inches from each side of the pipe after it has been laid. Payment width shall be either 4 feet or the pipe diameter plus 24 inches, whichever is greater. Payment depth shall start at 12 inches below the bottom of pipe. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted bedding material for pipe, furnished and placed at the Contractor's expense.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill and Grading

Section 01525 Blasting

Section 01550 Vibration, Seismic, and Acoustic Monitoring

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

C

EXECUTION

Amount of Rock Excavation

The extent of open excavation shall be controlled by prevailing conditions. Open excavation shall always be confined to the limits acceptable to the Owner.

If the Contractor excavates rock beyond the limits of payment indicated on the Drawings, or otherwise specified or authorized in writing by the Owner's Representative, the excess excavation, whether resulting from overbreakage or other causes, shall be properly backfilled by the Contractor as specified under *Section 01400, Earth Excavation, Backfill, Fill, and Grading*. Any losses incurred by the Contractor as a direct result of a work beyond the rock excavation limits will be at the sole liability of the Contractor with no additional compensation forthcoming from the Owner.

Disposing of Rock

The Contractor shall properly dispose of all blasted and pneumatically removed rock at the Contractor's expense.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01525

Blasting

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... EXECUTION

A

GENERAL

The Contractor shall furnish all labor, materials, tools, and equipment necessary to do all blasting and excavation of rock where encountered, and to ensure conformance with the lines and grades indicated on the Drawings or as directed. The Contractor shall provide all materials and perform all work necessary to ensure safe use and storage of explosives. The Contractor shall be responsible for any and all damage resulting from use of explosives. The Contractor shall properly dispose of the excavated material and shall furnish acceptable material for backfill material in place of the excavated rock as specified.

Important: Requirements of regulatory agencies shall always be met during blasting activities. Conduct all blasting in accordance with all applicable local, state, and federal laws, ordinances and code requirements.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill and Grading

Section 01500 Rock Excavation and Disposal

Section 01550 Vibration, Seismic, and Acoustic Monitoring

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

C

EXECUTION

1. Pre-Blast Survey

The Blasting Contractor shall conduct a pre-blast survey and supply all equipment, labor, and materials necessary to drill and blast rock or to pneumatically remove the rock in accordance with all Federal, State, and municipality safety regulations and requirements.

2. Blasting Safety

- a. The Blasting Contractor shall keep explosives and explosives materials on-site only in such quantity as may be necessary for work under way and only during times that explosives are being used. The Owner's Representative shall be notified in advance of any plans to store and use explosives. Explosives shall be stored in a secure manner, separate from all other tools and equipment. Caps or detonators shall be stored in a secure place that is more than 100 feet away from the explosive storage area.

Once the explosives work has been completed, all remaining explosives material shall be promptly removed from the premises and work site.

- b. The Blasting Contractor shall observe all State, Federal, and municipal laws, ordinances, and regulations relating to the transportation, storage, handling, and use of explosives. If any of these laws, ordinances, or regulations requires a Licensed Blaster to perform or supervise the blasting work, they shall ensure that their license is on-site and available for examination thereof by the Owner's Representative or any other officials having jurisdiction.
- c. The Blasting Contractor shall conduct operations involving explosives with all possible care to avoid injury to persons and property. Blasting shall be done only with such quantities and strengths of explosives, and in such manner, as to break rock approximately at intended lines and grades, leaving rock to be excavated in an unshattered condition.
- d. The Blasting Contractor shall endeavor to avoid excessive cracking of rock upon or against which any structure will be built and prevent injury to existing pipes or other structure and property above or below ground during blasting operations. To avoid flying pieces of rock, rock shall be well-covered with mats where required.

PENNICHUCK WATER WORKS

- e. The Blasting Contractor shall provide sufficient warning to all persons in vicinity of the work before any charge is detonated.
- f. The Blasting Contractor shall identify the presence of any two-way radios, stray electrical currents, or other conditions that may adversely affecting blasting operations and implement necessary precautions to prevent accidents and premature blasts.
- g. The Contractor shall provide all appropriate signs and cones to ensure traffic safety in the blasting operations area and in accordance with the regulations found in the latest version of the NHDOT Standard Specifications for Road and Bridge Construction.
- h. The Contractor shall keep an accurate record of each blast, noting the general location of the blast, the number and depth of drill holes, the type and quantity of explosives used, and any other data that may be required. The Contractor shall submit all blast records to the Owner's Representative.
- i. Seismic monitoring of the blasting operations shall be conducted in accordance with all State and municipal regulations and requirements.

SECTION 01550
Vibration, Seismic, and Acoustic Monitoring

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... EXECUTION

A

GENERAL

The Contractor shall provide all materials and equipment to perform all work necessary to protect and prevent damage of existing structures due to vibrations generated from construction activities.

Where determined necessary by the Owner and/or Engineer, the Contractor shall monitor construction related vibrations and acoustic waves to avoid damaging nearby structures, properties, and utilities located on or near the project and prevent hazardous health conditions for persons in the vicinity of the work.

Sources of construction related vibrations include blasting activities, compaction equipment, hoe ram, sheeting, and other construction activities resulting in vibrations to adjacent properties and/or structures. The Contractor shall secure the services of a qualified Seismic, Vibration, and/or Acoustic Consultant who shall consult with the Contractor, to mitigate effects from vibration related to construction activities.

Contractor shall be responsible for any and all damage resulting from construction activity vibrations.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill and Grading

Section 01500 Rock Excavation and Disposal

Section 01525 Blasting

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

C

EXECUTION

Prior to initiating any activity, which in the opinion of the Seismic/Vibration/Acoustic Consultant requires (or as directed by the Engineer or Owner), seismic, vibration, and/or acoustic monitoring, a Monitoring Plan shall be prepared by the Consultant and submitted to Contractor to support their methods of construction. The plan may be modified as work progresses based on monitoring results.

The Monitoring Plan shall identify:

1. Proposed construction activity
2. The anticipated seismic, vibration, and/or acoustic limits for the construction activity
3. Historic or significant structures of concern including structures in poor condition, structures supported by vibration sensitive materials which could cause settlement or loss
4. Procedures, techniques, and equipment to be employed by the Contractor to guard against damage to structures in the vicinity of the work area.

Seismic, vibration, and acoustic monitoring equipment shall meet the requirements of all local, state, and federal requirements and regulations.

The Contractor shall conduct a Pre-Construction Condition Survey of existing structures on the site identified in the Monitoring Plan including but not limited to brick and masonry structures, stone retaining walls and other sensitive areas. Further observation may be required at the discretion of the Contractor's Vibration Consultant or as directed by the Engineer or Owner. The completed Survey shall be provided to the Engineer or Owner as a written report.

The frequency and duration of monitoring for construction activities shall be identified in the Monitoring Plan.

Vibration Monitoring Reports shall be furnished to the Engineer upon request and shall include the following information:

1. The name of the Contractor and/or Subcontractors responsible for the particular construction activity.
2. The name of the approved Vibration Consultant.
3. The name of the operator of the vibration monitoring equipment.
4. A sketch indicating the location of the vibration monitors and the particular construction activity.

PENNICHUCK WATER WORKS

5. Results of monitored vibrations for the particular construction activity. This information should include the frequencies of the measured peak particle velocities.
6. Identification of any activity that caused the vibration limits to be exceeded and the time of day that the limits were exceeded.
7. A summary of related complaints received.

If the monitoring data indicates that the ground vibration limits for any of the three mutually perpendicular components or that acceptable human health acoustic levels have been exceeded, alternate construction methods will need to be considered by the Contractor to safeguard against damage to adjacent structures and/or human health. It will be the Contractor's responsibility to implement construction methods and techniques in a manner which will mitigate the effects of construction. Damage to existing structures or properties as a result of the Contractor's operations shall be resolved by the Contractor at no additional cost to the Owner.

The Engineer and/or Owner will notify the Contractor of any complaints concerning vibrations resulting from construction activities.

SECTION 01600

Water Main Pipe and Fittings

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCTS
D..... PRODUCT DELIVERY, STORAGE, AND HANDLING
E..... EXECUTION
F..... TESTING

A

GENERAL

The Contractor shall furnish and install pipe and fittings as indicated on the Drawings and as detailed in the Specifications. Ductile iron pipe shall be specified for all projects unless otherwise indicated or approved by the Owner's Representative. Cast iron fittings shall not be used.

Important: PVC pipe, HDPE pipe, and ductile iron pipe, valves, fittings, gaskets and related materials not subject to the AIS requirements must be manufactured in North America, unless otherwise previously approved. Additional restrictions may apply due to issues with funding sources.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill, and Grading

Section 01500 Rock Excavation and Disposal

Section 01525 Blasting

Section 01625 Polyethylene Encasement

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

Section 02400 Concrete Thrust Blocks

C

PRODUCTS

1. Ductile Iron Pipe

- a. Ductile iron pipe shall meet the requirements of American Water Works Association AWWA *C151/A21.51-91, American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.*

PENNICHUCK WATER WORKS

- b. Ductile iron pipe shall be, at minimum, Thickness Class 52, zinc-coated.
- c. The exterior of the pipe shall be petroleum asphaltic-coated with a minimum of 4 mils dry film thickness over electro-deposited metallic zinc plating. The petroleum asphaltic coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun, and strongly adherent to the fitting.

The zinc plating shall meet the requirements of *ISO 8179-1, Ductile iron pipes, fittings, accessories and their joints - External zinc-based coating - Part 1: Metallic zinc with finishing layer.*

The zinc plating shall be electro-deposited metallic zinc with a purity of 99.99%. The zinc plating shall be applied at a minimum thickness of 6 ounces per square yard.

Each segment of zinc-plated pipe shall be properly identified as such by the manufacturer.

- d. The nominal laying length of ductile iron pipe shall average no less than 18 feet per pipe section.
- e. The interior surfaces of ductile iron pipe shall be double-cement-mortar lined with a thickness of at least $\frac{1}{8}$ inch to meet the requirements of *AWWA C602, Cement-Mortar Lining of Water Pipelines in Place - 4 In. (100 mm) and Larger.*
- f. The interior surfaces of ductile iron pipe shall receive a 4-mil thick seal coating to meet the requirements of *AWWA C104.*
- g. Where required, ductile iron pipe and fittings shall be encased in Polyethylene to meet the requirements of *AWWA C105.* Refer to *Section 01625 Polyethylene Encasement* for more information.
- h. The Contractor shall provide sufficient quantities of fully-gauged ductile iron pipe to make all fitting nipples. The length of a ductile iron nipple must be 18 inches long or twice the pipe diameter, whichever is greater. Exception to this requirement must be approved by a representative from the Pennichuck Engineer Department prior to installation.
- i. The pipe manufacturer shall provide approved gaskets and gasket lubricants for push-on joint ductile iron pipe sections.
- j. The pipe supplier shall furnish two bronze wedges per pipe joint.

2. PVC Pipe

- a. PVC pipe shall meet the requirements of *AWWA C900*, Pressure Class 305 psi (DR 14).
- b. PVC pipe with push-on joints shall meet the requirements of *ASTM D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals*.
- c. PVC pipe joint gaskets shall meet the requirements of *ASTM F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*.
- d. The nominal laying length of PVC pipe shall average no less than 20 feet per pipe section.
- e. The pipe manufacturer shall furnish approved gaskets and gasket lubricants for push-on joint PVC pipe sections.
- f. The Contractor shall use ductile iron mechanical joint compact fittings in the PVC piping run in all locations where couplings or bends are specified. Injection-molded PVC fittings shall not be used.
- g. The Contractor shall lay insulated 10-gauge solid core tracer wire and detectable warning tape in the trench at the top of the bedding sand above all PVC piping runs.

3. High Density Polyethylene Pipe (HDPE) Pipe

- a. HDPE pipe for water mains shall be Polyethylene (PE) 4710, DR 11 (200 psi rated); ductile iron pipe sized (DIPS). HDPE pipe shall meet the requirements of *NSF/ANSI Standard 61*.
- b. HDPE Pipe shall meet the requirements of *ANSI/AWWA C901, Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service* and *ANSI/AWWA C906, Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks*
- c. All material shall be manufactures from a PE 4710 resin listed with the Plastic Pipe Institute as TR-4. The resin materials shall meet the specifications of *ASTM D3350* with a minimum cell classification of 445474C. HDPE pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specifications. HDPE products shall be homogeneous throughout and free of visible imperfections.

- d. HDPE pipe shall be color-coded with a permanent blue stripe on the exterior of the pipe to designate its use for water.
- e. All HDPE joints must be made by a Fusion Technician trained and certified to use the equipment required to fuse the pipe size as specified for this project. The Certificate must be provided to Pennichuck prior to starting the project. Both butt fusion and electrofusion equipment must be maintained and calibrated per their respective manufacture's requirements and recommendations.
- f. All HDPE fittings shall be made of HDPE material with a minimum material designation code of PE 4710 and meet the requirements of *AWWA C901* or *C906*.
- g. The Contractor shall lay insulated 10-gauge solid-core tracer wire and detectable warning tape in the trench at the top of the bedding sand above all HDPE pipe.

4. Mechanical Joint Compact Fittings

- a. Mechanical joint compact fittings and solid sleeve couplings shall be Ductile Iron Class 350 (350 psi rated working pressure) and meet the requirements of *AWWA C153, Ductile-Iron Compact Fittings for Water Service* for fitting sizes of 3 inches to 24 inches in diameter inclusive.
- b. Acceptable coatings and lining combinations are as follows, in order of preference:
 - i. Fusion-Bonded Epoxy (FBE) – Fusion-bonded epoxy shall be used to coat exterior and interior surfaces and shall be applied at a minimum thickness of 8 mils. Fusion-bonded epoxy shall meet the requirements of *AWWA C116/A21.16-15* and *AWWA C550-17, Protective Interior Coatings for Valves and Hydrants*.

Fusion-bonded epoxy coatings shall be applied without defect.

- ii. Zinc Plated – The exterior of the pipe shall be petroleum asphaltic-coated with a minimum of 4 mils dry film thickness over electro deposited zinc plating. The petroleum asphaltic coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun, and strongly adherent to the fitting.

ISO 8179-1, Ductile iron pipes, fittings, accessories and their joints - External zinc-based coating - Part 1: Metallic zinc with finishing layer

Fitting interiors shall be double-cement mortar-lined per the requirements of *ANSI/AWWA C104/A21.4-16, Cement-Mortar Lining for Ductile Iron Pipe and Fittings*. The cement mortar lining shall be seal-coated with a minimum thickness of 4 mils dry film in accordance with the requirements of *AWWA C104/A21.4-16*.

- c. The Contractor shall provide sufficient quantities of fully-gauged ductile iron pipe to make all fitting nipples.
- d. All fittings shall be of Standard Grade 70-25-05 Ductile Iron construction with the following minimum characteristics: 70,000 psi minimum tensile strength; 50,000 psi minimum yield strength; and 5% minimum elongation. Manufacturer's test results shall be made available upon request. Cast iron fittings shall not be used.
- e. The Contractor shall provide approved restrained gland assemblies for all fittings when connected to ductile iron pipe or "PVC restrainer glands or equivalent" unless otherwise specified.
- f. Solid sleeves shall be "long body" style without a pipe stop.
- g. SIP Industries fittings are approved for general use.

5. Mechanical Joint Resilient Wedge Gate Valves

- a. Approved mechanical joint resilient wedge gate valves shall include the following models for sizes 4 inches to 12 inches in diameter inclusive:
 - American Flow Control (AFC) - Model 2500
 - U.S. Pipe - Metroseal A-USP1
 - American AVK - Series 65
 - Mueller Co. - A-2361 or A-2362
 - Clow Valve Company – 2638
 - Kennedy Valve – AWWA C515 RWGV
 - M & H Valve Company – Style 7000

The use of any resilient wedge gate valves other than these requires prior written approval from Pennichuck Water Works.

- b. All mechanical joint resilient wedge gate valves from 4 inches through 12 inches diameter inclusive shall be the rubber-seated bubble tight-closing type and shall meet the requirements of *AWWA C515, Reduced-Wall, Resilient Seated Valves For Water Supply Service*.
- c. All external fasteners on mechanical joint resilient wedge gate valves shall be ASTM 18-8 Stainless Steel Type 304

- d. All mechanical joint resilient wedge gate valve bodies shall be coated on both the interior and exterior surfaces with a two-part thermoset epoxy cover to a nominal thickness of 10 mils.
- e. All ductile iron mechanical joint resilient wedge gate valve stems shall be non-rising and equipped with operating nuts that are 2-inch square. The opening direction for hydrants and valves is dependent on the particular municipality in which they are installed. Refer to *Appendix A, Hydrant and Valve Opening Direction* for more information.
- f. All resilient wedge tapping valves used in mechanical joint tapping shall be capable of accepting a full-size tapping cutter.
- g. All resilient wedge tapping valves shall conform to the *AWWA C515, Reduced-Wall, Resilient Seated Valves For Water Supply Service* with the exception that one end of the valve shall be flanged and one end shall be a mechanical joint.

6. Mechanical Joint Butterfly Valves

- a. Butterfly valve manufacturers considered by Pennichuck Water Works shall have a minimum of five years of experience in the manufacture of butterfly valves for the size and type of service as required in these Specifications.
- b. Approved mechanical joint butterfly valves shall include the following models for sizes 16 inches through 36 inches in diameter inclusive:
 - Henry Pratt Company – Pratt Groundhog
 - Clow Valve Company – Style 4500
 - M & H Valve Company – Style 4500
 - Kennedy Valve – Style 4500
 - Mueller Company - Mueller Linesal XPII
 - VSI Waterworks – AWWA Series BFI Butterfly Valve
 - Val-matic Valve and Mfg Corp - American – BFV Butterfly Valve

The use of any resilient wedge gate valves other than these requires prior written approval from Pennichuck Water Works.

- c. All mechanical joint butterfly valves from 16 inches through 72 inches diameter inclusive shall be the rubber-seated tight-closing type and shall meet the requirements of *AWWA C504*,

PENNICHUCK WATER WORKS

Rubber-Seated Butterfly Valves, 3 In. (75 mm) through 72 In. (1,800 mm) or AWWA C519, High Performance Water Works Butterfly Valves, 3 In. (75 mm) through 72 In. (1,800 mm)

- d. All mechanical joint butterfly valves must use the full AWWA C504, Class 150B valve shaft diameter and full Class 250 underground service operator torque rating throughout the entire travel to provide capability for emergency service operation.
- e. All ductile iron mechanical joint butterfly valve bodies shall conform to the requirements of AWWA C111/A21.11-17, *Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*.
- f. All mechanical joint butterfly valves shall be equipped with operating nuts that are 2-inch square. The opening direction for hydrants and valves is dependent on the particular municipality in which they are installed. Refer to *Appendix A, Hydrant and Valve Opening Direction* for more information.
- g. All mechanical joint butterfly valve bodies shall have integral hubs for housing shaft bearings and seals.
- h. All mechanical joint ends shall conform to the requirements of AWWA C111/A21.11-17.
- i. All butterfly valve discs shall be of the “off-set” design to provide a full 360° seating surface uninterrupted by shaft holes. There shall be no external ribs to the flow.
- j. Ductile Iron butterfly valve bodies and valve discs shall be constructed of Grade 65-45-12 Ductile Iron that meets the requirements of *ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*. Cast Iron butterfly valve bodies and valve discs shall be constructed of Cast Iron that meets the requirements of *ASTM A126 Class B Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings*. Non-metallic butterfly valve discs shall not be used in any Pennichuck Water Works projects.
- k. All resilient seats shall be Buna-N or natural rubber designed to provide tight shutoff at the specified pressures. The rubber seat may be on the disc edge or in the valve body but in either case, must be retained by positive mechanical means with corrosion-resistant hardware.
- l. Resilient seats must be capable of mechanical adjustment in either direction without the use of special tools and be capable of complete replacement in the field without chipping, grinding, or burning out the old seat or its retaining mechanism. The rubber mating surface in all cases must be, at minimum, 300 Series Stainless Steel.
- m. All mechanical joint butterfly valve shafts shall be of single piece “through” type construction. The shafts shall be fabricated from round stock, 18-8 Stainless Steel Type 304 material.

PENNICHUCK WATER WORKS

- n. All mechanical joint butterfly valve assemblies shall be furnished with a single two-way thrust bearing designed to center the disc in the body at all times and absorb thrust forces. The drive end shaft shall be of the cartridge type with O-rings to provide positive sealing.
- o. All mechanical joint butterfly valves shall be tested per *AWWA C504-10*, including hydrostatic, performance, and leakage tests.
- p. All ductile iron or cast iron components of mechanical joint butterfly valves shall have their internal and external surfaces coated with a high performance, one-part, heat-curable, thermosetting epoxy coating that has a minimum thickness of 9 mils, except for furnished bearing surfaces. This epoxy coating material shall meet the requirements of *NSF/ANSI Standard 61: Drinking Water System Components – Health Effects*.
- q. All mechanical joint butterfly valve actuators shall be integrally mounted on the valve mounting flange and shall be of the self-locking traveling nut type in accordance with *AWWA C504*.
- r. All external fasteners on mechanical joint butterfly valves shall be ASTM 18-8 Stainless Steel Type 304

7. Couplings

- a. Approved couplings shall include these from the following manufacturers:
 - Romac Industries, Inc. Alpha Couplings
 - Romac Industries, Inc. Macro HP Couplings
 - Romac Industries, Inc. 501 Couplings
 - Romac Industries, Inc. XR 501 Couplings
 - Romac Industries, Inc. 400 Couplings, with $\frac{3}{8}$ inch wall thickness \times 10 inches long center ring
 - Ford Meter Box Co. FC2A Couplings
 - Ford Meter Box Co. FC2W Couplings
 - Mueller Co. Maxi-Range Couplings
 - JCM Industries Model 203 Transition Couplings
 - JCM Industries Model 215 Couplings

PENNICHUCK WATER WORKS

- JCM Industries Model 241 Couplings
 - JCM Industries Model 242 Couplings
- b. Couplings with limited approval shall include these from the following manufacturers:
- Viking Johnson QuickFit Couplings
 - Viking Johnson MaxiFit Couplings
 - Viking Johnson MegaFit Couplings
 - Krausz USA HYMAX Couplings
 - Krausz USA HYMAX 2 Couplings
 - Krausz USA HYJOINT Couplings
- c. All couplings listed in this subsection shall be manufactured in North America. **Couplings with limited approval must be approved by Pennichuck Engineering for use in advance and on a case-by-case basis.**
- d. Couplings must be *NSF/ANSI Standard 61* approved for use with potable water supplies and meet the requirements of *AWWA C219*.
- e. The coupling body length shall be equal to or longer than the nominal diameter of the pipe, but in no case shall be less than 6 inches in length.
- f. Coupling bodies shall be fabricated from Ductile Iron Grade 65-45-12 or Steel Grade ASTM A53.
- g. Coupling bodies shall have a coating of fusion-bonded epoxy or Nylon 11.
- h. End rings shall be fabricated from Ductile Iron Grade 65-45-12 or Steel Grade ASTM A283.
- i. End rings shall have a similar coating as the coupling body or have an thermoset epoxy coating.
- j. Couplings with bituminous coatings, primer coatings, or “shop” coatings shall be fully encased in Polyethylene after installation.
- k. Nuts and bolts shall be stainless steel or high-strength, low-alloy steel that meets the requirements of *ANSI/AWWA C111/A21.11, Standard for Rubber-Gasket Joints for Ductile*

Iron Pressure Pipe and Fittings. High-strength, low-alloy steel nuts and bolts shall receive a corrosion-inhibiting coating.

1. All gaskets used in the coupling assembly shall be Virgin SBR (Styrene Butadiene Rubber) for water service in accordance with the requirements of *ASTM D2000 MBA 710*.

8. Ductile Iron Mechanical Joint Tapping Sleeves

- a. All mechanical joint tapping sleeves shall be mechanical joint split sleeves with an outlet flange that meets the requirements of *AWWA C110, Sections 10 – 14*.
- b. All mechanical joint tapping sleeves shall be of ductile iron construction and include a ¾ inch F.I.P. threaded test plug so that both the sleeve and valve can be pressure-tested before any tap is made.
- c. All mechanical joint tapping sleeves up to a size of 12 inches × 12 inches shall be rated for a minimum working pressure of 200 psig.
- d. All side rubber gaskets used in mechanical joint tapping sleeves shall be rectangular in cross-section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve and shall not require cutting or trimming to match mechanical joint end gaskets.
- e. All mechanical joint tapping sleeves shall be furnished with standard accessories, including glands, gaskets, and “T” head bolts and nuts as described elsewhere in these specification or their equivalent. All flange bolts shall be Type 316 stainless steel.
- f. Exterior surfaces shall be petroleum asphaltic coating applied at a minimum thickness of 4 mils dry film. The petroleum asphaltic coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun, and strongly adherent to the fitting.
- g. Interior surfaces shall be double-cement mortar-lined per the requirements of *ANSI/AWWA C104/A21.4-16*. The cement mortar lining shall be seal-coated with a minimum thickness of 4 mils dry film in accordance with the requirements of *AWWA C104/A21.4-16*.
- h. All ductile iron mechanical joint tapping sleeves shall be encased in Polyethylene. Refer to *Section 01625 Polyethylene Encasement* for more information.

9. Stainless Steel Tapping Sleeves

- a. Stainless steel tapping sleeves are allowed for use on ductile iron pipe if the diameter of the tap is one-half the diameter or less of the existing pipe.

- b. Stainless steel tapping sleeves are allowed for use on pre-1930s cast iron pipe 16 inches or 24 inches in diameter if the diameter of the tap is one-half the diameter or less of the existing pipe.
- c. Stainless steel tapping sleeves shall have either a stainless steel or ductile iron flange. If a ductile iron flange is used, it shall receive a factory-applied enamel coating.
- d. Stainless steel tapping sleeves shall be rated for a minimum working pressure of 200 psig.
- e. All lugs, bolts, nuts, washers, lifter bars, and armor for stainless steel tapping sleeves shall be fabricated from Type 304 Stainless Steel.
- f. Stainless steel tapping sleeves shall meet the requirements of *NSF/ANSI Standard 61*.
- g. Stainless steel tapping sleeves shall feature an included $\frac{3}{4}$ inch FIP threaded test plug for pressure testing purposes.

10. Steel Tapping Sleeves for 16-inch and 24-inch Asbestos Cement Pipe

- a. Steel tapping sleeves shall be Romac Industries, Inc., FTS425 Fabricated Steel Tapping Sleeves.
- b. Steel tapping sleeves are allowed for use on 16-inch diameter and 24-inch asbestos cement pipe.
- c. Steel tapping sleeves shall meet the requirements of *NSF/ANSI Standard 61*.
- d. As steel tapping sleeves are fabricated to order, the Contractor shall verify the outer diameter of the existing asbestos cement pipe.
- e. Bolts and nuts for steel tapping sleeves shall be high-strength low-alloy steel that meets the requirements of *AWWA C111*.
- f. Steel tapping sleeves shall be lined with a fusion epoxy coating that is 8 to 12 mils in thickness.
- g. Flanges shall be AWWA Class D plate flanges, ANSI Class 150.

11. Valve Boxes and Covers

- a. All valve boxes shall be grey cast iron, two-piece sliding type with a top flange and a minimum inside shaft diameter of 5 inches.

- b. The bottom section of the valve box shall be 48 inches long, unless otherwise specified on the Drawings, and provided with a belled (buffalo) base. The top section of the valve box shall be 26 inches long and designed to slide over the base section.
- c. Refer to *Standard Detail M14* for more information.
- d. All valve box covers shall be castiron, non-tilting heavy 2-inch drop-type. Valve box covers shall be recessed in the box top to prevent any snowplow damage. Valve box covers shall feature two pick holes to facilitate easy removal and the word “WATER” shall be cast to properly identify them.
- e. All valve box components shall be generously coated with a corrosion-resistant bituminous coating.
- f. All valve box components shall be manufactured in North America.

12. Megalug Style Mechanical Joint Restraints

- a. Megalug style mechanical joint restraints shall be one of the following types, or their equivalent:
 - EBAA Iron - Megalug® *Series 1100* for Ductile Iron pipe
 - EBAA Iron - Megalug® *Series 2000PV* for PVC pipe
 - Ford Meter Box Company – Uni-flange® Pipe Restraint Series 1559 for PVC pipe
 - Ford Meter Box Company – Uni-flange® Pipe Restraint Series 1500 for PVC and HDPE pipe
 - Ford Meter Box Company – Uni-flange® Wedge Action Restraint Series 1400
 - SIP Industries – EZ Grip® Joint Restraint for Ductile Iron Pipe
 - SIP Industries – EZ Grip® Joint Restraint for PVC Pipe
- b. Megalug style mechanical joint restraints shall be used in conjunction with all mechanical joint fittings mated to ductile iron and PVC pipe unless otherwise specified. Megalug style mechanical joint restraints shall be installed in place of MJ glands.

Important: Joint flexibility must be retained after the jointing operations have been completed.

- c. Megalug style mechanical joint restraints shall be cast ductile iron and meet the requirements of *ASTM A536-84, Standard Specification for Ductile Iron Castings*.
- d. Megalug style mechanical joint restraints shall permit proper clearance for the use of standard MJ Bell, “T” head bolts, and hardware. Reference Section 01600.c.16 on approved bolts and hardware.
- e. Megalug style mechanical joint restraints shall be designed to accommodate up to 250 psi of working pressure with a 2:1 safety factor.
- f. Megalug style mechanical joint restraints shall employ torque limiting twist-off nuts to ensure proper actuation of the restraining lugs.
- g. All Megalug style retainer glands must be coated with a thermoset epoxy cover to a nominal thickness of 10 mils.

13. Grip Ring® Pipe Restraints

- a. Grip Ring® pipe restraints shall be manufactured by EBAA Iron or its equivalent and shall be used in conjunction with all MJ fittings mated to PVC pipe unless otherwise specified.
- b. Grip Ring® pipe restraints shall be cast ductile iron and meet the requirements of *ASTM A536-84*.

Important: Joint flexibility must be retained after the jointing operations have been completed.

- c. Grip Ring® pipe restraints shall be installed in place of MJ glands.
- d. Grip Ring® glands shall be used as recommended by the restraint manufacturer and painted yellow to differentiate them from Standard MJ glands.

14. Foster Adaptor™

- a. Infact Corporation Foster Adaptor™ MJ restraint is approved for use on a conditional basis. Use of a Foster Adaptors™ must be approved for each location in advance of their use on MJ fittings and valves.
- b. All Foster Adaptors™ shall be manufactured in North America.
- c. Foster Adaptor™ restraints shall be installed in place of MJ glands, megalugs, griprings or any other pipe restraint method.

PENNICHUCK WATER WORKS

- d. Foster Adaptors™ shall be manufactured of ductile iron and meet the ductile iron and pressure specifications of *ANSI/AWWA C153/A21.53 AND C110/A21.10*.
- e. The Foster Adaptor™ shall be supplied with an NSF 61, 7-mil. fusion bonded epoxy coating conforming to *AWWA C116/A21.16-09* as well as the coating, surface preparation and application requirements of *ANSI/AWWA C550*.
- f. Foster Adaptors™ shall be provided with hardware in accordance with Section C part 16 of these specifications.

15. Hydrants

- a. Hydrants shall be one of the following types:
 - Mueller Co. Super Centurion 250™ with A-423 5¼ inch Valve
 - AMERICAN Flow Control 5¼ inch Waterous Pacer® WB67-250 with 16 inch upper standpipe length
 - U.S. Pipe Metropolitan® M94 with 5¼ inch Main Valve.
 - Clow Medallion with 5 1/4 inch Main Valve
- b. All hydrants shall be configured to be buried to a depth of 6 feet.
- c. All hydrants shall have working drain holes, breakaway flanges, and 1½ inch pentagonal operating nuts. The opening direction for hydrants and valves is dependent on the particular municipality in which they are installed. Refer to *Appendix A, Hydrant and Valve Opening Direction* for more information.
- d. All hydrants shall be factory-primed and coated with an approved yellow finish.
- e. All hydrants shall be ULFM approved.

16. “T” Head bolts and Miscellaneous Hardware

- a. All “T” Head bolts, bolts, washers and nuts shall be one of the following or approved equivalent;
 - Trumbull Stainless Steel “T” Head Bolts and Nuts Type 304 or Type 316 Stainless Steel
 - Trumbull Cor-Blue™ coated “T” Head Bolts and Nuts
 - Romac R-blue – Xylan coated “T” Head Bolts and Nuts.

PENNICHUCK WATER WORKS

- b. The use of any “T” head bolts other than these requires approval from Pennichuck Water Works.
- c. All stainless steel fasteners, bolts, “T” head bolts, nuts, threaded rod, rod couplings and washers are to be Type 304 stainless steel or Type 316 stainless steel
- d. Low alloy high strength cold rolled steel bolts, “T” head bolts, rod couplings, nuts and washers are acceptable if they are coated with either:
 - a baked on ceramic filled fluorocarbon resin
 - zinc base coated with an overcoat of Xylan 1424.
 - Hot dipped zinc galvanized
 - Other coatings with advanced approval and review by the engineer.
- e. Bolts and “T” head bolts shall feature roll formed threads and meet or exceed all ANSI/AWWA C111/A21.11 and C115/A21.15 requirements.
- f. Pigtailed, also known as “eye bolts”, “tie bolts” or “MJ eye bolts” shall be made with type 304 stainless steel or a low alloy steel in accordance with ANSI/AWWA C111/121 with one of the following corrosion inhibiting finishes if available:
 - a baked on ceramic filled fluorocarbon resin
 - zinc base coated with an overcoat of Xylan 1424.
 - Hot dipped zinc galvanized
 - Other coatings with advanced approval and review by the engineer.

17. Fire Services

- a. Fire Services may be constructed of ductile iron, PVC, or HDPE piping only if the piping is in accordance with Section 01600.C.1, 01600.C.2, and 01600.C.3, respectively, and all piping beneath the building, the riser into the building, and the underground piping 18 feet from the edge of the building shall be ductile iron.

D

PRODUCT DELIVERY, STORAGE, AND HANDLING

- a. All pipe shall be shipped to the work site in stacks cushioned by work separators such that pipe-to-pipe contact is prevented during the transit and storage of the pipe. Once delivered to the work site, all pipe shall be stacked in a safe and acceptable manner.
- b. The Contractor shall ensure that care is taken during the loading, trucking, unloading, and handling of all pipe and fittings so as not to damage the materials or surrounding area. Pipe and fittings shall not be dropped directly from the truck to the ground. The Contractor assumes responsible for any pipe or fittings damaged during delivery, handling, or storage. All damaged materials shall be removed from the work site immediately.
- c. Pipe sections may not be placed in position along the line of work unless approved by the Owner's Representative. Pipe and fittings must be stored in such a manner that they do not obstruct any roadways, driveways, sidewalks, etc.
- d. The Contractor shall keep all materials in the right-of-way with written permission from the municipality or on private property with written permission from the property owner.
- e. Pennichuck Water Works is not responsible for any agreements made between the Contractor and private land owners.

E

EXECUTION

1. Assembling Push-on Joint Pipe Runs

The Contractor shall assemble push-on joint pipe runs in strict observance with the manufacturer's instructions as follows:

- a. Thoroughly clean any dirt or foreign material from the groove and bell socket and insert the gasket, verifying that the gasket faces the proper direction and is correctly seated.

PENNICHUCK WATER WORKS

- b. Thoroughly clean any dirt or foreign material from the plain end and apply lubricant that meets the requirements of *NSF/ANSI Standard 61* in accordance with the pipe manufacturer's recommendations.
 - a. **Note:** The lubricant is supplied in sterile cans and every effort shall be made to keep it sterile.
- c. Verify that the plain end of the pipe is beveled; as square or sharp edges may damage or dislodge the gasket and cause leakage. When pipe is cut in the field, the plain end shall be beveled with a grinder to remove all sharp edges.
- d. Push the plain end into the bell of the pipe, keeping the pipe straight while pushing. Any allowable deflection from the pipe alignment may be made after the joint is assembled. Two bronze wedges shall be inserted at each joint.
- e. A timber header should be used between the pipe and jack or backhoe bucket to avoid any damage to the pipe.
- f. The cleanliness of each pipe section must be maintained at all times during assembly. The Contractor shall prevent any dirt or foreign material from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or any other material shall be allowed to be placed in the pipe at any time.
- g. As each pipe section is placed in the trench, it shall be properly connected to the previous pipe section and the pipe run brought to correct line and grade.
- h. Pipe shall be laid with the bells facing the direction in which work is progressing.
- i. To avoid infiltration with any water, dirt, or foreign material, pipe sections that have an open end exposed when work is not in progress shall be closed with a temporary watertight pipe plug or by other means approved by Pennichuck Water Works. If the trench is inundated, the Contractor shall ensure that pipe flotation does not occur and that pipe plugs remain in place until the trench has been dewatered.
- j. When it is necessary to deflect the pipeline from a straight line in either the horizontal or vertical plane, the amount of deflection shall not exceed 80% of the maximum allowable deflection as specified by the manufacturer. Since deflections are cumulative in the horizontal and vertical planes, allowable typical cumulative pipe deflection allowances shall also be made based on the pipe manufacturer's Specifications.

- k. The Contractor shall install air release valves as detailed on the Drawings at all high points on the pipeline, or as otherwise directed by the Owner's Representative. If a high point on the pipeline is created by the Contractor at a point other than those designated on the Drawings, installation of an air release valve must be approved by the Owner's Representative for payment purposes. Air release valves shall be installed at the end of all "dead end" water mains.

2. Installing Mechanical Joint Fittings

- a. All mechanical joint fittings shall be inspected prior to installation to ensure the gasket seats are free of excess coating. The Contractor shall manually remove any excess coating to ensure that the gasket will seal properly. All bare metallic surfaces exposed as the result of removing the excess coating shall be re-coated with similar material to prevent any corrosion.
- b. The Contractor shall install "compact" fittings as required in the "Mechanical Joint Fittings" Subsection for all fittings sizes from 3 inches to 24 inches.
- c. All mechanical joint fittings shall be placed, supported, and installed in strict accordance with the manufacturer's instructions and as directed by Pennichuck Water Works.
- d. After bolted connections in the mechanical joint have been made finger tight, the Contractor shall tighten diametrically opposite nuts in the joint progressively and uniformly around the joint with a properly calibrated torque wrench to the manufacturer's recommended values as specified above.
- e. The Contractor shall ensure that all back-up bends, tees, and other mechanical joint fittings subject to movement from internal pressures are properly braced by precast concrete thrust blocks that are in turn supported by compacted gravel aggregate unless otherwise specified. Refer to *Section 02400, Precast Concrete Thrust Blocks* of these Specifications for more information. Refer also to standard thrust block details on the Drawings for more information.
- f. The Contractor shall ensure that all mechanical joint fittings separated by pipe lengths of less than 10 feet shall be restrained by an appropriate number of ¾ inch to 1 inch diameter stainless steel threaded rod and nut assemblies as directed by the Owner's Representative. Unless otherwise restrained with threaded rods as specified, each MJ joint shall be installed with Megalug or PVC grip ring retainers.

Table 1600-A – Mechanical Joint Fitting Restraints

Pipe Size (in)	No. of Rods	Rod Diameter (in)
10 or less	2	¾
12 – 16	4	¾
24 or more	4	1

- g. The maximum allowed deflection per mechanical joint shall not exceed the limits indicated in the manufacturer’s Specifications.

3. Installing Mechanical Joint Resilient Wedge Valves and Butterfly Valves

- a. The Contractor shall ensure that all resilient wedge and butterfly valve bodies are installed with their operators plumb and level.
- b. The Contractor shall ensure that all resilient wedge and butterfly valve joints are assembled following the installation requirements outlined in the “Mechanical Joint Fittings” Subsection. All joint bolts shall be torqued using a calibrated torque wrench in accordance with the manufacturer’s Specifications.
- c. The Contractor shall ensure that the fusion-bonded epoxy coated exterior is not damaged. Any damaged areas shall be repaired by the contractor in accordance with the manufacturer’s recommendation, at the sole expense of the Contractor.
- d. The Contractor shall ensure that all resilient wedge and butterfly valves are restrained by means of stainless steel threaded rod and nut assemblies to the nearest fitting if the length of pipe between the valve and the fitting is less than 10 feet. The Contractor shall use Megalug retainer glands if the length of pipe is greater than 10 feet. Refer to *Table 1600-A – Mechanical Joint Fitting Restraints* for more information.
- e. The Contractor shall ensure that all resilient wedge and butterfly valves are installed complete with valve box and cover. Valve boxes and covers shall be installed following the guidelines in “Installing Valve Boxes and Covers” Subsection. Refer to standard valve box and cover details on the Drawings for more information.

4. Installing Ductile Iron Couplings

- a. The Contractor shall install ductile iron couplings in strict accordance with the manufacturer's instructions.
- b. Before installing ductile iron couplings, the Contractor shall descale and clean the end of each ductile iron pipe section, with the cleaned area extending 12 inches from the end.
- c. The Contractor shall begin the ductile iron coupling installation process by slipping the follower and gasket over the pipe to 6 inches from the end, and then placing the middle ring on the pipe end until it is centered over the joint. The Contractor shall use reference marks to determine the exact center location.

5. Installing Tapping Sleeves and Valves

- a. The Contractor shall install all tapping sleeves and valves in strict accordance with the manufacturer's instructions. The Contractor shall pressure-test all tapping sleeves and valves before beginning tapping operations.
- b. The Contractor shall ensure that tapping sleeves are installed such that the flanged face of the sleeve is plumb.
- c. The Contractor shall ensure that all tapping sleeves subject to movement from internal pressures are properly braced by precast concrete thrust blocks that are in turn supported by compacted gravel aggregate unless otherwise specified. Refer to *Section 02400, Precast Concrete Thrust Blocks* of these Specifications for more information. Refer also to standard thrust block details on the Drawings for more information.
- d. The Contractor shall ensure that the outlet of the valve is made up in accordance with the manufacturer's Specifications and that the valve is installed in accordance with the standard valve installation detail on the Drawings.
- e. The Contractor shall use the type of gland on the outlet end of the valve specified on the Drawings.
- f. The Contractor shall ensure that all body bolts are tightened to the torque values specified by the manufacturer.
- g. The Contractor shall retain the section of cut pipe, or coupon, that results from the tapping operation and submit it to the Owner's Representative.

6. Installing Valve Boxes and Covers

- a. The Contractor shall ensure that all valve boxes are installed such that they are concentric to the operating nut and plumb. The belled base section shall be placed on blocking in such a way that no additional loading is transferred to the valve.
- b. The Contractor shall ensure that longer valve box bottoms and/or tops are specified as required for water mains installed at depths that exceed the limitations of the valve box.
- c. The Contractor shall ensure that all valve boxes located in traveled ways are left flush with the pavement or gravel shoulder unless otherwise specified. Valve boxes located in other non-paved areas shall be left flush with finish grade unless otherwise specified.
- d. Extension rings shall not be used for adjusting new gate boxes to the proper grade.

7. Installing Megalug Style Mechanical Joint Restraints

- a. The Contractor shall ensure that all megalug style mechanical joint restraints are installed in accordance with the manufacturer's Specifications and with "Megalug Style Mechanical Joint Restraints" Subsection.
- b. Once the megalug style gland has been made up, proceed to tighten the twist-off lugs on the restraining lugs in a diametric pattern, twisting the lugs until each one is in contact with the pipe before completing the tightening process. Tighten the heads in a diametric pattern until all the twist-off heads have been removed.

8. Installing Hydrants

- a. The Contractor shall ensure that all hydrants are installed as shown on the Drawings and in the Standard Details.
- b. The Contractor shall ensure that all hydrants are installed such that they are plumb.
- c. The Contractor shall ensure that all hydrants are installed with their traffic safety flange located from 4 inches to 6 inches above the finished grade surrounding the hydrant.
- d. The Contractor shall ensure that all hydrant bases are installed in a 3 foot × 3 foot × 3 foot cube of 1½ inch crushed stone to allow for the free drainage of any water leaking from the hydrant's drain hole. A layer of 6-mil Polyethylene sheeting or geotechnical fabric shall be laid on the surface of the stone before completing the backfilling of the hydrant.

9. Installing PVC Grip Ring® Restrainers

- a. Before installing PVC grip ring retainers, the Contractor shall bevel and clean the end of each PVC pipe section.
- b. The Contractor shall begin the installation of PVC grip ring retainers by sliding the gland, grip ring, and MJ gasket on to the end of the pipe, verifying that the tapered side of the grip ring faces the gland.
- c. Next, insert the pipe end into the MJ fitting and slide the gasket into the MJ socket as far as possible. The gland and grip ring may be used to tap the gasket into the socket if necessary.
- d. Slide the grip ring up the pipe until its face is against the MJ gasket, then slide the gland up the pipe until it engages the grip ring.
- e. Install “T” head bolts in the MJ fitting and gland, then hand-tighten all the nuts.
- f. Using a torque wrench, tighten the nuts in a star pattern to the manufacture’s recommended torque value. Wait ten minutes after tightening the last bolt and then re-torque the bolts.

F

TESTING

1. Conducting Pressure and Leakage Testing

- a. The Contractor shall hire an approved independent certified testing company to perform pressure and leakage testing in accordance with the applicable AWWA Standards and Specifications. It is the sole responsibility of the Contractor to obtain the testing results from the testing company and submit the results to Pennichuck Water Works for each section of water main tested.

Important: All water mains, appurtenances, and hydrant branches shall be pressurized by the testing company to a minimum of 1½ times the normal working pressure of the water main or 150 psi, whichever is greater, for at least 2 hours.

Allowable Leakage rate shall be calculated using the following formula:

$$L = SD\sqrt{P} \div 1040.625$$

L = Allowable Leakage, ounces per **hour**

S = Length of Pipe tested, feet

D= Nominal Pipe Diameter, inches

P= Average Test Pressure During Leakage Test, psi

- b. If a section of water main piping fails pressure and leakage testing, the Contractor shall locate, uncover, and repair or replace the defective section of pipe, fitting, valve, or joint at no additional expense to the Owner and without any time extension. The testing company shall then conduct additional testing until satisfactory test results are achieved.

2. Conducting Flushing and Disinfection Operations

The testing company shall conduct flushing and disinfection operations using methods and procedures that meet the requirements of *AWWA C651, Standard for Disinfecting Water Mains*. All costs associated with flushing and disinfecting the water main shall be borne by the Contractor.

Samples from the disinfected water main shall be taken by the testing company for bacteriological analysis. If the testing company determines that the sample results indicate high bacteria levels, they shall immediately inform the Contractor and the Owner's Representative. The testing company shall then perform additional flushing and disinfection operations until subsequent test samples indicate safe bacteria levels.

PENNICHUCK WATER WORKS

Any additional flushing and disinfection operations by the testing company shall be conducted at the Contractor's expense.

The Contractor shall install suitable taps at the end of the disinfected water main to enable the collection of samples for bacteriological testing. The Contractor shall remove these taps and plug the water main with brass corporation plugs upon the successful completion of the disinfection operations and verification by Pennichuck Water Works.

Best Practices for Discharging Chlorinated water:

- A. Potable water containing chlorine shall be discharged directly into a sanitary sewer manhole or storm drain. The discharge event shall not cause a surcharge or disrupt sewer service. Please consult with the local Sewer Treatment facility prior to discharging into their system.
- B. It is recommended that when a sanitary sewer or storm drain manhole is not available, water should be dechlorinated using chemical or non-chemical methods. Testing is recommended throughout the discharge event to ensure chlorine levels are within acceptable range. Care shall be taken to avoid discharging directly into wetlands, vernal pools, stream beds, and other vulnerable environments.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01625
Polyethylene Encasement

Table of Contents

A..... GENERAL
B..... RELATED PRODUCTS
C..... PRODUCTS
D..... EXECUTION

A

GENERAL

The Contractor shall furnish and install Polyethylene encasement at all locations specified, or as directed by the Owner.

B

RELATED WORK

Section 01600 Water Main Pipe and Fittings

Section 01650 Water Service/Air Release Materials

C

PRODUCTS

1. Polyethylene Encasement Materials

- a. The Contractor shall supply Polyethylene encasement film in tubular or sheet form. The Polyethylene film shall meet the requirements of *AWWA C105, Polyethylene Encasement for Ductile-Iron Pipe Systems*. The film shall be free of tears, breaks, holidays, or defects. The film shall also have a 2.5% to 3.0% carbon black content, either low or high-density.

PENNICHUCK WATER WORKS

b. Low-density Polyethylene film shall be manufactured from virgin Polyethylene material that meets the following requirements of *ASTM D4976, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials*:

- Group 2 (Linear)
- Class C (Black)
- Density: 0.910 to 0.935 g/cm³
- Dielectric Volume Resistivity: 10¹⁵ ohm-cm (min.)

Low-density Polyethylene film shall have the following physical properties:

- Tensile Strength: 3,600 psi (min.)
- Elongation: 800% (min.)
- Dielectric Strength: 800 V/mil thickness (min.)
- Thickness: 0.008 inch, nominal

c. High-density, cross-laminated Polyethylene film shall be manufactured from virgin Polyethylene material that meets the following requirements of *ASTM D4976*:

- Group 2 (Linear)
- Class C (Black)
- Density: 0.940 to 0.960 g/cm³
- Dielectric Volume Resistivity: 10¹⁵ ohm-cm (min.)

High-density, cross-laminated Polyethylene film shall have the following physical properties:

- Tensile Strength: 6,300 psi (min.)
 - Elongation: 100% (min.)
 - Dielectric Strength: 800 V/mil thickness (min.)
 - Thickness: 0.004 inch, nominal
- d. Polyethylene tape used to join sheets of Polyethylene film shall be 3 inches wide (minimum 2 inches) plastic-backed adhesive tape. The adhesive material shall be suitable for long-term contact with Polyethylene film without damaging it.

D

EXECUTION

1. Preparing to Install Polyethylene Encasement

- a. The Contractor shall ensure that the pipe and valve surfaces that are to receive Polyethylene encasement are clean and free of any soil, mud, clay, cinders, or other foreign materials before any encasement operations are started.

The Contractor shall also ensure that no foreign materials are inadvertently trapped between the pipe and the Polyethylene film during the process.

- b. The Contractor shall ensure that the Polyethylene film is applied to the contour of the pipe to affect a snug but not tight fit with minimum space between Polyethylene film and the pipe. The Contractor shall allow sufficient slack in the contouring to prevent stretching the Polyethylene film where it bridges irregular surfaces such as bell spigot interfaces, bolted joints, or fittings. Overlaps and end joints shall be secured with Polyethylene adhesive tape to hold the Polyethylene encasement in place until backfilling operations have been completed.

Important: All efforts shall be made to prevent damage to the Polyethylene film due to backfilling operations.

- c. For water main installations below the water table or in areas subject to tidal action, the Contractor shall ensure that both ends of the Polyethylene tube are properly sealed with Polyethylene adhesive tape at the overlap joint.

2. Installing Polyethylene Encasement

a. Tubular Polyethylene (Method A)

- i. The Contractor shall cut the Polyethylene tube to length approximately 2 feet longer than the pipe section. Slip the tube around the pipe, centering it to provide a 1 foot overlap on each adjacent pipe section, and then bunching the film tube “accordion” fashion lengthwise until it clears the pipe ends.
- ii. Lower the pipe section into the trench and make a pipe joint with the preceding section of pipe. Make shallow bell holes at the joints to facilitate installation of the Polyethylene tube.
- iii. After assembling the pipe joint, make an overlap of Polyethylene tube. Pull bunched Polyethylene film from the preceding length of pipe, slip it over the end of the adjoining length of pipe and then secure it in place. Slip the end of the Polyethylene from the adjoining pipe section over the end of the first wrap until it overlaps the joint end of the preceding pipe, and then secure the overlap in place. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold with Polyethylene tape at quarter points along the length of the pipe.
- iv. Repair any cuts, tears, punctures, or other damage to the Polyethylene film, and then proceed with installation of the next section of pipe in the same manner.

b. Tubular Polyethylene (Method B)

- i. The Contractor shall cut the Polyethylene tube to length approximately 1 foot shorter than the pipe section. Slip the tube around the pipe, centering the tube to provide 6 inches of bare pipe on each end. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold with Polyethylene tape at quarter points along the length of the pipe.

PENNICHUCK WATER WORKS

- ii. Before making up the joint, slip a 3-foot length of Polyethylene film tube over the end of the preceding pipe section, bunching it in “accordion” fashion lengthwise along the pipe. After assembling the joint, pull the 3-foot length of Polyethylene film over the joint, overlapping the Polyethylene previously placed on each adjacent section of pipe by at least 1 foot. Make each end snug and secure.
- iii. Repair any cuts, tears, punctures, or other damage to the Polyethylene film, and then proceed with installation of the next section of pipe in the same manner.

c. Polyethylene Sheet

- i. The Contractor shall cut the Polyethylene sheet to length approximately 2 feet longer than the pipe section. Center the length to provide 1 foot overlap on each adjacent pipe section, bunching the sheet until it clears the pipe ends. Wrap the Polyethylene sheet around the pipe so that the sheet circumferentially overlaps the top quadrant of the pipe, and then secure the cut edge of the Polyethylene sheet at 3-foot intervals.
- ii. Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. Make a shallow bell hole at the joints to facilitate installation of the Polyethylene. After completing the joint, make the overlap and secure the ends.

d. Pipe-shaped Appurtenances

The Contractor shall ensure that all bends, reducers, offsets, and other pipe-shaped appurtenances are properly encased in Polyethylene film in the same manner as pipe sections.

e. Odd-shaped Appurtenances

The Contractor shall ensure that valves, tees, crosses, and other odd-shaped appurtenances, which may not be encased using tube type Polyethylene, are properly wrapped with flat sheet Polyethylene film and split lengths of Polyethylene tubing by passing the sheet around the appurtenance and encasing it. Make seams by bringing the edges together, folding them over twice and then taping them down. Tape Polyethylene securely in place at valve stems and other penetrations.

f. Encasement Openings

The Contractor shall ensure that encasement openings for branches, service taps, blow offs, air valves, and similar appurtenances added after the pipe has been installed are made by making an X-shaped cut in the Polyethylene and temporarily folding back the film. After the new appurtenance is installed, any slack in the film shall be taped securely to the appurtenance. Any cuts, as well as any other damaged areas in the Polyethylene, shall be properly repaired with Polyethylene tape. Service taps may also be made directly through the Polyethylene, with damaged areas being repaired as specified.

g. Junctions between Wrapped and Unwrapped Pipes

The Contractor shall ensure that when joining Polyethylene encased pipe to adjacent pipe that is not wrapped, the Polyethylene wrap is extended to cover the adjacent pipe for a distance of at least 3 feet. Ends shall be secured with circumferential turns of the tape. Service lines of dissimilar metals shall be wrapped with Polyethylene film or suitable dielectric tape for a minimum clear distance of 3 feet away from cast or ductile iron pipe.

3. Repairs

The Contractor shall ensure that any cuts, tears, punctures, or damage to Polyethylene film are repaired with adhesive tape or with a short length of Polyethylene sheet, wrapped around the pipe to cover the damaged area, and properly secured in place.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01650

Water Service and Air Release Materials

Table of Contents

A..... GENERAL
B..... RELATED PRODUCTS
C..... PRODUCTS
D..... EXECUTION
E..... TESTING

A

GENERAL

The Contractor shall furnish and install all water service replacements and reconnections as indicated on the Drawings and as detailed in the Specifications. All service line fittings shall be brass or copper, and all brass and copper parts in contact with water shall be designated lead-free with less than 0.25% lead content. All water service and air release materials must be manufactured in North America.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill and Grading

Section 02100 Sand

C

PRODUCTS

1. Copper Tubing

- a. All copper tubing shall be Type “K” and meet the requirements of *AWWA C800*.
- b. Copper tubing in 1 inch size shall be of the soft, coiled type and shall conform with the requirements of *ASTM B88, Standard Specification for Seamless Copper Water Tube*. Copper tubing for 1 1/2 inch and 2 inch copper tubing shall be supplied in straight lengths.
- c. The Contractor shall install detectable warning tape in the trench 18 inches to 24 inches below finished grade above all copper tubing runs.

2. Polyethylene Tubing

- a. Where the use of Polyethylene tubing is permitted, it shall be Copper Tubing Sized (CTS) and rated for a working pressure of 200 psi. **1 inch diameter polyethylene tubing can only be used with prior written approval from the Pennichuck Engineering department.**

- b. The Contractor shall lay insulated 10-gauge solid-core tracer wire in the trench at the top of the bedding sand above all Polyethylene tubing runs. Detectable warning tape shall be installed 18 inches to 24 inches below finished grade.
- c. Polyethylene tubing shall be reinforced with stainless steel insert reinforcements where fittings are attached to the Polyethylene tubing.
- d. Only approved brass compression-style fittings shall be used in conjunction with Polyethylene tubing.

3. Corporation Valves

- a. The Contractor shall install corporation valves that meet the requirements of *NSF/ANSI 61 Certification* and *AWWA C800*.

Approved corporation valve manufactures include the following:

- Mueller Co.® 300™ Ball Type Corporation Valves, with Mueller Co. 110 Compression Connection fittings
- Ford Meter Box Co. Ballcorps and Corporation Stops [Ford w/ “T” Compression Nut]
- Cambridge Brass™ Corporation Stops
- A.Y. McDonald Manufacturing Co. Corporation Valves

Corporation valves from other manufacturers must be pre-approved for use by Pennichuck Water Works.

- b. The Contractor shall ensure that all corporation valves have a Teflon-coated brass ball stop and are rated for a working pressure of 300 psi.
- c. The Contractor shall ensure that all corporation valves have a CC inlet thread and a copper pack joint compression outlet.
- d. Plug-style corporation valves shall not be used.

4. Curb Stops

- a. The Contractor shall install curb stops that meet the requirements of *NSF/ANSI 61 Certification* and *AWWA C800*.

Approved curb stops manufactures include the following:

- Mueller Co. 300™ Ball Curb Valves, with Mueller Co. 110 Compression Connection fittings
- Ford Meter Box Co. Ball Valve Curb Stops [Ford w/ “T” Compression Nut]
- Cambridge Brass Curb Stops and Meter Valves, with Series 202 Compression Couplings
- A.Y. McDonald Manufacturing Co. Curb Stops

Curb stops from other manufacturers must be pre-approved for use by Pennichuck Water Works.

- b. The Contractor shall ensure that all curb stops have a Teflon-coated quarter turn brass ball stop and are rated for a working pressure of 300 psi.
- c. The Contractor shall ensure that all curb stops open “left” and feature a ¼ turn stop.
- d. The Contractor shall ensure that all curb stops have no drain holes.
- e. Plug-style curb stops shall not be used.

5. Service Saddles

a. The Contractor shall install service saddles that meet the requirements of *AWWA C800*. Approved service saddle manufactures include the following:

- Mueller Co. DR2S, Epoxy-coated, double stainless steel strap
- Ford Meter Box Co. FCD202, Epoxy-coated, double stainless steel strap
- Romac Industries, Inc. Style 202NS, Nylon-coated, double stainless steel strap
- Smith-Blair Model 317, Nylon-coated, double stainless steel strap

Service saddles from other manufacturers must be pre-approved for use by Pennichuck Water Works.

b. The Contractor shall ensure that all saddles are provided with a female CC thread.

6. Service Boxes

a. The Contractor shall install service boxes that are arch style (“Erie”) pattern with a 5-foot to 6-foot slide-type adjustable riser, unless otherwise specified on the Drawings. Service boxes shall have a minimum I.D. of 1 inch.

b. The Contractor shall ensure that all service boxes are supplied with a plug-style cover. The cover shall be cast or ductile iron and shall screw onto the service box riser. The cover shall have “WATER” integrally cast into the cover. The plug shall be cast bronze or brass with a “rope” thread.

c. The Contractor shall ensure that all service boxes are furnished with a Type 304 Stainless Steel service box rod, ½ inch diameter by 30 inches long. A brass or stainless steel cotter pin shall be provided to secure the service box rod to the curb stop.

d. The Contractor shall ensure that all service boxes are coated with a bituminous coating that meets the requirements of *AWWA C110, Ductile-Iron and Gray-Iron Fittings*.

7. Brass Goods

- a. The Contractor shall ensure that all brass goods meet the requirements of *NSF/ANSI Standard 61*.

Approved brass goods manufactures include the following:

- Mueller Co.
- Ford Meter Box Co. (T-style)
- A.Y. McDonald Manufacturing Co.
- Cambridge Brass

Brass goods from other manufacturers must be pre-approved for use by Pennichuck Water Works.

- b. The Contractor shall ensure that all brass goods are supplied with iron pipe threads or compression couplings.
- c. The Contractor shall ensure that all brass goods are rated for a minimum working pressure of 150 psi.

D

EXECUTION

1. Installing Copper Tubing

- a. The Contractor shall ensure that all copper tubing water services are bedded in at least 6 inches of sand, above and below the tubing.
- b. The Contractor shall ensure that all copper tubing is installed with brass compression fittings unless otherwise detailed on the Drawings.

PENNICHUCK WATER WORKS

- c. The Contractor shall ensure that all copper tubing is installed without the occurrence of any kinks or egg-shaped anomalies. If any kinks or egg-shaped anomalies are found, the Contractor shall remove that particular section of copper tubing and then properly repair it. The Owner’s Representative shall have the final decision on any issues that may arise regarding the installation of copper tubing.
- d. Underground soldered fittings shall not be used.
- e. The use of crimping tools on copper tubing shall not be permitted.

2. Installing Compression Couplings

The Contractor shall ensure that all compression couplings are installed and tightened in accordance with the manufacturer’s recommendations, with care taken to prevent over-tightening.

3. Installing Corporation Valves

- a. The Contractor shall ensure that corporation valves are installed on all water services at the service tap into the water main.
- b. The Contractor shall ensure that properly-sized corporation valves that are directly tapped into ductile iron water mains meet the size requirements specified in the following table:

Table 1625A – Water Mains and Tap Sizes

Tap Size (in)	Main Size (in)
1	6 and larger
2	12 and larger

- c. The Contractor shall ensure that all corporation valves that cannot be directly tapped into ductile iron water mains instead shall be tapped through a tapping saddle. On 2-inch PVC pipe, 2-inch copper tubing, or 2-inch HDPE pipe the Contractor shall cut in a FIP Brass Tee with a compression fitting.

4. Installing Curb Stops

- a. The Contractor shall ensure that all curb stops are installed with a curb box assembly and rods as specified.
- b. The Contractor shall ensure that all curb stops are installed inside the municipal ROW within 1 foot of the edge of the ROW, or as close as is possible
- c. The Contractor shall ensure that all curb stops are installed plumb.
- d. The Contractor shall ensure that all curb stops are set upon pressure-treated wood blocking measuring 2 inches × 6 inches × 12 inches or upon a flat rock with similar dimensions.

5. Installing Service Boxes

- a. The Contractor shall ensure that all service box bases, placed on the same blocking or flat surface as the curb stop, are centered over the curb stop and are plumb.
- b. The Contractor shall ensure that all service box tops are flush with the existing finished grade.
- c. The Contractor shall ensure that all service boxes installed in sidewalks, drives, or pavement are installed inside a gate box top.

E

TESTING

1. Conducting Pressure Tests

- a. The Owner's Representative shall conduct a thorough visual inspection of all newly-placed water services after the Contractor has completed their installation work and before any backfill operations begin.

PENNICHUCK WATER WORKS

- b. The Contractor shall ensure that all corporation valves, curb stops, and couplings are left exposed for monitoring as the pressure test proceeds.
- c. The Contractor shall conduct the pressure test by filling and pressuring the system to the specified rating and visually inspecting each fitting, valve, hydrant, cap, and plug along the system to verify that no leakage has occurred.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01660

Cleaning and Lining – Cast Iron Water Mains

Table of Contents

A..... GENERAL
B..... RELATED PRODUCTS
C..... PRODUCTS
D..... EXECUTION
E..... TESTING

A

GENERAL

The Contractor shall furnish all materials, equipment, incidental items and labor necessary to completely clean and line cast iron water mains indicated on the drawings and as detailed within the specifications.

The work shall consist of excavating access holes, shoring, covering and dewatering access holes, making pipe openings, cleaning and lining the water mains, restoring the pipe openings, pressure testing and chlorination, backfilling, and trench restoration.

B

RELATED WORK

Section 01400	Earth Excavation, Backfill, Fill and Grading
Section 01600	Ductile Iron Water Main and Fittings
Section 01680	Temporary Water Mains and Services
Section 02700	Measurement and Payment

C

PRODUCTS

1. Cement – Mortar

- a. All cement-mortar for cast iron water mains shall be composed of Portland Cement, sand and water. The cement-mortar shall be proportioned by volume and shall be mixed and of the proper consistency to provide a dense, homogenous water main lining that shall adhere firmly to the interior wall of the water main. **The cement-mortar shall have a compressive strength of not less than 5,000 psi at 28 days.**

- b. Cement-Mortar shall be mixed in proportions of one part Portland Cement to one to one and one half parts of sand by volume. The exact proportions shall be determined by the characteristics of the sand used. The mortar shall be well mixed and the water-cement ratio shall be carefully controlled and kept to a minimum. No mortar which has attained its initial set shall be used for pipe lining. To improve the qualities of density, durability, insolubility and surface smoothness, a natural cement may be required and will be used in the proportion of one bag of natural cement to 5 bags of Portland Cement.
 - i. Sand - Sand shall be washed, cleaned, well graded and free from organic matter. 100% of the sand shall pass the No. 16 screen and no more than 5% shall pass the No. 100 sieve. Sand shall conform to Section 2.4 of AWWA C602-89 standard for Cement-Mortar Lining of Water Pipelines-4 In. (100mm) and Larger- In Place.
 - ii. Cement – The cement shall conform to the requirements of ASTM C150 for Type II cement. The cement shall be free of lumps and the residue on a standard No. 200 sieve shall not exceed 10% by weight.
 - iii. Water - Water shall be obtained from Pennichuck Water Works water supply.

2. Epoxy

- a. The coating system shall be a solids epoxy monolithic surfacing system for use in coating existing potable water mains. All products to be used on this project must be pre-approved by the Engineer prior to the bid date.
- b. The coating system shall meet all requirements in the following specifications:
 - i. ANSI/AWWA C620-07 – Spray-Applied in-place Epoxy Lining of Water Pipelines, 3 in. (75mm) and Larger
 - ii. NSF/ANSI 61 – Drinking Water System Components – Health Effects

D

EXECUTION

1. Phasing

Work on the cleaning and lining shall be phased in accordance with the plans and the special conditions section of these specifications. The intent is to divide the cleaning and lining into phases such that is compatible with the temporary bypass schemes for each street. A new cleaning and lining phase cannot be initiated until the previous phase has been completed and permanent service restored to the previous phase.

2. Valve Operations

- a. The Owner shall be responsible for **operating** all valves necessary to effect the required cleaning and lining work. **The Contractor shall provide the Owner with three (3) working days notice of each required valve operation associated with the cleaning and lining.**
- b. In the event that the Owner is unable to completely shut off the flow of water into the section of water main to be cleaned and lined it shall be the responsibility of the Owner to determine which valves are leaking by. **The Contractor will be responsible for replacing the leaking valves via a change order issued by the Owner.**

3. Excavation

- a. The Contractor shall complete access hole excavations in accordance with section 01400 of these specifications. The completed access hole excavations shall be shored to stabilize the excavation walls and prevent collapse of the traveled way into the excavation. All shoring shall comply with OSHA regulations.
- b. The Contractor shall provide steel plating to cover all access holes. The plating shall be of sufficient size and thickness to permit normal traffic to pass over the covered access holes. The Contractor shall properly secure the steel plating to the road surface and shall place a cold patch or asphalt ramp at the plate edges in order to produce a smooth transition from the existing roadway onto and off of the steel plating. Steel plating shall be flat with no more than 1" runout permitted between plate corners.

4. Dewatering

- a. Before initiating the cleaning and lining process, the Contractor shall dewater all pipe lines and access holes, drain all low spots and take all necessary precautions to prevent water from entering the main section being worked on. The Contractor shall insert bulkheads at the terminals of the dewatered sections.
- b. The trench shall be protected from wash and rainwater as is necessary to keep water out of the water main being cleaned and lined until the cleaning and lining is completed.

5. Obstructions

- a. In the event obstructions are encountered during the water main cleaning that preclude the passage of the cleaning and lining equipment then the Owner will authorize the Contractor, via the change order process, to locate and remove the obstructions.

6. Cleaning of Water Mains

- a. All rust, tubercles, deposits, loose materials and all other foreign materials shall be removed from the interior of the pipe lines by use of water propelled cleaning devices or other approved methods. The Contractor shall pass the machine through the mains as many times as may be necessary and to employ such other supplementary means as may be required to clean the pipe surfaces and to remove all foreign matter, rust and dust from the pipe surfaces. It shall be the responsibility of the Contractor to employ approved methods and to do all work necessary to obtain clean pipe surfaces and to insure the satisfactory bonding of the cement-mortar lining to the pipe surfaces. The Contractor shall be responsible for locating and restarting the cleaning unit if it should become lodged in the pipe.
- b. Branch connections and service connections shall be backflushed to remove all sediment, loose and foreign material which have entered the branch lines during cleaning operations. Precautionary measures shall be provided to protect valves and other appurtenances against the entrance of dirt, sediment and other foreign materials and any other damage. All damage to valves, pipes or other pipe line appurtenances and fittings as a result of the Contractor's operations shall be made good or replaced by the Contractor in a manner satisfactory to the Engineer, at no additional expense to the Owner; defective parts, not the result of the Contractor's operations will be repaired by and at the discretion of the Owner.
- c. After the cleaning operations, the Contractor shall make an examination of the interior of the pipes, in a satisfactory manner, to determine whether the pipes have been sufficiently and properly cleaned so as to assure the proper bonding and placing of the lining and to determine whether any repairs to the pipes are required, prior to the application of the lining. The Contractor shall provide such facilities as may be required for inspection of pipes by the Owner. If the examination and inspection reveals that the cleaning operations have not been satisfactorily performed, the Contractor, at no additional expense to the Owner, shall provide all other additional cleaning work as may be necessary for the proper installation of the lining and as required. No defective section or part shall be lined until repairs have been made and approved by the Engineer.

7. Cement-Mortar Lining of Water Mains

- a. Cement-mortar lining of water mains shall not be started until all cleaning operations have been satisfactorily completed and all defective water main fittings and appurtenances has been satisfactorily repaired or replaced. The first ten (10) feet of each section of pipe shall be cleaned and cement-mortar lined in accordance with the requirements, the Owner shall immediately inspect the cement-mortar for adequate thickness and continuity. If the lining is deemed to meet the specifications then the lining process shall proceed. If the lining process is deemed inadequate, then the cement-mortar will be washed out and reapplied until the application meets the specifications.

PENNICHUCK WATER WORKS

- b. The cement-mortar lining in the pipe lines shall be continuous, dense, smooth and without variations in quality, and free from noticeable changes in thickness. The cement-mortar lining of the pipe line shall be troweled in accordance with specifications set forth by, and under the direction of the Engineer.
- c. The cement-mortar lining thickness for the pipe lines shall be 1/8-inch minimum thickness with an allowable plus tolerance of 1/16-inch. **No minus tolerance in the cement-mortar lining thickness specified will be permitted.**
- d. Installation of Cement-Mortar Pipe Lining.
 - i. Immediately prior to running the lining machine through the pipe line, all sand, water, loose material and all other foreign material that has accumulated in the pipe lines shall be satisfactorily removed.
 - ii. The cement-mortar pipe lining shall consist of a one-course application of a pre-mixed cement-mortar and shall be continuously placed by a machine projecting the mortar against the wall of the pipe by centrifugal force, without injurious rebound, and with sufficient velocity to cause the mortar to be densely packed and to adhere in place. Pneumatic methods for placing cement-mortar will not be permitted. The travel of the machine and the rates of discharge of mortar shall be controlled so as to produce a uniform homogenous thickness of lining around the perimeter and along the length of the pipe line. Hand placing of the mortar lining shall not be permitted, except where machine placing is impossible or impracticable and so approved by the Engineer. The machine used for cement-mortar lining the pipe shall be provided with attachment for mechanically troweling the mortar so as to produce a smooth surface finish, and shall travel ahead of the lining so that the freshly placed and troweled mortar will not be touched until it has set; the design of the trowel attachment shall be such as to permit operation in pipes which may be found out of round, and produce a smooth surface without spiral shoulders. The finished surface shall be smooth and shall not have a sand finish.
 - iii. Mortar which does not provide a dense, homogenous lining which will adhere to the pipe surfaces, sand pockets, voids, oversanded and cracked areas, and such other defective areas and materials shall be removed to the pipe wall, and the areas shall be repaired by hand application or other approved method to the full required thickness of the mortar lining and as approved. All spatter and loose material shall be removed from the pipe lines.
 - iv. Troweled finished surfaces shall be tested for finish and 9 out of 10 places checked shall conform to the tolerance for finished surfaces. The waste materials shall be removed from the pipe ahead of the trowels. Lack of homogeneity will not be permitted. The Contractor shall make frequent determinations of the thickness of the lining as placed in order to maintain proper control of application. The cement-mortar lining shall nowhere be less than 1/8-inch and should be no greater than 3/16-inch. If any section of the lining shall show irregularity or shall require an excessive amount of

PENNICHUCK WATER WORKS

hand patching, or otherwise fail to meet these specifications, the faulty section of the lining shall be removed to the extent directed by the Engineer, the pipe recleaned, and the lining replaced by the above method at the Contractor's expense.

Note that this includes thin sections which shall be scraped off and redone with the machine.

Cables shall be sheathed at the ends of the pipe at all times.

- v. Service lines less than 2" in diameter shall be backflushed with water or air before the cement-mortar lining has set, to result in each service line having a full opening with no obstructions. Any service found to be obstructed with cement or debris shall be excavated, cleared, repaired, backfilled and pavement restored (if necessary) by the Contractor and at the Contractor's expense.

e. Curing of Cement-Mortar Lining

Immediately upon completion of the cement-mortar lining of pipe line between pipe openings or upon the completion of day's run of the machine, the section of the pipe line shall be closed at each end. As soon as practicable after placing the cement-mortar lining, water shall be introduced into the mortar lined section between the closed ends of pipe in order to create a moist atmosphere and keep the cement-mortar lining damp, but not under pressure, until the mortar lining has been in place not less than 48 hours. The Contractor shall be responsible for the proper curing of the cement-mortar linings.

f. Hand Mortar Work

Cement-mortar lining of sharp bends, specials, areas adjacent to valves, or other areas where machine placing is impracticable, and correcting defective areas, shall be done by hand. Hand placed mortar shall have uniformly smooth finished surfaces and with smooth transitions adjacent to machine placed areas. Cement-mortar shall be as specified herein for machine lining. Prior to the placing of hand mortar work, all areas to be lined shall be thoroughly cleaned in an approved manner with all loose and foreign materials removed and if required, surfaces shall be dampened before placing the mortar. Steel trowels shall be used for finishing where practicable. Hand mortar work shall be completed within 24 hours after machine application in that particular section of pipe line has been completed. Machine application of mortar lining shall be slowed down, or stopped, if necessary, to assure hand mortar work being placed in accordance with the requirements specified or directed.

g. Protection of Lining

The Contractor shall take every precaution to prevent injury to the pipe lining. All damage to pipe linings shall be satisfactorily repaired, or damaged portions removed and replaced to the satisfaction of the Engineer.

h. Inspection and Testing of Cement-Mortar

- i. The Contractor shall make a set of three (3) test cylinders of the cement-mortar used for pipe linings for every 1000 feet of water main that is lined. The making, curing, handling and testing of cement-mortar shall be in accordance with A.S.T.M. Specifications and as approved; the making, handling, curing and testing of mortar test cylinders shall be performed by the Contractor. The testing of mortar test cylinders will be as follows:
 - a. One cylinder tested at seven (7) days, one cylinder tested at twenty-eight (28) days, one cylinder held as a spare.
 - b. All test results shall be submitted to the Owner within one (1) week of completion.
 - c. Cylinder tests to be completed by an independent testing agency approved by the Owner.
- ii. The machine for placing the cement-mortar lining shall be so operated and controlled as to produce pipe linings conforming to the requirements specified herein. The operation and controls for the equipment shall be constantly checked while the machine is in operation.

i. Guarantee of Cement-Mortar Lining

The Contractor shall guarantee all materials and workmanship, furnished under this Contract, against deterioration and failure for a period of 1 year after final acceptance of all the work under this Contract. Any portion of the cement-mortar lining found to be deteriorated or to have failed shall be made good by the Contractor in a satisfactory manner by patching or by removal and replacement of the cement-mortar lining, as required by the Engineer, to provide a sound, durable cement-mortar lining. Repairs or replacements shall be made in accordance with the requirements specified herein, including removal of defective lining, cleaning the pipe, cutting and repairing or replacing access openings and other incidental work. Repairs or replacements of defective cement-mortar lining shall be provided by the Contractor at no additional expense to the Owner.

8. Epoxy

a. Installer Qualifications

- i. All products must be installed by an Installer that has been trained and certified by the manufacturer. The installer shall provide verifiable documentation of the above certification.

PENNICHUCK WATER WORKS

b. Quality Assurance

- i. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM standards.
- ii. Applicator shall use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts. These workmen shall be completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- iii. Applicator shall use approved specialty equipment adequate in size, capacity and number sufficient to accomplish the work of this Section in a timely manner.

c. Application

- i. The cured surfacing shall be monolithic with proper sealing connections to all un-surfaced areas and shall be placed and cured in conformance with the recommendations of the monolithic surfacing system manufacturer.
- ii. When cured, the system shall form a continuous, tight-fitting, hard, impermeable surfacing that is approved for potable water system service.
- iii. The system shall effectively seal the interior surfaces of the pipe and prevent any penetration or leakage of groundwater infiltration.
- iv. Heated, plural component, specially designed equipment for use in the application of the specified system approved for use by the monolithic surfacing system manufacturer.
- v. Application procedures shall conform to the recommendations of the interior surfacing system manufacturer, including material handling, mixing, and environmental controls during application, safety, and equipment.
- vi. The equipment shall be specially designated to accurately ratio and apply the specified materials and shall be regularly maintained and in proper working order.
- vii. The specified materials must be applied by an approved installer of the monolithic surfacing system.
- viii. Specially designed spray and/or spin-cast application equipment shall be used to apply each coat of the system.

d. Guarantee of Epoxy Lining

- i. The Contractor shall guarantee all materials and workmanship, furnished under this Contract, against deterioration and failure for a period of 1 year after final acceptance

of all the work under this Contract. Any portion of the epoxy lining found to be deteriorated or to have failed shall be made good by the Contractor in a satisfactory manner by patching or by removal and replacement of the epoxy lining, as required by the Engineer, to provide a sound, durable epoxy lining. Repairs or replacements shall be made in accordance with the requirements specified herein, including removal of defective lining, cleaning the pipe, cutting and repairing or replacing access openings and other incidental work. Repairs or replacements of defective epoxy lining shall be provided by the Contractor at no additional expense to the Owner.

E

TESTING

- a. Reference Section 01600.F for testing requirements

SECTION 01670

Asbestos Cement Pipe

Table of Contents

A..... GENERAL
B..... REFERENCED STANDARDS
C..... SUBMITTALS TO OWNER
D..... ASBESTOS PRE-CONSTRUCTION MEETING
E..... GENERAL CONSTRUCTION REQUIREMENTS
F..... DEFINITIONS

A

GENERAL

Asbestos cement pipe (ACP), also referred to as Transite pipe, is a known health risk to anyone who inhales airborne asbestos particles and fibers. ACP typically contains from 15% to 20% asbestos and is considered asbestos-containing material (ACM). Since ACM is a hazardous material, there are special handling requirements in place by law and by best recommended practices for handling and disposing of asbestos cement products. Conformance with these specifications is intended to minimize the release of asbestos fibers during ACP management and reduce asbestos exposure to acceptable regulatory thresholds.

Important: These handling requirements shall be observed in all instances when working with ACP.

It is the intent of Pennichuck Corporation (Owner), including Pennichuck Water Works (PWW) and Pennichuck Water Service Company (PWSC), that, to the extent possible, existing ACP is to be removed from service and disposed of in accordance with state and federal rules and regulations using means and methods in conformance with all applicable federal and state regulations that limit the release of asbestos fibers to the environment. If the ACP cannot be removed, the ACP shall be abandoned in place with brick-and-mortar closures at all open ends of the pipe or closures by other suitable means. Locations of “abandoned in place” ACP is to be documented in the records for the specific project.

The Contractor shall furnish all materials, equipment, incidental Items, and labor necessary to remove, where feasible, and dispose of all ACP.

Important: All ACP that is disturbed in the course of work shall be removed from the work site in accordance with this specification.

All ACP, ACP fragments, and ACM removed from the site shall be properly handled and their removal properly documented at each step of the disposal process in accordance with applicable federal, state, and local regulations. Copies of all completed ACP disposal documentation shall be submitted to the Owner.

It is anticipated that ACP will be classified as a Category II non-friable ACM, which is not considered regulated asbestos-containing material (RACM). However, the Contractor shall make provisions for the possible discovery or creation of friable ACM, such as degraded or broken ACP, during the work in their fee proposal. Friable ACP is considered RACM.

B

REFERENCED STANDARDS

All work completed under these specifications shall be done in strict accordance with all applicable federal, state, and local regulations, standards, and codes.

1. The most recent edition of any relevant regulation, standard, or code shall be in effect. Where there is a conflict between the regulations, standards, codes, and/or these specifications, the most stringent requirements shall apply.
2. The disturbance and/or removal of ACP is governed by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) 40 Code of Federal Regulations (CFR) 61; by the Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101; and the New Hampshire Code of Administrative Rules Chapters Env-A 1800, Env-Sw 900, and Env-Sw 2100.
3. ACP is classified by definition under 40 CFR 61, Subpart M, Section 61.141 as Category II, non-friable ACM, unless, when dry, it can be crumbled, pulverized, or reduced to powder by hand pressure. At that time, it becomes classified as regulated ACM (RACM) and subject to regulation under Subpart M.
4. As a minimum, the Contractor shall comply with the applicable portions of the following:
 - a. OSHA, including but not limited to:
 - i. 29 CFR Section 1926 – Safety and Health Regulations for Construction
 - ii. 29 CFR Section 1926.1101 – Safety and Health Regulations for Construction - Asbestos.
 - iii. 29 CFR Section 1910.134 – Occupational Health and Safety Standards - Respiratory Protection.
 - iv. 29 CFR Section 1910.1020 – Occupational Health and Safety Standards - Access to Employee Exposure and Medical Records.
 - v. 29 CFR Section 1910.1200 – Occupational Health and Safety Standards - Hazard Communication.

PENNICHUCK WATER WORKS

- b. Environmental Protection Agency (EPA) including but not limited to:
 - i. 40 Code of Federal Regulations Part 61 Subpart M – National Emission Standard for Asbestos.
- c. New Hampshire Code of Administrative Rules, including but not limited to:
 - i. New Hampshire Department of Environmental Services (NHDES) – Asbestos Management and Control, Chapter Env-A 1800.
 - ii. Waste Management Division Solid Waste Rules – Management of Certain Wastes, Chapter Env-Sw 900.
 - iii. Waste Management Division Solid Waste Rules – Management and Control of Asbestos Disposal Sites Not Operated After July 9, 1981, Chapter Env-Sw 2100.

A summary of applicable NHDES rules and regulations follows:

Env-A 1802.27 defines “Facility” as “any institutional, commercial, public, or private building or structure, work place, ship, installation, **utility infrastructure**, active waste disposal site, inactive waste disposal site operated after July 9, 1981, or rental dwelling. [emphasis added]”

Env-A 1802.52 defines “Utility infrastructure” as “any active or abandoned above-ground or underground system intended to convey a service, such as electricity, or to remove a waste, such as sewage, or to store a material, such as fuel, that is either constructed or insulated with ACM, including but not limited to transite pipe, electrical line, water line, sewer line, heating line, roadway, or storage tank.”

ACP that has conveyed water or wastewater is a facility.

Usually, when ACP is installed, it is Category II nonfriable ACM.

However, Category II nonfriable ACM can either become RACM if it:

1. Becomes friable as it deteriorates over time;
2. Has become crumbled, pulverized, or reduced to powder; or
3. Will likely become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

In accordance with Env-A 1803.01, an inspection must be conducted by an NHDES-certified asbestos inspector (AI) of the affected portions of a facility for the presence of ACM, prior to undertaking any demolition or renovation of a facility. Because the ACP is typically buried underground and not visible for inspection, it is assumed that ACP is Category II nonfriable ACM for the purpose of project planning. However, at the time when the ACP is exposed for removal, an asbestos inspector is required to determine whether the ACP is or will likely become friable and, therefore, be considered RACM.

If ACP is determined not to be RACM, then the requirements of Env-A 1804.08, Env-A 1805.07, Env-A 1805.08, and Env-Sw 901 would apply. In this case, notification to NHDES is not required.

If the asbestos abatement project involves ACP that is RACM, and the project is not more than 10 linear feet, then the activity would be a minor asbestos abatement project. The term does not include larger projects that are divided into smaller segments. Env-A 1805.13 specifies requirements for minor asbestos abatement projects, which requires, among other things, that the personnel involved in minor projects must be certified, but a licensed asbestos abatement entity is not required. ACM waste produced from a minor asbestos abatement project would also be subject to the requirements of Env-A 1804.08, Env-A 1805.07, Env-A 1805.08, and Env-Sw 901. In accordance with Env-A 1804.02, notification to NHDES is not required for any minor asbestos abatement project.

If the asbestos abatement activity will involve RACM that is more than 10 linear feet, the activity would be a major asbestos abatement project, and a New Hampshire-licensed asbestos abatement contractor must conduct the required asbestos abatement activities after proper notification to NHDES.

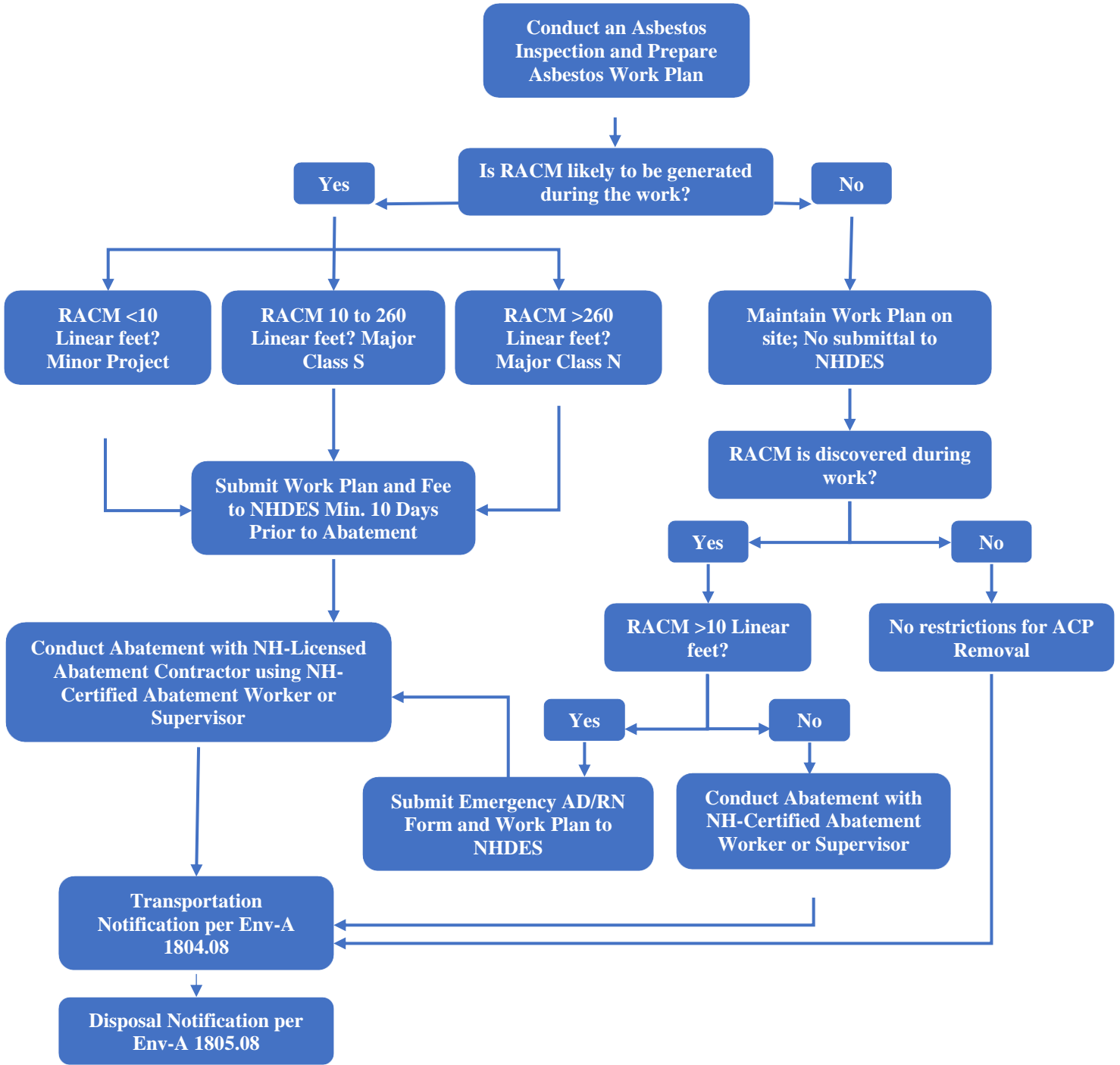
Major asbestos abatement projects are subject to the notification requirements of Env-A 1804.01 (an annual notification is also an option under Env-A 1804.04), Env-A 1804.07, and Env-A 1804.09. For an emergency asbestos abatement project, the notification requirements of Env-A 1804.05 would apply. Major asbestos abatement projects are also subject to the work practice requirements of Env-A 1805. Once ACP is removed from the facility, it is asbestos waste and subject to the requirements of Env-Sw 901.

Any alternative procedure to an asbestos abatement requirement can be requested using the procedures described under Env-A 1807.02.

The following ACP Project Decision Tree outlines the NHDES submittal and notification requirements for anticipated ACP projects.

PENNICHUCK WATER WORKS

B.1 - ACP Project Decision Tree



C

SUBMITTALS TO OWNER

1. Asbestos Removal Work Plan

The Contractor shall develop an Asbestos Removal Work Plan (work plan) that provides specific and detailed procedures (means and methods) that will be followed during ACP removal. The work plan must be submitted to the Owner and, if applicable, NHDES for review and approval 15 days prior to beginning work. The Contractor shall submit the work plan to the Owner prior to submittal of any plans to NHDES. Work plans submitted with insufficient detail will be returned requesting more information be provided. The Contractor shall comply with NHDES and any other agencies requirements during work plan preparation.

The Asbestos Removal Work Plan shall include:

- a. Proposed means and methods that are protective of human health and the environment and conform to all applicable state and federal rules and regulations unless a waiver has been obtained.
- b. Procedures/actions to be followed if the intact ACP becomes broken and the possibility exists of asbestos fibers becoming airborne.
- c. A list of equipment that will be used during the abatement and/or associated site work disturbing ACM.
- d. Copies of the abatement contractors' licenses and certifications and a list of qualified personnel that will be on site and their contact information.
- e. Copies of all associated permits, notifications, or waivers (including any correspondence or approvals) necessary to complete the work.
- f. The proposed locations within the project where ACM is located, where ACM is anticipated to be impacted and proposed locations for temporary on-site storage or stockpiles.
- g. Description of equipment and personnel decontamination procedures.
- h. Description of access controls and site security plans (stockpile and storage locations shall be included).

- i. Description of best management practices (BMPs) and/or engineering controls, as well as physical and visual controls to be deployed in or around the regulated areas and temporary storage/stockpile locations.
- j. The work plan submitted shall contain the following:
 - i. The scope of work to be accomplished regarding ACP shall be described in detail. For example: abandoning/removing X feet of ACP; tying into one or more joint(s)/section(s) of an existing water main and replacing one or more joints/sections (X feet) of pipe to make the connection; removing X feet of buried ACP encased in concrete crossing a drainage way not accessible by road; or connecting to an existing joint/section of ACP by tapping into the ACP.
 - ii. Detailed procedures that describe the methods/techniques to be employed to uncover, dislodge, handle, remove, secure, transport, and dispose of the ACP and any generated ACM waste.
- k. The work plan shall state or reference procedures in the contractor's health and safety program document that they will follow to comply with the federal OSHA asbestos standard.
- l. The work plan shall contain provisions for the environmentally compliant disposal of the intact ACP and any RACM created during the removal process.
- m. The work plan shall provide detailed procedures for retaining the ACP's Category II, non-friable NESHAP classification.
- n. The Contractor shall incorporate working with ACM and complying with mandated OSHA requirements for Class II, asbestos work in their project specific health and safety plan.
- o. Steps to inspect and maintain stockpiles until ACM is properly disposed.
- p. Proposed means and methods of ACM disposal and proposed licensed ACM disposal facility.

2. Disposal Documentation

- a. Submit proof satisfactory to the Owner, and as applicable, NHDES, that required permits, site location, and arrangements for transport and disposal of asbestos-containing waste material (ACWM) have been made that meet applicable environmental statutes and regulations.

- b. Include the name of the transporter and the name of the approved landfill where the ACP and ACWM will be buried.
- c. Submit copies to the Owner and if applicable, NHDES, of all transport manifests, trip tickets, and disposal receipts for all ACWM removed from the work area during the project.
- d. The Contractor will sign manifests as the Owner's representative (generator) for the ACP and provide copies to the Owner.

3. Notifications

The Contractor shall provide written notification to NHDES Air Resources Division (ARD) and the local municipality, as applicable, for major asbestos abatement projects that anticipate generating more than 10 linear feet of RACM at least ten (10) working days prior to starting ACP removal in accordance with Env-A 1804.01 Notification for Major Asbestos Abatement Projects.

If the start and/or completion date changes or a break in operation occurs, the Contractor shall notify NHDES ARD within 24 hours of changing the date(s) or interrupting the operation via telephone, fax, or email as specified in Env-A 1801.04(b); and provide a paper copy of the revised notification to NHDES within one business day.

The Contractor providing notice to NHDES shall also provide the requisite notification fee, as provided in Env-A 1804.09 Notification Fees.

(see <https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/Env-A%201800.pdf>)

Notification to NHDES is not required for projects where RACM is not anticipated to be generated during the ACP removal or for minor asbestos abatement projects that anticipate generating less than 10 linear feet of RACM. However, if greater than 10 linear feet of RACM is subsequently generated, notification to NHDES will be required as a major project.

All transporters of asbestos waste must provide NHDES with transport and disposal notification in accordance with Env-A 1804.08 and Env-A 1805.08. In all instances where greater than 10 linear feet, 25 square feet or 3 cubic feet of asbestos waste is disposed of, a waste shipment record must be sent to NHDES within 30 days of the delivery of the asbestos waste to the permitted disposal facility.

D

ASBESTOS PRE-CONSTRUCTION MEETING

The Contractor shall meet with the Owner at the project site, a minimum of 2 weeks prior to beginning abatement work. The Contractor shall be represented by an authorized representative and the field supervisor who shall supervise the project on a daily basis. The Contractor shall present evidence that all requirements for initiation of the work have been met. The minimum agenda for the meeting shall be:

1. Review of Pre-Job Submittals.
4. Channels of communication.
5. Construction schedule, including sequence of critical work.
6. Designation of responsible personnel.
7. Procedures for safety, security, quality control, housekeeping, and related matter.
8. Use of premises, facilities, and utilities.

The Contractor is required to provide one copy of the following at the preconstruction meeting:

1. Asbestos Abatement Contractor's Entity License.
2. State and Local Notifications, as required.
3. A list of abatement employees to be used on the project. Copy of licenses, training certificates and fit-tests of all workers and supervisors who will work on the project.
4. Documentation of medical records as required by OSHA or a notarized statement by examining medical doctor that such examinations took place and when, for each employee to be used on the project (preferred).
5. Copy of state or local license numbers for waste hauler and waste disposal site.

E

GENERAL CONSTRUCTION REQUIREMENTS

The ACP is considered by the U.S. EPA as Category II, non-friable ACM. The Owner wants its pipe to retain that asbestos categorization. By using procedures that have a low to no probability of fiber release, the pipe retains its classification as Category II, non-friable ACM.

1. No handling and disposing of ACP will begin without approval from the Owner.
2. The Contractor shall uncover, dislodge, handle, remove, transport, and dispose of all ACP specified in the contract documents for this project using wet technique procedures.
3. All work involving ACP and other ACM must be addressed in the work plan.
4. The Contractor shall take precautions to prevent damage to adjacent structures and material/finished material not required for ACP handling.
5. All projects involving ACP require that NESHAP and OSHA standards are met and/or exceeded.
6. To comply with NESHAP and OSHA requirements, this project will require workers trained in using wet technique procedures to dislodge and remove ACP, ACP joints, valves (any type) containing ACM, and any surrounding soils that may contain ACM.
7. OSHA requires that during any ACM disturbance, regardless of amount, the asbestos worker(s) shall be protected from potential airborne asbestos exposure in excess of the permissible exposure limit or excursion limit as stipulated in 29 CFR 1926.1101.
8. Contractors shall not use procedures that subject the ACP to forces that will crumble, pulverize, or reduce to powder the ACP.
 - a. Once the pipe becomes crumbled, pulverized, or reduced to powder it becomes classified as RACM and subject to NESHAP.
9. The following work practices and engineering controls shall not be used for work related to ACP or for work which disturbs ACM, regardless of asbestos exposure or the results of Initial Exposure Assessments:
 - a. High-speed abrasive disc saws and sanders that are not equipped with point-of-cut ventilator or enclosures with HEPA filtered exhaust air or wet cutting equipment;
 - b. Carbide-tipped cutting blades;
 - c. Electrical drills, chisels, and rasps used to make field connections in ACP;
 - d. Shell cutters used to cut entry holes in ACP;

PENNICHUCK WATER WORKS

- e. A hammer and chisel without using wet techniques to remove pipe connections;
 - f. Compressed air used to remove asbestos or material containing asbestos;
 - g. Dry sweeping, dry shoveling, or other dry clean-up of dust and ACM debris;
 - h. Employee rotation as a means of reducing employee exposure to asbestos.
10. Saw cutting of ACP shall only be conducted with a HEPA-shrouded vacuum attachment or wet cutting equipment, unless it is conducted within a small enclosure that isolates the area in which the saw cutting is being conducted to prevent the release of asbestos fibers to ambient air. These procedures will protect workers from the health risk associated with airborne asbestos.
 11. To meet and/or exceed NESHAP and OSHA guidelines, the contractor may subcontract the ACP handling and removal work to an EPA-accredited and New Hampshire-certified asbestos abatement contractor, asbestos abatement worker, or a certified asbestos abatement company.
 12. ACP uncovering, dislodging, handling, and/or removing shall be conducted during regular business hours, 8 a.m. to 5 p.m., Monday-Friday, where possible.
 13. Disposal bags for RACM shall be 6-mil polyethylene and labeled as required by EPA Regulation 40 CFR 61.150 (a)(1)(iv) or OSHA requirement 29 CFR 1926.1101(k)(8).
 14. Stick-on labels identifying the generator's name (Pennichuck Corporation) and address and the project site location shall be applied to any asbestos waste disposal bag that contains RACM, as per EPA or OSHA and Department of Transportation requirements.
 15. The Contractor shall remove and double bag with 6-mil polyethylene sheeting to yield a total of at least 12-mil, the asbestos pipe in the trench or immediately when it comes out of the trench, seal, label, transport, and dispose of all Category II non-friable ACM and RACM in compliance with applicable current federal, state and local regulations, laws, ordinances, rules, standards and regulatory agency recommended requirements.
 16. Time is of the essence in removing the ACM from the project area.
 17. All notifications required to state regulatory agencies and local municipality will be made by the Contractor with copies provided to the Owner.
 18. The Contractor shall have an on-site supervisor, who is an OSHA Competent Person, present on the job site at all times that the ACP work is in progress.
 - a. Supervisor shall be thoroughly familiar with and experienced at asbestos pipe handling using wet techniques and shall be familiar with and shall enforce the use of all safety procedures and equipment.

PENNICHUCK WATER WORKS

- b. Supervisor shall be knowledgeable of all applicable EPA, OSHA, and NHDES asbestos requirements and guidelines.
19. The Contractor has sole and primary responsibility for the “means and/or methods” of the work; an obligation to the Owner to inspect all stages of the work; and sole responsibility to supervise the performance of the work.
20. Certain work practices for ACP disturbance are prohibited as per this Specification.
21. The Contractor shall be responsible for site safety and for taking all necessary precautions to protect the Contractor’s and Owner’s personnel and the public from airborne asbestos exposure and/or injury.
22. The Contractor shall be responsible for maintaining the integrity of the work area.
23. The Contractor shall confine operations at the site to the area requiring interface with the ACP and the general site area in close proximity to the project.
24. The Contractor will not unreasonably encumber the site with materials or equipment.
25. If ACWMs are required to be stored overnight in a secured area, the waste material and waste containers shall be labeled according to OSHA, EPA, and New Hampshire requirements, and containerized to preclude unauthorized disturbance of the ACWMs.
26. The Contractor shall be responsible for obtaining and coordinating waste disposal and transport of ACWM to a permitted asbestos waste landfill.
27. The Contractor shall demarcate the area of ACP interface (“regulated area”) with barrier tape and warning signs, per OSHA regulation 29 CFR 1926.1101.
 - a. Access to the regulated area will be limited to authorized personnel and visitors.
 - b. The contractor shall identify in their site-specific health and safety plan how they intend to limit access and who is authorized to be in the demarcated area.
28. Abandonment of ACP:
 - a. The Contractor is responsible for isolating the existing mains to remain in place by capping, plugging and blocking as necessary.
 - b. The opening of an abandoned ACP and all other openings or holes shall be blocked off by manually forcing cement grout or concrete into & around the openings in sufficient quantity to provide a permanent watertight seal.
29. The Contractor’s on-site Competent Person shall inspect the work area, verify, and certify that no residual ACP fragments and debris remain.
30. The Contractor shall allow for field survey of left-in-place ACP by the Owner prior to completion of the work.

F

DEFINITIONS

ACM	Asbestos-containing material
ACWM	Asbestos-containing waste material
ACP	Asbestos cement pipe
AI	NHDES-certified asbestos inspector
BMPs	Best management practices
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
GPS	Global Positioning System
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHDES	New Hampshire Department of Environmental Services
OSHA	Occupational Safety and Health
Owner	Pennichuck Corporation (Owner), including Pennichuck Water Works (PWV) and Pennichuck Water Service Company (PWSC)
PPE	Personal Protective Equipment
RACM	Regulated Asbestos-Containing Material; friable ACM

Friable - Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. ACP can emit airborne fibers if the materials are cut or sawed, or if they are broken. Friable ACM is considered regulated ACM (RACM).

Category II non-friable ACM - ACP is classified by definition as non-friable, but can become friable as it deteriorates over time or has become or is likely to become crumbled, pulverized, or reduced to powder during the course of the ACP removal.

Competent Person - Competent person means, in addition to the definition in 29 CFR 1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f): in addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR part 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2).

SECTION 01680
Temporary Water Mains and Services

Table of Contents

A..... GENERAL
B..... RELATED PRODUCTS
C..... PRODUCTS
D..... EXECUTION
E..... TESTING

A

GENERAL

The Contractor shall furnish all materials, equipment, incidental Items, and labor necessary to install, maintain, and remove temporary water mains and services as indicated on the Drawings and as detailed in the Specifications.

The Contractor shall hook up temporary water services to every building along the temporary water main route using a minimum pipe size of $\frac{3}{4}$ inch inside diameter unless otherwise specified on the Drawings. Temporary water service shall be provided through exterior sill cocks or through the existing water service pipe in accordance with the Drawings.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill, and Grading

Section 01670 Cleaning and Lining of Cast Iron Water Mains

C

PRODUCTS

1. Temporary Water Mains

- a. All temporary water main pipes shall be of the size specified by the Engineer.
- b. All temporary water main fittings and connections shall be rated for a minimum working pressure of 200 psi.
- c. Temporary water mains not specified by the Engineer shall be designed by the Contractor and approved by the Engineer.

2. Temporary Water Service

All temporary water service pipes shall be 1-inch diameter CTS high-density Polyethylene or its approved equivalent, unless otherwise approved by the Engineer. All temporary water service pipes shall have a minimum inside diameter of ¾ inch.

D

EXECUTION

1. Phasing the Work

- a. All temporary water mains shall be installed as approved by the Engineer. The installation of all temporary water mains shall be phased based on the availability of feed water for the temporary water main. All temporary water mains must be installed, chlorinated, and tested for bacterial contamination testing prior to connecting any temporary water services.
- b. When the Contractor has completed construction of the new water main system, they shall remove all temporary water mains and service and restore all damaged roads, sidewalks, drives, curbs, lawns, and other areas that have been disturbed by the Contractor's construction operations to their original condition.

2. Constructing Temporary Water Mains

- a. If the Contractor decides to install a temporary water main in a location or fashion different from that approved by the Engineer, the Contractor shall prepare Drawings showing the alternate layout together with details of the connections to the point of supply, materials to be used (type and size), details of crossing the traveled way, precautionary measures for the protection of the temporary bypass lines, public health and safety
- b. The Contractor shall ensure that all dead ends on temporary water mains are provided with a valve and a blow-off that can be used when filling or flushing the temporary water main.
- c. The Contractor shall install a pressure-reducing valve on any temporary water main where the anticipated pressure may exceed 80 psi at its low point. The pressure-reducing valve shall be the same size as the temporary water main.

- d. The Contractor shall submit to the Owner an emergency response plan for dealing with any problems that may occur with the temporary water main system while in service. The emergency response plan shall be cover the work site 24 hours per day and seven days per week with a maximum response time of 30 minutes. The emergency response plan shall be approved and in place before beginning work on installing the temporary water main system.
- e. The Contractor shall ensure that all temporary water mains are buried at each street crossing. Temporary water mains shall be ramped at each driveway crossing and each sidewalk crossing per *Standard Detail T04*. The Contractor shall deploy watchmen, lights barriers, signs, and such other methods as may be necessary or required to prevent injury to persons and property and to comply with all Federal, State and municipal safety codes, ordinances, and regulations.
- f. The Contractor shall ensure that all temporary water mains are located outside of the traveled way except where impractical. The temporary water main shall be placed in a location where it will cause the least obstruction and inconvenience and where it will be subject to the least amount of possible damage.
- g. Fire Department connections shall be provided in locations specified by the Engineer and as shown on *Standard Detail T03*.

3. Constructing Temporary Water Service Lines

- a. The Contractor shall ensure that temporary water service lines are hooked up to every building along the temporary water main route. Temporary water service shall be provided through exterior sill cocks or through the existing service.
- b. The Contractor shall ensure that all sill cock connections are made using a “Siamese” connection with two shut-off valves. The first shut-off valve shall be used to control the temporary water service flow and second shut-off valve shall have a standard hose bib thread to allow for the continued use of the sill cock for any outside watering requirements.
- c. The Contractor shall ensure that all sill cock connections are made with sufficient slack left in the temporary water service line to allow for movement of at least 3 feet in either direction from its original location to facilitate any lawn and yard maintenance.
- d. The Contractor shall ensure that each temporary water service line is connected to the temporary water main with a ball-style corporation shut-off valve.

- e. When the Contractor has completed construction of the new water main system, they shall remove all temporary water mains and service lines and restore all damaged roads, sidewalks, drives, curbs, lawns, and other areas that have been disturbed by the Contractor's construction operations to their original condition.

E

TESTING

1. Conducting Pressure Tests

- a. The Owner's Representative shall conduct a thorough visual inspection of all newly-placed temporary water services after the Contractor has completed their installation work and before any backfill operations begin.

2. Conducting Flushing and Disinfection Operations

The Contractor shall conduct flushing and disinfection operations using methods and procedures that meet the requirements of *AWWA C601*. All costs associated with flushing and disinfecting the temporary water main shall be borne by the Contractor.

Samples from the disinfected water main shall be submitted to an EPA approved laboratory for bacteriological analysis. If the sample fails bacteriological testing, the Contractor shall then perform additional flushing and disinfection operations until subsequent test samples indicate safe bacteria levels.

Any additional flushing and disinfection operations shall be conducted at the Contractor's expense.

The Contractor shall install suitable taps at the end of the disinfected water main to enable the collection of samples for bacteriological testing.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01800

Crushed Gravel

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D EXECUTION

A

GENERAL

The Contractor shall furnish, place, and compact crushed gravel in authorized excavations as ordered by the Owner's Representative and as indicated on the Plans.

B

RELATED WORK

Section 02300 Paving

C

PRODUCT

The Contractor shall use crushed gravel that has been screened and well-graded in sizes from $\frac{3}{8}$ inch to $\frac{3}{4}$ inch, or other such sizes as may be approved by the Engineer. Approved gravel shall consist of clean, hard, and durable particles or fragments. Approved gravel shall be free of dirt, vegetable matter, or any other objectionable materials, and shall not have an excess of soft, thin, elongated, laminated, or disintegrated pieces.

Gravel shall meet or exceed the requirements of the New Hampshire DOT General Specifications for Item No. 304.3, *Crushed Gravel* or Item No. 304.4, *Crushed Stone (Fine)*. The Contractor may substitute the use of screened crushed gravel with suitably sized and graded crushed stone with the Engineer's approval. The Specifications in this section shall apply to both aggregate types.

D

EXECUTION

- a. The Contractor shall ensure that the crushed gravel is spread in layers of uniform thickness not greater than 12 inches, and then thoroughly compacted by means of a suitable vibrator or mechanical tamper. The Contractor shall ensure that the crushed gravel is compacted to at least 95% maximum dry density and meets the requirements of *ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))*.
- b. The Contractor shall ensure that all subgrade lifts are rolled with a vibratory roller capable of producing a dynamic force of 27,000 lbs, making four passes over the subgrade prior to placing the crushed gravel.
- c. The Owner shall assume the responsibility for employing a competent and licensed Soils Engineering firm to conduct testing and analysis as may be required. The Contractor shall provide access for Soils Engineer to the crushed gravel to be used on this job a minimum of two weeks prior to the placement of any structural fill so that the maximum soil density may be properly determined.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 01900

Gravel Aggregate for Road Base and Water Main Backfill

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D..... EXECUTION

A

GENERAL

The Contractor shall furnish, place, and compact bank run gravel as indicated on the Drawings or as ordered by the Engineer

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill, and Grading

Section 01600 Water Main Pipe and Fittings

Section 01800 Crushed Gravel

C

PRODUCT

The Contractor shall use bank run gravel that is granular material, well-graded in sizes from fine to coarse, with a maximum size of 6 inches. Bank run gravel shall meet or exceed the requirements of the New Hampshire DOT General Specifications for Item No. 304.2, Gravel. The Contractor shall ensure that bank run gravel is obtained from approved natural deposits and unprocessed except for the removal of unacceptable materials and stones larger than the maximum size permitted.

D

EXECUTION

Bank run gravel shall be spread in layers of uniform thickness not exceeding 12 inches before compaction and moistened or allowed to dry as directed. Then it shall be thoroughly compacted by means of suitable power driven tampers or other power driven equipment to at least 95% maximum dry density to meet the requirements of *ASTM D1557*.

SECTION 02000

Common Borrow

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D EXECUTION

A

GENERAL

The Contractor shall furnish, place, and compact selected borrow as indicated or directed. In most cases, common borrow will be generally classified as material (other than rock) excavated from the trench unless deemed unsatisfactory by the Engineer due to the presence of substantial amounts of clay, vegetable matter, or other deleterious material.

If additional common borrow is required beyond that available from normal excavation activities, then such common borrow shall meet the minimum requirements specified in this Section.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill, and Grading

C

PRODUCT

The Contractor shall use common borrow that meets the following requirements:

- Common borrow shall be inorganic natural soils and/or rock having not more than 5% by weight passing the No. 200 sieve.
- Common borrow shall have a maximum stone size of 6 inches and material well-graded throughout entire site range.
- Common borrow shall be free from roots, leaves, and other organic materials.
- Common borrow shall be free from ice or frost with no frozen soil particles
- Common borrow shall have a moisture content that is $\pm 4\%$ of the optimum moisture content at the borrow source.

D

EXECUTION

The Contractor shall spread selected borrow in layers of uniform thickness not exceeding 12 inches before compaction and moistened or allowed to dry as directed. The Contractor shall compact common borrow thoroughly by means of suitable power-driven tampers or other power-driven equipment. Refer to *Standard Detail M02* for more information.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 02100

Sand

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D EXECUTION

A

GENERAL

The Contractor shall furnish and place sand as indicated on the Drawings, as directed by the Engineer, or as herein specified.

B

RELATED WORK

Section 01400 Excavation, Backfill, Fill and Grading

Section 01650 Water Service Materials

Section 02450 Styrofoam Insulation

C

PRODUCT

Aggregate for sand shall be sand of hard, durable particles free from vegetable matter, lumps or balls of clay, and other deleterious substances. The gradation shall meet the grading requirements of the following table:

Table 02100A – Sand Aggregate Gradation

Sieve Designation	% by Weight Passing Square Mesh Sieve
3/8 in	85 – 100
No. 200	0 -10

D

EXECUTION

The Contractor shall spread sand in layers of uniform thickness not exceeding 12 inches before compaction and moistened or left in natural state as directed. The Contractor shall thoroughly compact the sand by means of suitable power-driven tampers or other power-driven compaction equipment.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 02200

Loam and Seed

Table of Contents

A..... GENERAL
B..... SUBMITTALS AND TESTING
C..... PRODUCT
D..... EXECUTION
E..... MAINTENANCE AND ACCEPTANCE

A

GENERAL

The Contractor shall furnish all labor, materials, tools, and equipment necessary to do all loaming and seeding and temporary seeding where indicated on the Drawings and as herein specified.

B

SUBMITTALS AND TESTING

1. Loam

- a. The Contractor shall provide two representative 5-gallon topsoil samples to the Owner's Representative 15 days prior to its use on-site. Samples shall indicate the location of the source material. If additional sources shall be used during the project, the Contractor shall provide samples for all locations. At the Owner's Representative's request, the Contractor shall have the topsoil sample tested for physical properties and pH (or lime requirement), organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soils testing for agricultural uses.
- b. All topsoil shall be screened clear of all stones greater than ½ inch, as well as sticks, plants and all other foreign materials before being spread. 100% of the material shall pass the ½ inch sieve and at least 90% shall pass the No. 10 sieve.
- c. All topsoil shall have a pH range between 6 – 7.

C

PRODUCT

1. Loam

- a. Loam shall be a good grade of topsoil from a site approved by the Owner's Representative. The loam shall be loose and friable and shall be free from admixtures of subsoil, refuse, large stones, clods or roots, or any other undesirable foreign matter. Muck, peat, or other excessively acidic soils containing undue proportions of either clay or sand will not be accepted.

The Owner's Representative will have final determination as to whether the topsoil is representative of the submitted topsoil samples. If any materials are found to be inadequate, the Owner's Representative will reject them and the rejected topsoil will be removed from the site at the Contractor's expense.

- b. When designated on the Plans or as directed, existing topsoil found within the lines of improvement in excavation areas, embankment areas, or both, shall be excavated and stockpiled by the Contractor for later use as loam on slopes and other areas, or on future work. Stockpiles shall be placed at designated locations.

Additional loam to complete the project, if required, shall be obtained by the Contractor from sources beyond the site. Unless designated for future work, salvaged topsoil not required for use on slopes shall be graded to match the surrounding terrain and the area seeded and mulched.

2. Permanent Seed

- a. Seed shall be certified as to its proper mixture, germination, and purity qualities. Each variety of seed shall have germination rate of at least 80%, a purity of at least 85%, and a weed content of no more than 1%. All seed shall be from the same or previous year's crop unless recent tests by an approved testing agency demonstrate that older seed meets the above requirements.

PENNICHUCK WATER WORKS

b. The seed mixture shall consist of seed proportioned percent by weight as follows:

Method Number 1 – Park Mixture	
Creeping Red Fescue	50%
Kentucky Bluegrass	30%
Annual Ryegrass	20%

3. Temporary Seed

Temporary seed shall be Winter Rye.

4. Mulch

- a. Hay or straw mulch shall consist of long-fibered hay or straw, reasonably free from noxious weeds and other undesirable material. No material shall be used which is so wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings, or any other short-fibered material shall be used unless directed.
- b. Cellulose fiber mulch shall consist of elongated virgin wood fibers capable of producing a strong yellow-brown reaction with Graff C Stain for the presence of lignin in accordance with *TAPPI Test T 401 OS-74*. The ash content shall not exceed 2.0%.
- c. The material shall be non-toxic to plants and animals upon contact and shall contain a green color sufficient to provide a definite contrast with the ground surface for metering purposes. It shall be supplied in uniform moisture resistant package not exceeding 100 pounds each and marked to show the air-dried weight for tank mixing purposes.

D

EXECUTION

1. Loam

Loam shall be spread uniformly on prepared areas to the depth of 4 inches as shown on the Plans or as directed. Any remaining clods, roots, stones measuring over ½ inch, and all other foreign matter, shall be removed. All loam shall be brought to a true, even surface, meeting the required grade.

2. Seeding Method for Permanent Seed

- a. Preparing the Soil. After the loamed or un-loamed areas to be seeded have been brought to grade, all ground not loose and friable shall be scarified to a depth of at least 2 inches immediately before seeding or mulching. All stones measuring over ½ inch and all objects which would be detrimental to mowing shall be removed and disposed of as directed. Hand raking will not be required provided an acceptable surface can be obtained by other means.
- b. Fertilizing and Applying Agricultural Ground Limestone. Fertilizer and agricultural ground limestone shall be applied at a rate of 30 pounds of 10-10-10 fertilizer per 1,000 square feet of loamed area. Ground limestone shall be applied at a rate of 25 pounds per 1,000 square feet of loamed area.
- c. Sowing Seed. The seed shall be sown as specified in the NHDOT Standard Specifications for Road and Bridge Construction unless otherwise indicated on the Plans or as approved. The seed shall be Park Mixture as specified above and shall be applied at a minimum rate of 3 pounds per 1,000square feet of loamed area.
- d. Mulching. Mulch shall be applied as specified in the NHDOT Standard Specifications for Road and Bridge Construction unless otherwise indicated on the Plans or as directed. Mulch should be applied at a rate of 1 to 2 tons per acre in a uniform blanket. Clumped or thick mulch shall be thinned.

3. Seeding Method for Temporary Seed

- a. Sowing Seed. The seed shall be sown as specified in the NHDOT Standard Specifications for Road and Bridge Construction unless otherwise indicated on the Plans or as directed.

- b. Mulching. Mulch shall be applied as specified in the NHDOT Standard Specifications for Road and Bridge Construction unless otherwise indicated on the Plans or as directed.

4. **Hydroseeding**

Hydroseeding with a cellulose fiber mulch applied as a waterborne slurry at a rate of 60 pounds of mulch per 1,000 square feet of area, when mixed with proper quantities and types of seed, fertilizer, and agricultural limestone, may be used in lieu of separate mulching and seeding.

E

MAINTENANCE AND ACCEPTANCE

1. Seeding, Watering, and Repairs

Seeding shall be done by either method between the dates of March 31st to September 30th, inclusive. The Contractor shall maintain each seeded area until acceptance of the individual area.

Important: Maintenance shall include watering the newly-seeded area until permanent grass growth is established over 85% of the disturbed area.

The Contractor is responsible for all cost of watering; including the cost of the water. Maintenance shall also consist of providing protection by erecting necessary signs or barriers and by repairing damaged areas as directed. Damaged areas shall be repaired by reestablishing the grade of the area prior to damage and by reapplying mulch. Refertilizing and reseeded will not be required during this period.

Necessary maintenance or repairs will not be paid for but shall be considered incidental to the Contract. Areas fertilized, seeded, and mulched by either method between October 1st and March 31st will be accepted only upon attainment of a reasonably thick uniform stand of grass free from sizable thin or bare spots.

2. Maintaining Seeded Areas

When all other work on the project has been completed and some seeded areas still have not been accepted, the Contractor shall maintain those areas for an additional 60 days, exclusive of the periods from November 15th to April 15th. The seeded areas will be accepted upon attainment of a reasonably thick uniform stand of grass.

If unaccepted areas still remain at or near the end of the 60-day maintenance period, the Owner's Representative may direct a final reseeded by the Contractor or may deduct the Contract value of the unaccepted area from payment due the Contractor. In either event, the Contractor's responsibility for the seeded areas will terminate at the end of 60 days and the seeded areas will be accepted as complete.

3. Acceptance

The acceptance of any seeded area shall be in writing. After acceptance, the Contractor will be relieved of further expense for maintaining the areas, except for damage resulting from their own or their Subcontractor's operations.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 02250

Chain Link Fence

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCTS
D..... EXECUTION

A

GENERAL

The Contractor shall furnish and install chain link fencing, gates, barbed wire, and other associated materials as indicated on the drawings and as detailed within the specifications below.

B

RELATED WORK

Section 01400.....Earth Excavations, Backfill, Fill, & Grading

C

PRODUCTS

1. Chain Link Fence

- a. All fence posts, tension wire, barbed wire and mesh shall be hot dipped galvanized. The fence post, top rail, tension wire and mesh shall also be poly-vinyl coated.
- b. Fence Posts -
 - i. Line Posts - Shall be 2-1/2" in diameter, Schedule 40 and shall be hot dipped galvanized.
 - ii. Terminal/Corner Post - Shall be 3" in diameter, Schedule 40 and shall be hot dipped galvanized terminal posts shall be set at all changes in fence direction exceeding 45 degrees.
 - iii. Gate Posts - Shall be 4" diameter, Schedule 40 and shall be hot dipped galvanized.
- c. Fence mesh shall be 2" square and shall be hot dipped galvanized after weaving. The wire gauge of the mesh will be No 9. Where specified on the plans the wire mesh shall be coated with a minimum of 7 mils of poly-vinyl chloride permanently bonded to the galvanized wire via thermal fusion bonding.

PENNICHUCK WATER WORKS

- d. The fence shall be provided with a 1-5/8" top rail. The top rail shall be hot dip galvanized. The fence shall be equipped with a bottom galvanized tension wire. The bottom tension wire shall be a minimum of 7 gauge and shall be attached to the fence mesh at maximum intervals of 24" with 11 gauge hog rings. Where the fencing is vinyl coated the bottom tension wire and hog rings shall also be vinyl coated. The top of the fence shall be provided with three strands of barbed wire, pointing out from the top of the fence at a 45 degree angle.
- e. Provide the fence mesh with an intermediate horizontal brace in order to produce fence stability at all terminal and gate posts. Where brace rods are used they shall be equipped with a 3/8" diameter truss rod and turnbuckle. The truss rod and turnbuckle shall be hot dipped galvanized.
- f. The top of the fence and gates shall be protected with three strands of barbed wire supported on arms that are supported on the posts and shall be at approximately 45 degrees to the vertical. The barbed wire and supports shall be capable of supporting a minimum of 250# load applied to the outer barbed wire strand without breaking. The barbed wire shall be hot dipped galvanized and shall conform to ASTM A-121, chain link fence grade.
- g. Gate - The gate latch, hinges, and bracing shall be hot dip galvanized. The gate shall have a center pin that latches the gate leafs into the ground. Provide a 1" diameter by 18" long galvanized receiver pipe in the ground below the center of the gates to receive the center pin.

D

EXECUTION

1. All fence posts shall be set true and vertical.
2. Line posts shall be set a minimum of 32" deep in a concrete footing. The concrete shall be a minimum of 2,000 psi concrete @ 28 days.
3. Terminal posts shall be set a minimum of 36" deep in a concrete footing.
4. Gate posts shall be set a minimum of 42" deep in a concrete footing.
5. All concrete footings shall extend at least 4" below of the post set in them. Minimum concrete footing diameter for line and terminal posts is 12". The minimum concrete footing diameter for gate posts is 15".
6. Posts spacing shall not exceed 10' on center.
7. The bottom of the fence mesh shall be within 2" of the ground.

SECTION 02300

Paving

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... QUALITY ASSURANCE
D..... SUBMITTALS
E..... PRODUCT
F..... EXECUTION

A

GENERAL

The Contractor shall provide all labor, tools, equipment and materials required to pave the all areas to the thickness and types as defined on the Plans. All paving construction methodologies shall meet or exceed those defined in *Section 401, Plant Mix Pavements – General* of the current NHDOT Standard Specifications for Road and Bridge Construction.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill, and Grading

Section 01800 Crushed Gravel

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

Section 02600 Clean Up

C

QUALITY ASSURANCE

The Contractor shall ensure that their paving operations conform to the requirements of *Section 304 – Aggregate Base Course* and *Section 403 – Hot Bituminous Paving* of the current NHDOT Standard Specifications for Road and Bridge Construction.

The Engineer reserves the right to inspect all paving materials and the preparation of paving materials at the paving plant.

The Contractor shall ensure that paving operations are conducted in accordance with all State and local requirements.

D

SUBMITTALS

The Contractor shall submit a paving mix design with laboratory tests certifying conformance with Specifications for the bituminous paving materials to the Engineer.

The Contractor shall submit a certification by the bituminous paving material plant of conformance with all referenced standards.

The Contractor shall submit plant batch slips with each batch of bituminous paving material delivered to the work site to the Engineer.

E

PRODUCT

1. Bituminous Paving Materials

The Contractor shall that ensure that all bituminous paving materials are supplied in accordance with *Section 401 – Plant Mix Pavements – General* and *Section 403 – Hot Bituminous Paving* of the current NHDOT Standard Specifications for Road and Bridge Construction. Specific types of bituminous paving materials to be placed shall be as specified on the Drawings or in the Standards Details.

The Contractor shall that ensure that bituminous paving materials meet all State and local requirements.

2. Aggregate Base Course Materials

The Contractor shall that ensure that all aggregate base course materials are supplied in accordance with *Division 300, Section 304 – Aggregate Base Course* of the current NHDOT Standard Specifications for Road and Bridge Construction.

F

EXECUTION

1. Placing Aggregate Base Course

- a. The Contractor shall ensure that all aggregate base course used as fill and backfill is the proper type for the pavement type it is designed to support. Backfill shall meet the requirements of *Section 01400 Earth Excavation, Backfill, Fill, and Grading*.
- b. The Contractor shall ensure that the aggregate base course surface is properly maintained in an undisturbed condition until the pavement has been placed. The Contractor shall ensure that any damaged or eroded aggregate base course is properly repaired and restored to grade before commencing paving operations.

2. Placing Bituminous Paving

- a. The Engineer shall inspect the bituminous paving material at the paving plant and determine its suitability for the project.
- b. The Contractor shall saw cut all existing pavement where it will match into the new pavement as indicate on the Drawings. The Contractor shall ensure that the saw cutting operations meet the requirements of *Section 628, Sawed Pavement* of the NHDOT Standard Specifications for Road and Bridge Construction.
- c. The Contractor shall place and compact bituminous paving at the thickness specified or as directed by the Engineer. The Contractor shall verify that the pavement has been compacted to the proper thickness once compaction operations have concluded.
- d. The Contractor shall ensure that the position of all manhole covers, catch basin grates, valve boxes, and similar Items in the paved area are adjusted as necessary to conform with the finished and base pavement grades or as directed by Engineer.
- e. The Contractor shall ensure that all joints between the existing pavement and the new pavement are tack coated in accordance with *Section 401* of the NHDOT Standard Specifications for Road and Bridge Construction.

PENNICHUCK WATER WORKS

- f. The Contractor shall furnish, install, maintain, and later remove all safety devices necessary to ensure public safety as they conduct their paving operations as required and in accordance with the Specifications.
- g. The Contractor shall ensure that all surplus and unsuitable materials are removed and disposed of properly.
- h. Core samples may be required to confirm the quality and design parameters of the bituminous paving materials. The Owner is responsible for the cost of taking and testing core samples. Failed core sample tests are the Contractor's responsibility.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 02400
Concrete Thrust Blocks

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D..... EXECUTION

A

GENERAL

The Contractor shall ensure that all mechanical joint fittings, including elbows, tees, hydrants, and branches, are protected against separation caused by unbalanced hydrostatic and hydrodynamic thrust forces. The Contractor shall supply all materials, labor, and equipment as required to install cast-in-place or precast concrete thrust blocks backed by undisturbed or properly compacted soil to ensure the integrity of the joint fittings at the locations indicated on the Drawings or as directed by the Engineer.

The Contractor shall ensure that cast-in-place or precast concrete thrust blocks meet the requirements of *ACI 304R-00 - Guide for Measuring, Mixing, Transporting, and Placing Concrete*.

All cast-in-place concrete thrust blocks shall be of the “mass” design utilizing no reinforcing steel, except for hooks as required for resistance-type thrust blocks.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill and Grading

Section 01600 Water Main Pipe and fittings

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

C

PRODUCTS

1. Concrete Thrust Blocks

- a. All cast-in-place and precast concrete thrust blocks shall be fabricated with Type III A air-entrained portland cement and be plant-batched. The concrete shall be Class A with a minimum 28-day compressive strength of 3,000 psi, a maximum water/cement ratio (gallons per bag of cement) of 0.53 and a maximum slump no greater than 6 inches.
- b. All cast-in-place concrete thrust blocks shall be sized as designated on the Drawings, but no cast-in-place concrete thrust block shall have a volume of less than $\frac{3}{4}$ cubic yard.
- c. All precast concrete thrust blocks shall have the following minimum dimensions: 2-foot width \times 3-foot length \times 2-foot height, or as specified by the Owner's Representative.

D

EXECUTION

1. Installing Cast-in-Place Concrete Thrust Blocks

- a. The Contractor shall ensure that fresh concrete is placed within 1½ hours after mixing, with no water added to the mix at the job site. The Contractor shall ensure that the concrete's specified maximum water content is not exceeded.
- b. The Contractor shall ensure that the fresh concrete is placed such that it is not allowed to fall freely more than 5 feet to avoid aggregate segregation.
- c. The Contractor shall ensure that the fresh concrete is consolidated by spading or by mechanical vibration.
- d. The Contractor shall ensure that the fresh concrete has cured for at least one hour prior to commencing any backfilling operations. The concrete forms may be left in place while backfilling.

2. Installing Precast Concrete Thrust Blocks

- a. The Contractor shall ensure that precast concrete thrust blocks are installed directly behind the joint fitting it is restraining, with the face of the block at right angles to the total force vector.
- b. The Contractor shall ensure that precast concrete thrust blocks are installed with aggregate base course between the thrust block and undisturbed earth. The Contractor shall ensure that the aggregate base course meet the requirements of *Section 01900 Gravel Aggregate for Road Base and Water Main Backfill*. The aggregate base course shall be placed in lifts that have a maximum thickness of 12 inches and compacted to a minimum Proctor of 95%. Hand tamping and rodding shall be used to drive the crushed gravel into all voids surrounding the thrust block.

SECTION 02450
Styrofoam Insulation

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D..... EXECUTION

A

GENERAL

All pipelines that have been buried with less than 4 feet of cover shall have Styrofoam™ board insulation mounted over the top of the water main to provide frost protection in accordance with the details on the Drawings.

Styrofoam board insulation shall be installed near all catch basins and storm drains to provide frost protection. Refer to *Standard Detail M16*, *Standard Detail M17*, *Standard Detail M18*, and *Standard Detail M19* for more information.

B

RELATED WORK

Section 01600 Water Main Pipe and Fittings

Section 01900 Gravel Aggregate for Road Base and Water Main Backfill

Section 02100 Sand

C

PRODUCT

1. Specifying Styrofoam Insulation Board Parameters

- a. All Styrofoam insulation used shall be board type, with a minimum thickness of 2 inches and minimum dimensions of 2 feet width × 8 feet length.
- b. All Styrofoam insulation used shall be closed cell, high density insulation suitable for direct burial in the ground.

D

EXECUTION

- a. The Contractor shall ensure that water mains buried less than 4 feet deep are first covered by a layer of properly compacted sand with a thickness of 6 inches. The Contractor shall then install Styrofoam insulation boards laid side-by-side to achieve a minimum width of 4 feet with staggered seams, centered over the water main.
- b. The Contractor shall ensure that Styrofoam insulation boards are installed adjacent to catch basins and storm drains as shown on the Drawings. Aggregate base course may then be placed directly on the insulation and properly compacted for the roadway base.
- c. Styrofoam insulation shall be installed above all water service lines that run beneath driveways and parking lots.
- d. Styrofoam insulation shall be installed vertically at specified locations in the field as directed by the Owner's Representative.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 02500
Managing Water Flow During Construction

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D..... EXECUTION

A

GENERAL

The Contractor shall assume the responsibility of managing the flow of water and dewatering excavations at the work site during construction activities. The Contractor shall provide and deploy all necessary equipment and personnel, including pumping apparatus to accomplish this.

B

PERMITS

Permits for managing water flow during construction shall be obtained and paid for by the Contractor. Permits required may include the following:

- New Hampshire *RSA 485-A:17 – Terrain Alteration* (a site-specific permit concerning water quality)
- Construction Dewatering Permit
- EPA Dewatering Permit

C

EXECUTION

1. Dewatering Excavations

The Contractor shall ensure that all excavation work below ground water level is dewatered by approved methods to prevent saturated soil from flowing into the excavation, undermining existing structures, breaking up the naturally undisturbed earth in the banks, or loosening foundation materials. The Contractor shall lower the water level in advance of excavation and maintain a level such that any structures may be placed on a firm and dry foundation.

2. Deploying Pumping Apparatus

- a. The Contractor shall deploy personnel and pumping apparatus with adequate power and capacity to remove all water which may be encountered in their excavation work. The Contractor shall also keep additional pumps of sufficient power and capacity on hand and at the ready at the work site to provide backup for any unanticipated equipment breakdown or handle flooding issues.
- b. The Contractor shall ensure that all pumped water is discharged at a location and in such a way that there is no adverse impact on the environment. If the water being discharged contains sediment, it shall be pumped through appropriately-sized erosion control facilities such as hay bales or silt fences.

3. Constructing and Maintaining Temporary Water Control Structures

- a. The Contractor shall develop Drawings and details for any temporary water control structures, especially in jacking and receiving pits, to the Owner's Representative for their review and approval. The Contractor shall submit their proposal for temporary water control structures at least two weeks in advance of any construction work.
- b. The Contractor shall ensure that the construction of any temporary water control structures, the maintenance and proper operation of the same, and all other operations connected therewith, are carried out in a satisfactory manner. The Engineer may at any time require the Contractor to increase the precautions taken or to demand additional steps to make the temporary works adequate, substantial, and secure. Such directions or instructions given from time-to-time by the Engineer shall in no way relieve the Contractor from their entire responsibility for the efficiency and safety of these works.
- c. The Contractor shall make their own estimates of the necessary size, strength, and configuration of temporary water control structures, and shall assume all expenses and losses which may result from their inadequacy or from failure due to any cause whatsoever. Any work destroyed or damaged thereby shall be repaired or replaced by the Contractor at their expense.

4. Monitoring Water Turbidity

In waters that are used as a source of 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 not be increased more than allowed by applicable Federal, State, and local regulations.

SECTION 02550

Dust Control

Table of Contents

A..... GENERAL
B..... RELATED WORK
C..... PRODUCT
D..... EXECUTION

A

GENERAL

This section of the Specifications covers the control of dust with Calcium chloride and water.

B

RELATED WORK

Section 01400 Earth Excavation, Backfill, Fill and Grading

Section 01600 Water Main Pipe and Fittings

C

PRODUCTS

1. Calcium Chloride

- a. Calcium chloride used for dust control shall meet the requirements of *AASHTO M 144, Standard Specification for Calcium Chloride* and *ASTM D98, Standard Specification for Calcium Chloride*.
- b. Calcium chloride shall be securely packaged in moisture-proof bags marked with the following information:
 - Manufacturer
 - Product name
 - Net weight
 - Percentage of Calcium Chloride guaranteed by the manufacturer

- c. Calcium chloride shall be delivered to the work site in a dry condition. Calcium Chloride that has been improperly packaged, stored, or handled resulting in it becoming caked or sticky, or otherwise compromised by excessive moisture, shall be rejected for use by the Owner.

2. Water

Water used for dust control shall be clean, fresh not brackish, and free of any oils, acid or alkaline chemicals, vegetable matter, or other debris.

D

EXECUTION

1. Applying Calcium Chloride for Dust Control

- a. The Contractor shall apply Calcium chloride for dust control when ordered to do so by the Owner's Representative. The Contractor shall ensure that Calcium chloride is applied only in areas which will not be adversely affected by the application.
- b. The Contractor shall ensure that Calcium chloride is applied at a rate of 1½ pounds per square yard or at any other rate as directed by the Owner, using a mechanical spreader or other approved method. The number and frequency of Calcium chloride applications shall be determined by the Owner.

2. Spraying Water for Dust Control

- a. The Contractor shall ensure that water sprayed for dust control is dispersed through a nozzle with a minimum pressure of 20 psi gauge.
- b. The Contractor shall use a sprayer with a nozzle-equipped spray bar that is connected to a water tank and a pump.
- c. The Contractor is responsible for the cost of water drawn from hydrants for use in dust control.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

SECTION 02600
Work Site Clean Up

Table of Contents

A.....EXECUTION

A

EXECUTION

1. Conducting Work Site Clean Up Operations

- a. The Contractor shall ensure that the work site and adjacent areas are maintained in an orderly condition, and kept cleaned up, with all rubbish, surplus materials, and unneeded construction equipment removed as necessary. Any property damage caused by the Contractor's operations shall be repaired in a way that inconveniences the public and property owners as little as possible.
- b. The Contractor shall ensure that any material or debris that has washed into or may be found in existing watercourses, ditches, gutters, drains, pipes, or other structures, and caused by the Contractor's work, is entirely removed and satisfactorily disposed of, in a timely manner. All ditches, channels, drains, pipes, and other structures shall be left in a clean and neat condition upon completion of the work.
- c. The Contractor shall ensure that, on or before the completion of the work, all temporary buildings and structures are removed, unless otherwise permitted in writing by the Owner's Representative. The Contractor shall ensure that all temporary works, tools, machinery, and any other construction equipment furnished by them is removed.
- d. The Contractor shall ensure that all rubbish generated by their operations is removed and properly disposed of in a roll-off container, daily. Roll-offs used shall be removed from the work area once they are filled. The Contractor shall ensure that all organic matter that may be found in, under, and around privies, houses, and other buildings used by them is removed, acceptably disinfected, and covered.
- e. The Contractor shall ensure that all roads, shoulders, grounds, and all parts of the premises and adjacent property affected by their operations are left in a neat and satisfactory condition, as required by the Contract and the approval of the Engineer. The Contractor shall ensure that all disturbed property is returned to its original grade and cover unless specified otherwise in the Drawings and Specifications or approved by the Engineer.

SECTION 02700
Measurement and Payment

Table of Contents

1 WATER MAIN
2 FITTINGS (FOR MAINS)
3 VALVES
4 SERVICES
5 HYDRANTS
6 EARTHWORK
7 MISCELLANEOUS
8 INTERIOR PLUMBING

GENERAL

The following subsections describe the measurement of and payment for the work to be done under the items listed in the Bid Schedule. Each unit or lump sum price stated in the Bid Schedule shall constitute full compensation as herein specified for each item of work completed in accordance with the Drawings and Specifications, including clean up.

After work is completed, the Owner's Representative shall make final measurements to determine the quantities of various items of work accepted as the basis for final settlement. The Contractor, in the case of unit price items, will be paid for the actual amount of work accepted and for the actual amount of materials in place, as shown by the final measurements.

SECTION NO. 1: WATER MAIN

ITEM NO. 1-X-YY: Water Main and Size

1. Method of Measurement:

- a. The length of pipe for water mains shall be measured by the linear foot along the horizontal centerline of the pipe including fittings.
- b. Measurement shall be along the water main installed and backfilled in the trench.
- c. Note:
 - i. X = Type of Pipe
 1. Ductile Iron
 2. PVC
 3. HDPE
 - ii. YY = Diameter of Pipe in inches
 - iii. Example: 12 inch Ductile Iron Water Main shall be represented as 1-1-12.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all layout, saw cutting, labor, field cut pipe (gauge), materials and equipment necessary to excavate the trench and/or directional drilling pits for, install water main, backfill and compact the trench, and include restoration to subgrade.

- b. The cost of pressure testing and disinfecting the water main will account for 10% of this bid item and shall be retained until completion.

SECTION NO. 2: FITTINGS (FOR MAINS)

ITEM NO. 2-X-YY OR 2-X-YYxZZ: Fittings (For Mains) and Size

1. Method of Measurement:

- a. This item shall be paid for on a unit basis with a unit being one MJ fitting installed complete with retainer glands, 3/4" stainless steel threaded rod, hardware at each joint, and a precast thrust block as required on the plans and designated in the specifications.

- b. Note:

- i. X = Type of Fitting

- 1. Bend (all degrees)
 - 2. Solid Sleeve
 - 3. Coupling
 - 4. Reducer
 - 5. Tee
 - 6. Swivel Tee
 - 7. Foster Adapter
 - 8. Cap/Plug
 - 9. Stainless Steel Tapping Sleeve
 - 10. Ductile Iron Mechanical Joint Tapping Sleeve
 - 11. Steel Tapping Sleeve for 16-inch and 24-inch Asbestos Cement Pipe
 - 12. Blank

- ii. YY = Size of Fitting in inches

- iii. ZZ = Second dimension of the fitting in inches (Example: 12"x14" Reducer or 8"x6" Tee)

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install the fitting as specified, including the excavation, backfill and restoration to the subgrade as designated on the Drawings.

SECTION NO. 3: VALVES

ITEM NO. 3-X-YY: Valve and Size

1. Method of Measurement:

- a. This item shall be measured and paid for on a unit basis with a unit being one either a MJ Valve or Air Release Assembly.
- b. MJ Valves are to be complete with retainer glands and 3/4" stainless steel threaded rod with stainless steel rod fittings at each joint and a valve box complete with cover as shown on the Drawings and designated in the Specifications.
- c. Air Release Assembly's are to be complete including, but not limited to Type K Copper tubing or CTS HDPE tubing, tapping saddle, CTPJ corporation stop, CTPJ x 90 degree bends, CTPJ x FIP adapter, MIP plug, CTPJ curb stop with operating rod and curb box assembly, gate box tops, stainless steel plastic tubing reinforcing inserts, rigid insulation panels and pressure treated blocking. All materials on Standard Details M-03 through M-07 including the tapping sleeve and corporation shall be included in this bid item.

d. Note:

- i. X = Type of Valve
 - 1. Gate
 - 2. Butterfly
 - 3. Tapping
 - 4. Altitude
 - 5. Air Release Assembly
 - 6. Ball Valve
 - 7. Blank
- ii. YY = Size of Valve in inches

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install the valve as specified, including the excavation and backfill to designated subgrade and cover as designated in the Drawings.

SECTION NO. 4: SERVICES

ITEM NO. 4-1: Service Reconnection

1. Method of Measurement:

- a. This item shall be paid for on a unit basis and shall be installed as detailed on the Drawings and in the Specifications.

2. Basis of Payment:

- a. The unit price for this item shall include all the labor, materials and equipment necessary to reconnect an existing copper service from the existing water main to the new water main.
- b. The existing copper service shall be connected to a piece of new 1" Type K copper tubing that is tapped into the DIPCL or PVC water main with a corporation and tapping saddle (as required) as shown on the Drawings.
- c. This payment item shall include the installation of a 1" wet tap, a tapping saddle if required, 1" corporation, 1" type K copper from the corporation to the existing copper service, a Copper by Copper brass compression coupling, and the excavation and backfilling to sub grade as designated on the Drawings.
- d. The quantities of pipe, fittings, parts and labor associated with this work shall be compensated for in this payment item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

ITEM NO. 4-2-X-Y: Service Tubing

1. Method of Measurement:

- a. This item shall be paid for on a linear foot basis and shall be installed as shown on the Drawings and detailed in the Specifications.

b. Note:

- i. X = Type of Tubing
 - 1. Copper
 - 2. HDPE
 - 3. Blank
- ii. Y = Size of Tubing in inches

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials and equipment necessary to excavate the trench, install, bed, and backfill the trench for the tubing as detailed on the Drawings and in the Specifications.

ITEM NO. 4-3-X: Curb Stop

1. Method of Measurement:

- a. This item shall be paid for on a unit basis with a unit being one curb stop complete with the valve box assembly installed and backfilled to subgrade as shown on the Drawings and detailed in the Specifications.

b. Note:

- i. $X = \text{Size of Curb Stop in inches}$

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install a curb stop including the excavation, valve box assembly and backfill to subgrade as designated on the Drawings and in the Specifications.

ITEM NO. 4-4-X: Corporation Stop

1. Method of Measurement:

- a. This item shall be paid for on a unit basis with a unit being one corporation stop complete, installed, and backfilled to subgrade as shown on the plans and detailed in the specifications.

b. Note:

- i. $X = \text{Size of Corporation Stop in inches}$

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install a corporation stop including the excavation and backfill to sub grade as designated on the Drawings and detailed in the Specifications.

ITEM NO. 4-5-X-YY or 4-5-X-YYxZZ: Fittings (For Services)

1. Method of Measurement:

a. This item shall be paid for on a unit basis with a unit being one copper or brass fitting installed complete with proper connection and required hardware as required on the Drawings and designated in the Specifications.

b. Note:

i. X = Type of Fitting

1. Bend (all degrees)
2. Tee
3. Female Adapter
4. Male Adapter
5. Cap/Plug
6. Union
7. Service Saddle
8. Blank

ii. YY = Size of Fitting in inches

iii. ZZ = Second dimension of the fitting in inches (Example: 2"x1" Tee)

2. Basis of Payment:

a. The unit price for this item shall include all labor, materials and equipment necessary to install the fitting as specified, including the excavation, backfill and restoration to the subgrade as designated on the Drawings.

SECTION NO. 5: HYDRANTS

ITEM NO. 5-1-X: Hydrants

1. Method of Measurement:

a. This item shall be measured and paid for on a unit basis and shall be installed as detailed on the Drawings and in the Specifications.

b. The other components of a hydrant assembly (anchor tee, pipe and gate valve) will be measured and paid for under their specific pay item.

PENNICHUCK WATER WORKS

- c. The payment item for a new hydrant shall include one new fire hydrant, precast thrust block, stone, specified MJ gland, plastic sheeting, stainless steel threaded rod with hardware, excavation and backfilling to the subgrade.
- d. The unit price for this item shall include all the labor, materials and equipment necessary to complete the installation of a new hydrant to a hydrant branch.
- e. Note:
 - i. X = Type of Hydrant Component
 - 1. New Hydrant
 - 2. Hydrant Reconnection
 - 3. Hydrant Extension

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install the hydrant as specified, including the excavation and backfill to designated subgrade and cover as designated in the Drawings and specified in the Specifications, or as directed by the Engineer.

SECTION NO. 6: EARTHWORK

SUBSECTION NO. 6-1: GRAVELS AND PAVEMENT

ITEM NO. 6-1-1: Bank Run Gravel

1. Method of Measurement

- a. This pay item shall be measured in cubic yards, linear feet, tons, or square yards as stated in the Bid Schedule.
- b. Bank run gravel shall be used to replace excavated material in locations as designated in the Drawings.
- c. Cubic yard quantities shall be calculated using the average end area method. All materials shall be in place and compacted. Only when agreed upon with the Engineer, truck measurement quantities can be utilized in lieu of the average end area method. Truck quantities shall be deducted by 20% to compensate for loss in volume associated with compaction.

PENNICHUCK WATER WORKS

- d. Linear feet shall be measured along the length of water main installation or as designated on the Drawings.
- e. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- f. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment

- a. The unit price of this item shall be considered full compensation for the furnishing of all materials, labor, equipment and tools necessary for furnishing, placing, grading, and compacting bank run gravel.
- b. The unit price of this item shall also be considered full compensation for the furnishing of all materials, labor, equipment and tools necessary for excavating areas requiring placement, grading, and compaction of bank run gravel.

ITEM NO. 6-1-2: Processed Gravel

1. Method of Measurement

- a. This pay item shall be measured in cubic yards, linear feet, tons, or square yards as stated in the Bid Schedule.
- b. Processed Gravel shall be used to replace excavated material in locations as designated in the Specifications or Drawings.
- c. Cubic yard quantities shall be calculated using the average end area method. All materials shall be in place and compacted. Only when agreed upon with the Engineer, truck measurement quantities can be utilized in lieu of the average end area method. Truck quantities shall be deducted by 20% to compensate for loss in volume associated with compaction.
- d. Linear feet shall be measured along the length of water main installation or as designated on the Drawings.
- e. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.

- f. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment

- a. The unit price of this item shall constitute full compensation for the furnishing of all materials, labor, equipment, and tools necessary for furnishing, placing, grading, and compacting processed gravel as specified.
- b. The unit price of this item shall also be considered full compensation for the furnishing of all materials, labor, equipment and tools necessary for excavating areas requiring placement, grading, and compaction of processed gravel.
- c. This item shall include materials, labor, tools, and equipment required to establish final grading so that bituminous pavement can be constructed to the grades and elevations shown on the Drawings.

ITEM NO. 6-1-3: Machine Placed Temporary Trench Patch

1. Method of Measurement

- a. This pay item shall be measured in linear feet, tons, or square yards as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of the water main installation or as designated on the Drawings.
- c. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- d. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment

- a. This item shall constitute full compensation for all materials, labor, equipment, and tools necessary for installation of temporary trench patch including pavement and underlying gravels, unless provided for under a separate item.

- b. Pavement outside the limits shown on the Drawings that is cracked, broken, or otherwise damaged, as a result of the Contractor's operations, shall be repaired by the Contractor at no additional cost to the Owner.
- c. This pay item requires individual weight slips.

ITEM NO. 6-1-4: Machine Placed Permanent Trench Patch

1. Method of Measurement

- a. This pay item shall be measured in linear feet, tons, or square yards as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of the water main installation or as designated on the Drawings.
- c. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- d. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment

- a. The unit price for this item shall include all labor and equipment necessary to sawcut existing asphalt, fine grade and furnish and install asphalt.
- b. Pavement outside the limits shown on the Drawings that is cracked, broken, or otherwise damaged, as a result of the Contractor's operations, shall be repaired by the Contractor at no additional cost to the Owner.
- c. This pay item requires individual weight slips.

ITEM NO. 6-1-5: Machine Placed Bituminous Base Course

1. Method of Measurement

- a. This pay item shall be measured in linear feet, tons, or square yards as stated in the Bid Schedule.

PENNICHUCK WATER WORKS

- b. Linear feet shall be measured along the length of the water main installation or as designated on the Drawings.
- c. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- d. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment

- a. The unit price for this item shall include all labor and equipment necessary to sawcut existing asphalt, fine grade and furnish and install asphalt.
- b. Pavement outside the limits shown on the Drawings that is cracked, broken, or otherwise damaged, as a result of the Contractor's operations, shall be repaired by the Contractor at no additional cost to the Owner.
- c. This pay item requires individual weight slips.

ITEM NO. 6-1-6: Machine Placed Bituminous Surface Course

1. Method of Measurement

- a. This pay item shall be measured in linear feet, tons, or square yards as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of the water main installation or as designated on the Drawings.
- c. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- d. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment

- a. The unit price for this item shall include all labor and equipment necessary to sawcut existing asphalt, fine grade and furnish and install asphalt.

- b. Pavement outside the limits shown on the Drawings that is cracked, broken, or otherwise damaged, as a result of the Contractor's operations, shall be repaired by the Contractor at no additional cost to the Owner.
- c. This pay item requires individual weight slips.

ITEM NO. 6-1-7: Hand Placed Hot Bituminous Pavement

1. Method of Measurement

- a. This pay item shall be measured in linear feet, tons, or square yards as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of the water main installation or as designated on the Drawings.
- c. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- d. Square yards shall be measured along the length of the water main multiplied by the width as depicted on the Drawings, or as directed by the Engineer.

2. Basis of Payment

- a. The unit price for this item shall constitute full compensation for furnishing all materials, labor, equipment, saw cutting, and tools necessary to furnish, place, grade, compact, and install hot bituminous pavement.

ITEM NO. 6-1-8: Mill Existing Pavement

1. Method of Measurement

- a. This pay item shall be measured in linear feet or square yards as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of water main installation, as designated on the Drawings, or as directed by the Engineer.
- c. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings, or as directed by the Engineer.

- d. The milling area shall be to the specified length and width as shown on the Drawings or as directed by the Engineer.

2. Basis of Payment

- a. The unit price for this item shall constitute full compensation for furnishing all materials, labor, equipment, and tools necessary to mill the existing pavement as shown on the Drawings or directed by the Engineer.

ITEM NO. 6-1-9: Install Reclaimed Material

1. Method of Measurement

- a. This item shall be measured in either cubic yards, square yards, linear feet, or tons as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of water main installation, as designated on the Drawings, or as directed by the Engineer.
- c. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings, or as directed by the Engineer.
- d. Cubic yard quantities shall be calculated using the average end area method. All materials shall be in place and compacted. Only when agreed upon with the Engineer, truck measurement quantities can be utilized in lieu of the average end area method. Truck quantities shall be deducted by 20% to compensate for loss in volume associated with compaction.
- e. Tonnage quantities will require individual weight slips for each truck shipment to the project. These tickets shall be given to the Engineer on a daily basis. All weight slips must be performed on scales sealed by the appropriate governmental authority.
- f. Installation of reclaimed material shall be to the specified depth and width as shown on the Drawings or as directed by the Engineer.

2. Basis of Payment

- a. This item shall include full compensation for uniformly grading the reclaimed asphalt to the depth and grades shown on the Drawings or as directed by the Engineer.

- b. This item shall include stock piling and protection of material against segregation or contamination by other materials deemed unsuitable for road reconstruction. Material shall be re-handled once the road subgrade is established.

ITEM NO. 6-1-10: Asphalt Reclamation

1. Method of Measurement:

- a. Asphalt reclamation shall be measured in either square yards or linear feet as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of water main installation, as designated on the Drawings, or as directed by the Engineer.
- c. Square yards shall be measured along the length of the water main installed multiplied by the approved payment width as depicted on the Drawings, or as directed by the Engineer.
- d. The roadway pavement shall be reclaimed to the specified depth and width as shown on the Drawings or as directed by the Engineer.

2. Basis of Payment:

- a. This item shall include full compensation for protection of existing structures or utilities, or the furnishing of all materials, labor, equipment and tools necessary for constructing the pavement reclamation.
- b. This item shall include full compensation for the protection of existing structures and utilities; or lowering existing utility structures to a depth below the existing pavement and gravel materials to be pulverized.

ITEM NO. 6-1-11: Crushed Gravel for Shoulder Leveling

1. Method of Measurement:

- a. This pay item shall be measured in linear feet.
- b. The measurement shall be taken along the center line of the road regardless if gravels are needed on one side or both sides of the road.

2. Basis of Payment:

- a. The unit price of this item shall constitute full compensation for the furnishing of all materials, labor, equipment, and tools necessary for furnishing, placing, grading, and compacting crushed gravel as specified.

ITEM NO. 6-1-12: City of Nashua Final Trench Restoration - Low Traffic

1. Method of Measurement

- a. This pay item shall be measured in linear feet.
- b. Linear feet shall be measured along the length of water main installation or as designated on the Drawings.

2. Basis of Payment

- a. The unit price of this item shall be considered full compensation for the furnishing of all materials, labor, equipment and tools necessary to remove/excavate the existing asphalt and gravel materials and replace them as detailed on the Drawings.
- b. Should it be necessary for the Contractor to construct and repave a wider trench, the Contractor may do so but no extra compensation shall be awarded unless the circumstances that created the need for the trench widening are beyond the control of the Contractor and the Contractor has received the approval of the Engineer.
- c. The quantities of labor, equipment and materials associated with this work shall be compensated for in this pay item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

ITEM NO. 6-1-13: City of Nashua Final Trench Restoration - High Traffic

1. Method of Measurement

- a. This pay item shall be measured in linear feet.
- b. Linear feet shall be measured along the length of water main installation or as designated on the Drawings.

2. Basis of Payment

- a. The unit price of this item shall be considered full compensation for the furnishing of all materials, labor, equipment and tools necessary to remove/excavate the existing asphalt and gravel materials and replace them as detailed on the Drawings.
- b. Should it be necessary for the Contractor to construct and repave a wider trench, the Contractor may do so but no extra compensation shall be awarded unless the circumstances that created the need for the trench widening are beyond the control of the Contractor and the Contractor has received the approval of the Engineer.
- c. The quantities of labor, equipment and materials associated with this work shall be compensated for in this pay item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

SUBSECTION NO. 6-2: Pavement Markings

ITEM NO. 6-2-1-X: Retroreflective Painted Pavement Markings

1. Method of Measurement:

- a. Retroreflective painted markings shall be measured in linear feet, square feet or a lump sum basis as stated in the Bid Schedule.
- b. Linear feet shall be measured lengthwise along the center of the pavement marking. Double lines and combination solid/broken lines will be measured as separate lines according to the length of each individual line.
- c. Square feet shall be measured lengthwise along the center of the pavement marking times the width of the marking as required on the Drawings or Specifications.
- d. Note:
 - i. $X = \text{Width of Marking in inches}$

2. Basis of Payment:

- a. The unit price shall include all labor, materials and equipment to clean, prepare and apply marking to surface per NHDOT Specifications.

ITEM NO. 6-2-2-X: Retroreflective Thermoplastic Pavement Markings

1. Method of Measurement:

- a. Retroreflective thermoplastic markings shall be measured in square feet or a lump sum basis as stated in the Bid Schedule.
- b. Square feet shall be measured lengthwise along the center of the pavement marking multiplied by the width of the marking as required on the Drawings or Specifications, or as directed by the Engineer.
- c. Note:
 - i. X = Width of Marking in inches

2. Basis of Payment:

- a. The unit price shall include all labor, materials and equipment to clean, prepare and apply marking to surface per NHDOT Specifications.

ITEM NO. 6-2-3-X: Obliterate Pavement Markings

1. Method of Measurement:

- a. Obliterate pavement markings lines shall be measured by the linear foot with no adjustment to width. The marking to be removed will be measured along the center of the marking.
- b. Obliterate pavement marking symbols or words shall be measured by the square foot. Square feet shall be measured along the center of the symbol/word multiplied by the width of the marking.
- c. Note:
 - i. X = Type of Removal
 1. Pavement Marking Line
 2. Pavement Marking Symbol/Word

2. Basis of Payment:

- a. The unit price shall include all labor, materials and equipment to remove markings from pavement surface per NHDOT Specifications. Payment will not be made for removal of removable pavement marking tape.

SUBSECTION NO. 6-3: EXCAVATION

ITEM NO. 6-3-1: Trench Ledge Excavation and Disposal

1. Method of Measurement:

- a. Trench Ledge Excavation and Disposal shall be measured on a cubic yard basis, as uncovered in the field. Ledge quantities shall not be removed until measurements have been verified by the Owner.
- b. Cubic yards shall be measured from the top of ledge to the required trench depth at a trench width as depicted in Specification Section 01500.

2. Basis of Payment:

- a. This pay item shall include all means necessary to remove and dispose of all ledge including, but not limited to blasting. This pay item shall also incorporate the costs of backfilling the voids left by rock removal.

ITEM NO. 6-3-2: Boulder Excavation and Disposal

1. Method of Measurement:

- a. Boulder Excavation and Disposal shall be measured on a cubic yard basis, as uncovered in the field. Payment shall only be made for boulders measuring greater than one cubic yard in volume.
- b. Cubic yards shall be measured by taking the average length, width, and depth of the boulder as measured by the Engineer.

2. Basis of Payment:

- a. This pay item shall include all means necessary to remove and dispose of all boulders including, but not limited to blasting. This pay item shall also incorporate the costs of backfilling the voids left by boulder removal.

ITEM NO. 6-3-3: Test Pit Excavation

1. Method of Measurement:

- a. This item shall be paid for on a cubic yard basis and shall be executed as shown in the Drawings and detailed in the Specifications.

2. Basis of Payment:

- a. This payment item shall include all labor, materials and equipment necessary to excavate, backfill, shore, plate and locate the existing water main and other utilities that may conflict with the water main construction. Excluding gravels and pavement restoration, this payment item will encompass all situations involved in the exploratory excavation process.
- b. The quantities of labor, equipment and materials associated with this work shall be compensated for in this payment item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

SUBSECTION NO. 6-4: SOILS

ITEM NO. 6-4-1-1: Unsuitable Materials Above Pipe Bedding Subgrade

1. Method of Measurement:

- a. Payment for unsuitable materials shall be on an in place cubic yard basis.
- b. This item shall be measured based on in place cubic yards of unsuitable materials above the pipe bedding subgrade, which are removed from the trench, and located within trench payment widths per Pennichuck Standard Detail M02.2.
- c. Unsuitable soils limits shall be as directed and approved by the Engineer. Final measurements shall be agreed upon on a daily basis.

2. Basis of Payment:

- a. The cost shall include all labor, equipment and materials necessary for the removal of the unsuitable material and replacement of material in accordance with Specification Section 01400.
- b. Compensation for pipe bedding sand or roadway gravels should not be factored in this cost.

ITEM NO. 6-4-1-2: Unsuitable Materials Below Pipe Bedding Subgrade

1. Method of Measurement:

- a. Payment for unsuitable materials shall be on an in place cubic yard basis.

PENNICHUCK WATER WORKS

- b. This item shall be measured based on in place cubic yards of unsuitable materials below pipe bedding subgrade, which are removed from the trench, and located within the trench payment widths per Pennichuck Standard Detail M02.2.
- c. Unsuitable soils limits shall be as directed and approved by the Engineer. Final measurements shall be agreed upon on a daily basis.

2. Basis of Payment:

- a. The cost shall include all labor, equipment and materials necessary for the removal of the unsuitable material and replacement of material in accordance with Specification Section 01400.
- b. Compensation for unsuitable materials below pipe bedding subgrade shall include the replacement materials per Pennichuck Standard Detail M02.2.

ITEM NO. 6-4-2: Erosion Control

1. Method of Measurement:

- a. Erosion Control shall be paid on a unit, linear foot, or lump sum basis as stated in the Bid Schedule and as shown on the Drawings.

2. Basis of Payment:

- a. If Erosion Control is paid for on a lump sum basis, it shall be paid as 50% of the amount shall be released when the project is 25% complete, less the 10% retainage. The remainder shall be released at substantial completion, less the retainage.
- b. This pay item shall be considered full compensation for all materials, labor and equipment necessary for the installation of erosion, sediment control and storm water management devices, the maintenance of the same in good working order, and replacement of any devices damaged or filled with sediment.

ITEM NO. 6-4-3: SWPPP and Monitoring

1. Method of Measurement:

- a. Storm Water Pollution Protection Plan and Monitoring shall be paid on a lump sum basis. The Contractor is responsible for the NOI, SWPPP monitoring and inspection reports.

- b. Measurement for monitoring will be made based on the percentage of work completed at each payment requisition.

2. Basis of Payment:

- a. The price for this item shall be considered full compensation for development of a detailed plan that shows the location of all erosion and storm water control devices including sedimentation basins, sediment collection bags, etc., for construction dewatering discharges necessary to complete the work. The plan shall include appropriate phases that are keyed to specific project milestones.

SUBSECTION NO. 6-5: LANDSCAPING

ITEM NO. 6-5-1: Clearing and Grubbing

1. Method of Measurement:

- a. This item will be paid for on either a lump sum or acreage basis as shown in the Bid Schedule and on the Drawings.

2. Basis of Payment:

- a. This item shall include all labor, materials and equipment necessary to clear and grub the land as designated on the Drawings. This pay item includes tree and stump removal within the designated area. This clearance shall be shown in the Drawings or directed by the Engineer.

ITEM NO. 6-5-2-X: Tree and Stump Removal

1. Method of Measurement:

- a. This item shall be measured and paid for on either a lump sum or unit basis, as stated in the Bid Schedule.

- b. The diameter of the tree shall be measured 4' off the existing grade at the base of the tree.

c. Note:

- i. X = Diameter of Tree in inches

2. Basis of Payment:

- a. Tree and stump removal shall include all labor and equipment necessary to remove trees and stumps and properly dispose of them off-site.

ITEM NO. 6-5-3: Landscaping Remediation

1. Method of Measurement:

- a. This item will be measured and paid for on a project basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. This item shall include all labor, materials and equipment necessary to repair the disturbed area to its pre-construction conditions.
- b. The Contractor shall be responsible for coordinating with a subcontractor relative to the type of work to be performed and obtain a quote for any item which will exceed \$1,000.00 per address.
- c. This item shall only be used with approval from the Engineer or Owner.

ITEM NO. 6-5-4: Loam and Seed

1. Method of Measurement:

- a. Loam and seed shall be measured and paid for on a lump sum, square yard, or linear foot basis in accordance with the detail depicted on the Drawings.
- b. Linear feet shall be measured along the length of water main installation or as designated on the Drawings.
- c. Square yards shall be measured along the length of the water main multiplied by the approved payment width as depicted on the Drawings.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to restore and stabilize all disturbed areas not restored by other pay items.

- b. Payment will be made for 60% of the bid item value upon completion of topsoil installation and hydroseeding. The remaining 40% of the bid item value will be paid after 85% of grass growth has been established.

ITEM NO. 6-5-5-X: Tree and Shrub Replacement

1. Method of Measurement:

- a. This item shall be paid for on a lump sum or unit basis as stated in the Bid Schedule.

- b. Note:

- i. X = Species of Tree or Shrub

- 1. Species 1
 - 2. Species 2
 - 3. Species 3
 - 4. Species 4
 - 5. Species 5
 - 6. Species 6
 - 7. Species 7
 - 8. Species 8

2. Basis of Payment:

- a. This item shall include all labor, materials and equipment necessary to furnish and install trees and shrubs.
- b. This item shall only be used with approval from the Engineer or Owner.

SECTION NO. 7: MISCELLANEOUS

SUBSECTION NO. 7-1: PRECONSTRUCTION

ITEM NO. 7-1-1: Preconstruction Video Documentation

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis as stated in the Bid Schedule.

2. Basis of Payment:

- a. Payment for this item will be made upon acceptance of the Video Documentation by Pennichuck after review and confirmation that the video clearly depicts the entire proposed work area.
- b. The quantities of labor associated with this work shall be compensated for in this payment item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

ITEM NO. 7-1-2: Mobilization and Demobilization

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis.
- b. This payment item shall include the costs associated with obtaining the required insurances, building permits, street permits, traffic signage and mobilizing/demobilizing equipment and materials to/from the job site.

2. Basis of Payment:

- a. This item shall not exceed 5% of the total project bid. Should the value of this item exceed 5% of the total project bid, the amount greater than the 5% will be paid upon final completion.
- b. Payment shall be made as follows: 75% of this bid item value (within the 5%) can be released upon initial mobilization, less retainage. After substantial completion, 100% of this bid item (within the 5%) will be released, less the retainage.

ITEM NO. 7-1-3: Vibration, Seismic, and/or Acoustic Monitoring

1. Method of Measurement:

- a. This item shall be paid for on an hourly basis.
- b. The Engineer or Owner must approve use of vibration monitoring prior to installation of monitoring devices. Vibration monitoring initialized prior to Engineer's approval will not be eligible for payment.
- c. Monitoring shall be performed by a qualified Vibration, Seismic, and/or Acoustic Consultant.

2. Basis of Payment:

- a. Payment for monitoring shall be based on actual invoices from the Subcontractor and submitted to the Engineer. Payment shall be without markup.
- b. The payment shall constitute full compensation for the furnishing of all labor, equipment and materials associated with providing monitoring services in accordance with the Drawings and Specifications.
- c. This payment shall include, but not be limited to; coordination, scheduling, and payment for all services; providing support services for the vibration monitoring firm; and all other work required for or incidental to the satisfactory completion of this item.

SUBSECTION NO. 7-2: POST CONSTRUCTION

ITEM NO. 7-2-1: Reset Property Boundaries

1. Method of Measurement:

- a. This item shall be measured and paid for on a unit basis to reset property boundary markers disturbed during construction.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to reset a property boundary to the original location with a licensed surveyor.

SUBSECTION NO. 7-3: INSTALLATION OF METER PIT

ITEM NO. 7-3-1: Residential Meter Pit

1. Method of Measurement:

- a. This item shall be measured and paid for on a unit basis.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install a residential meter pit.

ITEM NO. 7-3-2: Master Meter Pit

1. Method of Measurement:

- a. This item shall be measured and paid for on a unit basis.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install a master meter pit.

SUBSECTION NO. 7-4: ELECTRICAL INSTALLATIONS

ITEM NO. 7-4-1-X: Communications Conduit

1. Method of Measurement:

- a. This item shall be paid for on either a linear foot or lump sum basis as stated in the Bid Schedule.
- b. Linear feet shall be measured along the length of conduit installation or as designated on the Drawings, or as directed by the Engineer.
- c. Note:
 - i. $X = \text{Size of Conduit in inches}$

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to excavate the trench, install communications conduit, backfill and compact the trench, and restore the area to subgrade.

ITEM NO. 7-4-2: Pull Boxes for Communications Conduit

1. Method of Measurement:

- a. This item shall be paid for on a unit basis as stated in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to excavate the trench, install a pull box, backfill and compact the trench, and restore the area to subgrade.

ITEM NO. 7-4-3: Electrical Panel and Meter Socket

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis.

2. Basis of Payment:

- a. The unit price for this item shall include all labor, materials and equipment necessary to install an electrical panel and meter socket.

SUBSECTION NO. 7-5: TRAFFIC

ITEM NO. 7-5-1-X: Traffic Control

1. Method of Measurement:

- a. Maintenance of Traffic shall be paid on a lump sum basis for the entire project and shall include traffic signage and roadway maintenance.
- b. Police Officer with Cruiser (7-5-1-2, Hourly). The Contractor will be responsible to coordinate and pay the Municipality directly for a Police Detail with Cruiser and will be reimbursed for the total hours that the Police Detail is required on project.
- c. Police Officer with a Cruiser (7-5-1-3, Allowance) The Contractor will be responsible to coordinate and pay the Municipality directly for a Police Detail with Cruiser and will be reimbursed for the total cost of the invoices for the police detail. Measurement for the Police Officer shall be based on cost of the approved invoices submitted.
- d. Certified Flaggers shall be paid on an hourly basis for the hours of actual work performed, measured to the nearest $\frac{1}{4}$ hour. Overtime rate shall be factored in this unit cost. The total hours requested will be based on daily tickets, invoices or certified payroll depicting the hours the Certified Flagger worked.

e. Note:

- i. X = Type of Traffic Control
 1. Maintenance of Traffic
 2. Police Officer with Cruiser (Hourly)
 3. Police Officer with Cruiser (Allowance)
 4. Certified Flagger

2. Basis of Payment:

- a. Maintenance of Traffic (7-5-1-1) shall be paid on a lump sum basis. 50% of the lump sum value shall be released when the contract value is 25% complete. The remaining 50% of the lump sum value shall be released at substantial completion.
 - i. Traffic Signage shall include all temporary signage, cones, barrels and barricades to maintain a safe road during construction and all signage associated with the Contractor's detour package.
 - ii. Roadway maintenance shall include ditch restoration, dust control and grading of trenches during construction in a condition acceptable to the Owner.
- b. Police Officer with Cruiser (7-5-1-2, Hourly) shall be totals hours approved for the Police Detail multiplied by the Bid hourly unit price.
- c. Police Officer with Cruiser (7-5-1-3, Allowance) shall be reimbursed per the actual cost of the invoice associated with the Police Detail and approved by the engineer for that project. Contractor markup of the invoices is not allowed.
- d. Traffic Control, Certified Flagger (7-5-1-4) shall be totals hours approved for the flagger multiplied by the Bid hourly unit price. This shall include means of communications, signage and appropriate safety apparel.

ITEM NO. 7-5-2: Portable Message Sign

1. Method of Measurement:

- a. The portable changeable message sign shall be per NHDOT specifications and will be paid for on a monthly basis as directed by the Owner.

2. Basis of Payment:

- a. This item shall be paid for on a monthly basis and include the cost to relocate, secure and maintain during the course of the project.

ITEM NO. 7-5-3: Traffic Signalization

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis as stated in the Bid Schedule.

2. Basis of Payment:

- a. This item shall include all labor, materials and equipment necessary to install or repair traffic signalization.

SUBSECTION NO. 7-6: TEMPORARY WATER

ITEM NO. 7-6-1: Temporary Water Main

1. Method of Measurement:

- a. This item shall be paid for on a lump sum basis and shall be installed as shown on the Drawings and detailed in the Specifications.

2. Basis of Payment:

- a. The lump sum for this item shall include all labor, materials and equipment necessary to install and maintain the temporary water main and temporary water main connections to existing water mains and hydrants as shown on the plans. This pay item shall include the installation, disinfection, maintenance, removal of the temporary water main, and restoration of the disturbed area.

ITEM NO. 7-6-2-X: Temporary Water Service

1. Method of Measurement:

- a. This item shall be paid for on a unit basis and shall be installed as detailed on the Drawings and in the Specifications.

b. Note:

- i. X = Type of Temporary Water Service
 - 1. Type 1
 - 2. Type 2
 - 3. Type 3
 - 4. Type 4

2. Basis of Payment:

- a. The unit price for this item shall include all the labor, materials and equipment necessary to temporarily connect an existing property to the temporary water main. Also included is the labor and equipment necessary to install the temporary water service underground where necessary and any other efforts associated with installing the pipe so as not to create hazard to pedestrian or vehicular traffic. Temporary water connections are to be installed in advance of water main construction. Temporary water services will not be initiated until successful bacteria testing of the temporary water main has been completed.

SUBSECTION NO. 7-7: INSULATION

ITEM NO. 7-7-1: Rigid Insulation Board

1. Method of Measurement:

- a. This item shall be paid for on a unit basis with one unit being a closed cell high density rigid Styrofoam insulation board that is 2 in thick by 2 ft wide and 8 ft long.
- b. Rigid insulation board shall be placed over any water main, services, or fittings that have less than 5 feet of cover on all sides or as directed by the Engineer and shown on the Drawings.

2. Basis of Payment:

- a. This item shall include all labor and materials necessary to install high density rigid Styrofoam insulation over, under or adjacent to the water main, services, or fittings in the vicinity of catch basins, drain pipes, and other locations as directed by the Engineer and as depicted in the Specifications.

SUBSECTION NO. 7-8: REPLACEMENT OF SIDEWALK AND CURBS

ITEM NO. 7-8-1-X: Curb

1. Method of Measurement:

- a. New Asphalt Curb (7-8-1-1) and New Granite Curb (7-8-1-3) shall be measured per linear foot of new vertical, radial or sloped curb installed as shown on the Drawings or where directed by the Engineer.
- b. Remove and Reset Granite Curb (7-8-1-2) shall be measured per linear foot of vertical, radial or sloped curb removed, regardless of type or size, protected and reset as shown on the Drawings or where directed by the Engineer.
- c. Measurement shall be along the centerline of the curb, to the nearest linear foot.
- d. Note:
 - i. X = Type of Curb
 1. New Asphalt Curb
 2. Remove and Reset Granite Curb
 3. New Granite Curb

2. Basis of Payment:

- a. This item shall be paid for at the Contract unit price per linear foot.
- b. This unit price shall constitute full compensation for the furnishing of all materials, labor, equipment, and tools necessary for removing, stockpiling, sorting and installing the curb including, excavation, bedding (gravel and concrete) material, alignment controls, cutting and fitting, backfilling and other work required for or incidental to the completion of this item.
- c. This unit price shall be considered full compensation for installation of used curbing or installation of new curbing.

ITEM NO. 7-8-2-X: Sidewalk Replacement

1. Method of Measurement:

- a. This pay item shall be measured per linear foot, square foot, or square yard as shown in the Bid Schedule.

PENNICHUCK WATER WORKS

- b. Linear feet shall be measured along the length of sidewalk replacement or as designated on the Drawings, or as directed by the Engineer.
- c. Square feet shall be measured along the length of the sidewalk replacement multiplied by the approved width of the sidewalk replacement, or as directed by the Engineer.
- d. Square yards shall be measured along the length of the sidewalk replacement times the approved payment width as depicted on the Drawings.
- e. Note:
 - i. X = Type of Sidewalk
 - 1. Asphalt
 - 2. Concrete
 - 3. Brick

2. Basis of Payment:

- a. This unit price shall constitute full compensation for the furnishing of all materials labor, equipment, and tools necessary for sidewalk replacement including, excavation, bedding (gravel) materials, concrete, asphalt, brick, alignment controls, cutting and fitting, backfilling and other work required for or incidental to the completion of this item.

SUBSECTION NO. 7-9: REMOVAL AND ABANDONMENT

ITEM NO. 7-9-1-X: Removal of Existing Water Main

1. Method of Measurement:

- a. This pay item shall be measured per linear foot or a lump sum basis, as shown in the Bid Schedule.
- b. Measurement shall be taken along the centerline of the water main. This pay item shall include all water main, valves, and fittings along the water main that is to be removed.

c. Note:

- i. X = Type of Water Main to be Removed
 - 1. Non-Asbestos Cement
 - 2. Asbestos Cement

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all layout, saw cutting, labor, materials and equipment necessary to excavate the trench and remove the water main including valves and fittings, backfill and compact the trench, include restoration to subgrade, and properly dispose of the removed water main.

ITEM NO. 7-9-2-X: Abandonment of Existing Water Main

1. Method of Measurement:

- a. This pay item shall be measured per linear foot, cubic yard, or a lump sum basis as shown in the Bid Schedule.
- b. Linear feet shall be measured along the centerline of the water main.
- c. Cubic yards shall be measured using the length of the water main multiplied by the cross-sectional area of the water main, or as directed by the Engineer.
- d. Note:
 - i. X = Type of Abandonment
 - 1. Leave in Place
 - 2. Flowable Fill

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all layout, saw cutting, labor, materials and equipment necessary to excavate the trench and abandon the water main including valves and fittings, backfill and compact the trench, and include restoration to subgrade.

ITEM NO. 7-10: Night Work Premium

1. Method of Measurement:

- a. This item shall be paid for on an hourly basis per crew with time measured beginning after normal work hours and ending when the overnight effort is concluded the following day.

PENNICHUCK WATER WORKS

- b. This payment item shall include the extra charges associated with special equipment particular to nighttime construction, payroll premiums for overtime work by hourly employees and premium costs associated with obtaining asphalt and gravel outside of the supplier's normal production hours.
 - c. For the purposes of this payment item, a crew will be defined as a foreman, two laborers/pipe fitters, excavator operator, loader operator or rubber tire backhoe operator, two dump trucker operators, and all associated equipment.
2. Basis of Payment:
- a. The quantities of equipment and labor associated with this work shall be compensated for in this payment item and shall not be compensated for under any other individual payment items for which they may otherwise be classified.

ITEM NO. 7-11-1: Casting Adjustment for Manholes

1. Method of Measurement:
- a. This item shall be measured on a unit basis as shown in the Bid Schedule with one unit being the adjustment of one casting.
2. Basis of Payment:
- a. The unit price for this item shall constitute full compensation for all labor, materials and equipment necessary to adjust the casting to be flush with the final finish surface.

SECTION NO. 8: INTERIOR PLUMBING

ITEM NO. 8-1: Plumbing Permit

1. Method of Measurement:
- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.
2. Basis of Payment:
- a. The unit price for this item shall constitute full compensation for the reimbursement of the application fee cost for the Plumbing Permit. The permit shall be filled out by the Contractors licensed plumber.

ITEM NO. 8-2: Compression Fitting with a Plug

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a compression fitting with a plug according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-3: Reducer for Service Line to Copper Tubing

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a reducer for the service line to copper tubing according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-4: All Meter Fittings including Cellar Valve, Meter Horn, Radio Wire, and Residential Dual Check Valve

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.
- b. One unit shall include one Cellar Valve, one Meter Horn, one Radio Wire, and one Residential Dual Check Valve.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install the meter fittings listed above according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-5: Pressure Reducing Valve

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a pressure reducing valve according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-6: Expansion Tank

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install an expansion tank according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-7: Fitting to Connect Copper to Existing Interior Plumbing

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a fitting that connects the new copper tubing to the existing interior plumbing according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-8: Copper Tubing to Complete Connection to Existing Interior Plumbing (POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a linear foot basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install copper tubing to complete the connection from the new service line to the existing interior plumbing according to the Plumbing Code recognized by the Town or City where the project is located.
- b. This item shall also include all hangers and other accessories necessary to install the pipe per code.

ITEM NO. 8-9: Piping from Pressure Tank to Hose Bib or Irrigation System (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a linear foot basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install piping from the pressure tank to a hose bib or irrigation system according to the Plumbing Code recognized by the Town or City where the project is located.
- b. This item shall also include all hangers and other accessories necessary to install the pipe per code.
- c. This item shall include an interior survey of all plumbing fixtures and appliances to verify that the non-potable water system is no longer connected to any of the interior plumbing fixtures and appliances.

ITEM NO. 8-10: Fittings for Piping from Pressure Tank to Hose Bib or Irrigation System (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install fittings for the piping from the pressure tank to a hose bib or irrigation system according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-11: New Ball Valve on Discharge Side of Pressure Tank (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a new ball valve on the discharge side of the pressure tank according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-12: New Hose Bib with Connection to Pipe (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a new hose bib with a connection to interior plumbing for non-potable water according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-13: New Pipe Connection to Existing Hose Bib (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a new pipe connection to an existing hose bib according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-14: New Pipe Connection to Existing Irrigation System (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a new pipe connection to an existing irrigation system according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-15: Labels at Tank and Hose Bib (NON-POTABLE WATER)

1. Method of Measurement:

- a. This pay item shall be measured on a unit basis as shown in the Bid Schedule.

2. Basis of Payment:

- a. The unit price for this item shall constitute full compensation for all labor, materials, and equipment necessary to furnish and install a new labels at the water tank and any hose bibs which utilize non-potable water according to the Plumbing Code recognized by the Town or City where the project is located.

ITEM NO. 8-16: Interior Modifications

1. Method of Measurement:

- a. This pay item shall be measured as an allowance as shown in the Bid Schedule.

2. Basis of Payment:

- a. The allowance for this item shall constitute full compensation for all labor, materials, and equipment necessary to restore the interior of a building to its original condition prior to construction. This pay item shall be used to cover all interior modification items affected by normal installation of interior plumbing. Items shall include, but are not limited to, the replacement of dry wall, ceiling restoration, interior paint, etc.
- b. The Contractor shall be responsible for coordinating with a subcontractor relative to the type of work to be performed and obtain a quote for any item which exceeds \$1,000.00 per address.
- c. This pay item shall only be used with approval from the Engineer or Owner.

PENNICHUCK WATER WORKS

[This page has been left intentionally blank]

APPENDIX A

Hydrant and Valve Opening Direction

System	Town	Open Direction
Amherst Village District	Amherst	Right
Bon Terrain	Amherst	Left
Souhegan Woods	Amherst	Left
Atkinson	Atkinson	Left
Locke Lake	Barnstead	Left
Bedford	Bedford	Right
Bow	Bow	Left
Chester	Chester	Left
Glenn Ridge	Derry	Left
Maple Hills	Derry	Left
Farmstead	Derry	Left
Derry	Derry	Right
Glenwoodlands	Epping	Right
Forest Ridge	Exeter	Left
Hollis	Hollis	Right
Hooksett	Hooksett	Left
Hudson	Hudson	Left
Thurston Woods	Lee	Left
Litchfield	Litchfield	Left

PENNICHUCK WATER WORKS

System	Town	Open Direction
Londonderry	Londonderry	Left
Springwood Hills	Londonderry	Right
Merrimack	Merrimack	Right
Sunrise Estates	Middleton	Left
Milford	Milford	Right
Nashua	Nashua	Right
Great Bay	Newmarket	Right
Birch Hill	North Conway	Left
Pelham	Pelham	Left
Pittsfield	Pittsfield	Left
Rolling Hills	Plaistow	Left
Sweet Hill	Plaistow	Right
Twin Ridge	Plaistow	Right
Raymond	Raymond	Left
Autumn Woods	Salem	Right
Salisbury	Salisbury	Left
Beaver Hollow	Sandown	Left
Tilton	Tilton	Left
Daniels Lake	Weare	Left
Windham	Windham	Left

F. Appendices

Geotechnical Report



GEOTECHNICAL REPORT

The attached geotechnical report of Verdantas, LLC presents information and data obtained for purposes of project engineering and design. The report is included herein to make the information and data available to Bidders and Contractors.

There is no warranty, expressed or implied, given to Bidders or Contractors by the Owner or Verdantas, LLC regarding these data or their adequacy to serve the purposes of Bidding and Contractors. Bidders and Contractors should not rely solely on the information and data described herein, but should obtain whatever information and data they deem necessary for their purposes.

This report is not a part of the Contract Documents.



Geotechnical Evaluation Report

Remedy PFAS Contamination in Domestic Water

Rolling Meadow Condominium Association

Old Nashua Road, Londonderry, NH

Prepared for:

Rolling Meadow Condominium Association
9 Boyd Road
Unit 36
Londonderry NH, 03053

Prepared by:

Verdantas
186 Granite Street
3rd Floor, Suite A
Manchester, NH, 03101
603-314-0820

Verdantas Project No: 16063

October 2024



This page intentionally left blank.

Table of Contents

1. Introduction	1
1.1 Project Information	1
1.2 Site Description	1
2. Geotechnical Investigation Activities	2
2.1 Geotechnical Boring Program	2
3. Subsurface Conditions	3
3.1 Overburden Soils	3
3.2 Bedrock/Refusal Surfaces	4
3.3 Groundwater Observations	6
4. Feasibility Evaluation	6
4.1 Open Trenching	7
4.2 Directional Drilling	7
4.3 Jack and Bore	7
5. General Pipeline Construction Recommendations	10
5.1 Acceptable Bearing Surfaces	10
5.2 Water Management During Construction	10
5.3 Excavation Safety	11
6. Limitations	11

Figures

Figure 1.....	Site Locus
Figure 2.....	Boring Location Plan Overview

Appendices

Appendix A	Boring Logs
Appendix B	Bedrock Core Photographs

1. INTRODUCTION

Verdantas LLC (Verdantas) prepared this geotechnical report for Rolling Meadow Condominium Association to support the design of a proposed water supply development and connection of the Rolling Meadows Condominiums to the Pennichuck Water Works (PWW) water system (the Project). A Site Locus map is included as Figure 1, which shows the approximate Project location. This report is intended to characterize subsurface conditions along sections of the proposed water main alignment, and provide pipe installation recommendations in support of the Project development. Verdantas prepared this geotechnical evaluation in accordance with our scope of services dated April 29, 2024, approved by Rolling Meadows Condo Association Board President, Michelle LaMothe, on April 30, 2024. This report is subject to the Limitations included herein.

1.1 Project Information

Our current understanding of the Project is that it will consist of approximately 10,700 linear feet of underground water main to be installed along segments of Old Nashua Road, Nashua Road (Route 102), Bayberry Lane, Pendleton Lane, Treadway Lane, and Canterbury Lane (all in Londonderry, NH). Our understanding of the proposed Project is based upon the following:

- site walks along the proposed water main alignment;
- review of the 2024 plan prepared by Verdantas, titled “Rolling Meadows Water Main Interconnection – Overall Site Plan” (the Overall Site Plan);
- PWW 2023 standard details for utilities; and
- review of pertinent and readily available online information such as aerial photographs, topographical maps, and surficial geology maps.

We understand that PWW water utilities are required to have 5 feet of cover below finished grade and a minimum of 12-inches of bedding beneath the utility. Based on the pipe diameters identified on the Overall Site Plan, this places the depth of excavation for water main trenching between 6.5 and 7 feet.

Surficial geology maps and visual observation of the Project area indicate the presence of bedrock outcrops along the proposed water main alignments. The presence of these outcrops indicates that bedrock removal will likely be required for the watermain installation. The intent of the investigation program described herein was to collect subsurface information to assist the design team with selection of the most effective pipe installation methods (e.g., pipe jacking, open trenching, horizontal directional drilling, etc.).

1.2 Site Description

Verdantas understands that the portion of proposed water main along Old Nashua Road will total approximately 4,925-feet in length. The proposed water main is planned to start at an existing PWW operated utility, cross under Rt. 102 (Nashua Road) and extend in a generally southwesterly direction to the Rolling Meadows Condominiums. The water main alignment will be located along Old Nashua Road and will cross Old Nashua Road to the opposite shoulder near Pendleton Lane, providing service to the Rolling Meadows Condominiums.

At the western-most end of the water main alignment along Old Nashua Road, the alignment turns south for approximately 350-feet to connect to a building located on Boyd Road. Visual

observations made during site visits indicate that this connection will require crossing Chase Brook.

The remaining 5,425-feet of proposed water main will be installed along sections of Bayberry Lane, Pendleton Lane, Treadway Lane, and Canterbury Lane. Visual observations made during site visits indicated that a deep ravine is located at the proposed alignment connection between Treadway Lane and Canterbury Lane.

Topography across the Project is variable and generally features residential dwellings surrounded by rolling hills with mild elevation changes ranging from 264 feet at the lowest point to 330 feet at the highest. The landcover is generally a mixture of wooded areas and grassy fields with scattered wetlands, which were generally observed at the lowest elevation along the bases of hills. There are sporadic rock outcrops present across the Project.

2. GEOTECHNICAL INVESTIGATION ACTIVITIES

2.1 Pre-Clearing Activities - Geotechnical Boring Program

Boring locations were selected along the proposed alignment with the intent of characterizing expected typical conditions, including the general continuity of expected shallow bedrock and the nature of deeper native or fill deposits. Borings were then marked out on the roadway shoulders by Verdantas on June 20, 2024, with slight field adjustments being made for certain locations due to actual features present. Prior to initiating the subsurface investigation, DigSafe Systems, Inc. (DigSafe) was notified to mark potential buried utilities present at the proposed locations. Treadway Lane and Canterbury Lanes are private ways, where DigSafe was unable to mark utilities. For borings in these locations, GPRS, Inc. was subcontracted to identify and mark underground utilities, if present, prior to starting the drilling program using ground penetrating radar on June 17, 2024.

GPRS conducted additional preclearing of Borings on August 5, 2024 at locations along Bayberry Lane, Pendleton Lane, and in a field adjacent to Old Nashua Road and Boyd Road, within the Rolling Meadows Condo Association. Additional preclearing was conducted due to conflicting utility information and the proximity of boring locations to utilities.

2.2 Geotechnical Boring Program

Verdantas coordinated a focused geotechnical drilling program along the proposed water main alignment. GeoSearch Inc. (GeoSearch) of Sterling, MA was subcontracted to advance a total of 31 borings. The investigation was performed using a CME 55 Drill Rig during the first mobilization and a CME 85 during the second mobilization. A Verdantas representative was present during the investigation activities to observe, photograph, and log subsurface conditions encountered at each of the boring locations.

All 31 soil borings advanced included split spoon sampling of overburden soils. In addition to split spoon sampling, 12 soil borings included bedrock coring. The remaining 19 borings were designated as ledge probes, advancing the auger flight until auger refusal occurred that was inferred to indicate the bedrock surface, or until the augering extended below planned excavation depths.

During the period of July 8, 2024 to July 9, 2024 five (5) soil borings were advanced, (designated C-01, C-02, T-01, T-02, and T-03) and 26 soil borings were advanced during the

period of August 12, 2024 to August 16, 2024 (designated B-01A, B-01B, B-02 to B-05, FO-01, FB-01, P-01 to P-03, ON-01 to ON-14, and ON-16). The delay between drilling mobilizations was due to driller availability and administrative delays. See Figure 2 for boring locations.

Verdantas oversaw the advancement of:

- six (6) borings located along Bayberry Lane, designated B-01A to B-05;
- two (2) borings located along Canterbury Lane, designated C-01 and C-02;
- two (2) borings located in the field adjacent to Boyd and Old Nashua Road, designated FB-01 and FO-01;
- fifteen (15) borings located along Old Nashua and Young Road, designated ON-01 to ON-16;
- three (3) borings located along Pendleton Lane, designated P-01 to P-03; and
- three (3) borings located along Treadway Lane, designated T-01 to T-03.

Borings were advanced using 4.24-inch diameter hollow-stem augers as indicated on the boring logs in Appendix A. Where split spoon samples were taken, samples were recorded in general accordance with the American Society for Testing Materials (ASTM) specifications for the Standard Penetration Test (SPT).

A 24-inch split spoon sampler was used to recover the samples. The sampler was advanced by blows from a 140-pound auto hammer free falling from a height of 30 inches, with the number of blows needed to advance the sampler in 6-inch increments of penetration being recorded for each 24-inch sample interval. The summation of the blows necessary to drive the second and third increments is called the Standard Penetration Number (N-value), which is used as an indicator of the soil's inherent bearing capacity and in situ density.

The soil samples retrieved in the split spoon sampler during each SPT were visually classified in general accordance with the Burmister Soil Classification System. Bedrock cores were collected from select borings to confirm the presence and quality of bedrock along the water main alignment, with core collection targeted in areas where bedrock was encountered within the anticipated excavation depths. Photographs of bedrock cores are included in Appendix B.

3. SUBSURFACE CONDITIONS

The soil profile and conditions outlined below highlight the major subsurface stratifications encountered in the borings drilled at the Site. The individual boring logs should be consulted for detailed descriptions of the subsurface conditions identified at each boring location. When reviewing the boring records and the subsurface profile, it should be understood that subsurface conditions might vary between and away from the boring locations. The findings of this report are less likely to apply to areas not explored as a function of increased distance away from the specific subsurface exploration locations. Variations in subsurface conditions are possible laterally and with depth that are not identified on the boring logs or otherwise in this report.

3.1 Overburden Soils

Fill and Native Sands were encountered at most of the boring locations and are inferred to extend from the ground surface to a depth range of approximately 0.5 to 27 feet along the planned water main alignment. In general, the overburden soils varied greatly ranging from relatively shallow to below expected excavation depths. Refer to boring logs in Appendix A, Table 1, and site plans for additional detail. General soil depth to bedrock has been separated by location and is as follows:

Bayberry Lane (B-01A to B-05)

Overburden was observed to range from approximately 0.8 to 10 feet in thickness. In general, these soils consisted of 0.8 to 2 feet of topsoil underlaid by sand fill and/or native sands. The sand fill was generally 1 to 3 feet thick consisting of brown, medium dense, fine to coarse sand, and trace silt and gravel. Native sands were generally 5 to 9 feet thick consisting of tan, medium or very dense, fine to medium sand, and gravel.

Canterbury Lane (C-01 and C-02)

Overburden was observed to range from approximately 7.4 to 27 feet in thickness. In general, these soils consisted of 0.7 to 1 foot of topsoil underlaid by sand fill and/or native sands. The sand fill was generally 3.3 to 7 feet thick consisting of brown, loose, fine to medium sand, and gravel. Native sands were generally 3.4 to 18 feet thick consisting of tan or grey, medium dense, fine to coarse sand, and silt.

Field Adjacent to Boyd and Old Nashua Road (FB-01 and FO-01)

Overburden was observed to range from approximately 0.8 to 8 feet in thickness. In general, these soils consisted of 0.8 feet of topsoil underlaid by sand fill and/or native sands. The sand fill was generally 0 to 1 foot thick consisting of brown, very loose, fine to medium sand, and silt. Native sands were generally 0 to 5 feet thick consisting of tan, dense, fine to medium sand, and gravel.

Old Nashua and Young Road (ON-01 to ON-16)

Overburden was observed to range from approximately 0.5 to 8.6 feet in thickness. In general, these soils consisted of 0.3 to 3 feet of topsoil underlaid by sand fill and/or native sands. The sand fill was generally 0 to 6 feet thick consisting of loose, tan, fine sand, and silt. Native sands were generally 0 to 6.6 feet thick consisting of tan, dense, fine to medium sand, and gravel.

Pendleton Lane (P-01 to P-03)

Overburden was observed to range from approximately 1.8 to 3.8 feet in thickness. In general, these soils consisted of 0.3 to 3 feet of topsoil underlaid by sand fill and/or native sands. The sand fill was generally 0 to 1.5 feet thick consisting of brown, loose, fine to coarse sand, trace silt and gravel. Native sands were generally 1 to 5 feet thick consisting of medium dense, tan, fine to medium sand, and fine gravel.

Treadway Lane (T-01 to T-03)

Overburden was observed to range from approximately 2.6 to 10 feet in thickness. In general, these soils consisted of 0.5 to 2 feet of topsoil underlaid by sand fill and/or native sands. The sand fill was generally 0.6 to 7.5 feet thick consisting of loose, brown, fine to medium sand, and silt. Native sands were generally 0 to 6 feet thick consisting of brown, fine sand, and silt.

3.2 Bedrock/Refusal Surfaces

Bedrock was encountered in 21 of the 31 borings. The depth to the competent bedrock surface is interpreted to range from 0.5 to 27 feet below ground surface; the shallowest depth to competent bedrock was encountered in boring ON-12 and the greatest depth to competent bedrock was encountered in boring C-02. Refer to Boring logs in APPENDIX B, Table 1, and site plans for additional detail. The individual boring logs should be consulted for detailed descriptions of bedrock and refusal surfaces identified at each boring location. General bedrock and refusal surfaces along each of the roadway segments are as follows:

Bayberry Lane (B-01A to B-05)

Weathered bedrock was encountered in borings B-03 and B-04 at depths of 0.5 and 1 foot respectively. Competent bedrock was encountered at approximately 4.5 feet in boring B-03 and confirmed with 5 feet of rock core. The weathered bedrock and competent bedrock surfaces did not exhibit a discernable trend along the length of the road. As such, it is anticipated that weathered bedrock and competent bedrock will be encountered sporadically along portions of this proposed pipe alignment, specifically between Treadway and Pendleton Lanes.

Canterbury Lane (C-01 and C-02)

Auger refusal was encountered on suspected bedrock in boring C-01 at a depth of 7.4 feet. Weathered bedrock was not encountered in this boring. Boring C-02 encountered weathered bedrock at a depth of 27 feet and competent bedrock at a depth of 29 feet. Competent bedrock was confirmed in boring C-02 with 5 feet of rock core. It is currently understood that the forcemain is no longer planned to cross at this location.

Field Adjacent to Boyd and Old Nashua Road (FB-01 and FO-01)

Weathered bedrock was encountered in both borings FB-01 and FO-01 at depths of 7 feet and 1 foot respectively. Competent Bedrock was encountered in these borings at depths of 15 feet and 6 feet, respectively and verified with 10 feet of rock core. As such, it is anticipated that weathered bedrock and competent bedrock will be encountered along of the majority of the proposed pipe alignment.

Old Nashua and Young Road (ON-01 to ON-16)

Bedrock was encountered in 11 of the 15 borings.

Weathered bedrock was encountered in borings ON-01, ON-02, ON-06, ON-07, ON-08, ON-13, and ON-14 at depths of 2 feet, 4.5 feet, 6 feet, 7 feet, 8.5 feet, 6 feet, and 0.9 feet and respectively.

Competent Bedrock was encountered in borings ON-04, ON-08, ON-10, ON-12, and ON-16 at depths of 6 feet, 9.4 feet, 5.5 feet, 6.3 feet, 0.6 feet, and 8.6 feet respectively and verified with 5 feet of rock core in borings ON-04, ON-08, ON-10, ON-12, and ON-16.

The weathered bedrock and competent bedrock surfaces exhibited general closer surface proximity along the length of the road closest to the length of road between the gasoline corridor and Rt. 102 as well as in the proximity of the intersections of Jefferson Drive and Old Nashua Road. As such, it is anticipated that weathered bedrock and competent bedrock will be encountered sporadically along portions of this proposed pipe alignment.

Pendleton Lane (P-01 to P-03)

Weathered bedrock was encountered in borings P-01, P-02, and P-03 at depths of 3 feet, 1.8 feet, and 8 feet respectively. Competent bedrock was encountered in boring P-01 at a depth of 5.5 feet and verified with 5 feet of rock core. As such, it is anticipated that weathered bedrock and competent bedrock will be encountered sporadically along portions of this proposed pipe alignment.

Treadway Lane (T-01 to T-03)

Weathered bedrock was encountered in boring T-03 at a depth of 2.5 feet. Competent bedrock was encountered in boring at a depth of 10 feet and verified with 5 feet of rock core. As such, it is anticipated that weathered bedrock and competent bedrock will be encountered sporadically along a small portion of this proposed pipe alignment.

3.3 Groundwater Observations

Observations were made for the presence of groundwater during drilling operations. Many of the boring logs note no observed groundwater. Where encountered, groundwater was measured at depths of 4 to 21 feet below ground surface. The individual boring logs should be consulted for detailed descriptions of the subsurface conditions identified at each boring location.

Bayberry Lane (borings B-01A to B-05)

Groundwater was not observed during drilling operations.

Canterbury Lane (C-01 to C-02)

Groundwater was not observed in C-01, but was encountered at a depth of 18.5 feet in boring C-02.

Field Adjacent to Boyd and Old Nashua Road (FB-01 and FO-01)

Groundwater was not observed during drilling operations.

Old Nashua and Young Road (ON-01 to ON-16)

Groundwater was observed at depths of 4 to 7 feet in borings ON-03, ON-04, and ON-05. These borings are located adjacent to a wetland, which may explain the relatively elevated groundwater conditions. Otherwise, groundwater was not observed during drilling operations.

Pendleton Lane (P-01 to P-03)

Groundwater was not observed during drilling operations.

Treadway Lane (T-01 to T-03)

Groundwater was not observed in boring T-02, but was observed at depths of 4 to 8 feet in borings T-01 and T-03.

4. FEASIBILITY EVALUATION

Based upon the subsurface data collected by Verdantas, subsurface soils within the investigation areas are suitable for the proposed new water main alignment provided proper engineering and construction practices are performed. However, conditions are moderately variable, and engineering and construction practices will generally need to be tailored to as many similar sections of the alignment as practicable. These practices can primarily include cut-and-cover but will depend upon the chosen pipe installation method for each section of the new alignment(s). Native soils encountered at the likely pipe installation depths are structurally capable of providing underlying support and maintaining the integrity of overlying formations and surficial features. Where competent bedrock is encountered in conflict with the proposed water main elevations, its removal can be achieved by excavation and hoe-ramming in most places; extensive line drilling may be required at select locations or implemented as a potential cost saving measure.

Verdantas preliminarily evaluated several alternatives to facilitate the proposed new pipeline construction based upon the alternatives being applicable to a significant percentage of the alignment. This report does not include an exhaustive or complete feasibility analysis of different pipe installation options for each logical subsection of the alignment, but instead is intended to identify several reasonable techniques and associated risks.

While other alternatives are explored, it is expected that Jack and Bore methods will be used for the installation of new water line for the eastern portion of the project site (i.e., where it crosses Rt. 102 from STA. 63+31.00 to STA. 64+03.00). The alternatives listed will likely require additional evaluation with regard to their feasibility, cost, and performance in consideration of access and continuity of subsurface conditions.

4.1 Open Trenching

Open trenching is the standard approach for construction of pipelines, where a trench is excavated, the pipe installed, and then backfilled. Temporary shoring is typically required to minimize excavation volumes and facilitate the safe installation and backfill of the new piping.

There are several advantages of this method. A specialty contractor is not needed to install the pipeline. Cut and cover operations can achieve significant productivity under many conditions, and starting and stopping operations is relatively straight forward. This method also reasonably allows for the implementation of switching excavation methods depending upon conditions encountered.

The disadvantages of this method include that there will be relatively significant surface disturbance and considerations must be made for shoring and dewatering. This method also requires more lateral space along the alignment to deliver and install materials, as well as to remove spoils and maneuver the shoring. Traffic barriers and active control are also common.

4.2 Directional Drilling

Directional drilling is a method of installing underground pipes, conduits, and/or cables most often in a shallow arc along a prescribed bore path by using a specialized surface mounted drilling rig. This method is typically used when trenching or excavating is not practical, such as the ravine and wetland stream crossings present along the proposed watermain alignment. Directional drilling can be very productive in well-defined, relatively homogeneous conditions.

The installation process involves establishing a staging area and entrance pit, and then advancement of a pilot hole along the designed alignment, which is later enlarged by passing a larger cutting tool known as a back reamer. The drilling typically involves the addition of a viscous fluid such as mixture of water and bentonite or polymer continuously pumped to the cutting head or drill bit to facilitate the removal of cuttings, stabilize the bore hole, cool the cutting head, and lubricate the passage of the pipe. After installation and cleaning of the casing pipe, the inner water line pipe will be installed, with or without grout within the interstitial space. The inner pipe can be made of materials such as polyvinyl chloride, polyethylene, ductile iron, and steel, and the materials chosen will depend upon its compatibility with the arc and overall length of the cased bore hole.

Advantages to the use of this method are that insignificant disturbance to surficial features (such as the Rt. 102 crossing) will occur, and the use of shoring will most likely not be required because of the ability to launch the pilot bores at distances well away from the features to be drilled under. Disadvantages include difficulty maintaining alignment with dissimilar materials and an irregular/shallow bedrock surface.

4.3 Jack and Bore/Microtunneling

Jack and Bore is a method of pipe installation where hydraulic jacks are used to push pipes in stages through the ground from behind a shield. A launching pit is required to create a reaction

surface to jack against and must be configured to prevent soil failure from the reaction forces. Microtunneling is similar to jack and bore, except that it utilizes fully automated controls. These techniques are more commonly used to install utilities along relatively short distances under existing structures. Pipe jacking/microtunneling is best suited for straight alignments and soils that do not contain a significant amount of cobbles and boulders. Because as short a jacking length as possible is preferred, the launching and receiving pits are often close to the structure or formation being undermined, therefore requiring shoring of the launching and receiving pits.

This alternative is likely only practicable for the crossing beneath the Rt. 102 crossing and otherwise is anticipated to be an ineffective method for the majority of this project. A major disadvantage is the need to use sheeting or trench boxing for the launching and receiving pits, volume of bedrock excavation anticipated and the associated amount of dewatering that could be required.

4.4 Installation Recommendations

4.4.1 Roadway Corridors

The relatively shallow and irregular weathered bedrock and competent bedrock surfaces will likely be problematic for the directional drilling alternative if trying to advance through multiple types of soils/bedrock. Furthermore, the large launching pits, right of way constraints, and length of pipe runs make the pipe jacking/microtunneling options impractical and likely too costly.

Therefore, based on the observed subsurface conditions along the proposed watermain alignments, it is recommended that open trenching methods be used for installation along roadway corridors. We anticipate that excavation depths of 6.5 to 7 feet will be needed to provide the 5 feet of pipe cover required by PWW.

The contractor should be prepared to excavate weathered bedrock and competent bedrock along portions of the roadway alignment. It is anticipated that mechanical methods, such as a hydraulic hoe ram, can likely complete the required bedrock excavation in an efficient manner for most of the sections where bedrock will interfere with the water main elevation. However, line drilling at select alignment locations may be required to cost-effectively remove bedrock along portions of the pipe alignments.

Given the nature of the bedrock, narrow right of ways, and the proximity of the work to existing roadways and overhead utilities, blasting of the bedrock will likely be difficult and may not be possible in many locations. However, the Contractor may propose alternative bedrock excavation methods with their bid for approval by the Engineer.

Additionally, we strongly recommend that the project team coordinate with PWW to evaluate using foam insulation and traditional cover as frost protection for the pipe along select portions of the alignment(s), to allow for less than 5 feet of pipe cover currently required by PWW. This could reduce the amount of bedrock excavation, saving costs and ultimately expediting the construction schedule.

Pipe subgrades and backfill should be prepared in accordance with the recommendations provided in Sections 5.1. and 5.2.

4.4.2 State Route 102 Crossing

Based on the observed subsurface conditions at Borings ON-14 and ON-16 located on the southern and northern sides of Rt. 102, it is anticipated that the bedrock surface is highly

variable through this area. Additionally, Verdantas reviewed online available records for state roadways through the [NH DOT Roads and Projects Viewer \(unh.edu\)](https://www.unh.edu/nhdot/roads-projects-viewer), which indicate that bedrock could be located approximately 6 feet below grade along the western portion of the intersection of Old Nashua Road and Rt. 102, and approximately 8-10 feet below grade along the eastern side of the intersection¹. Furthermore, based on visual observations of this area, the fill embankment that Rt.102 is built atop increases from about three feet thick on the west side of the intersection to greater than 10 feet thick on the eastern side of the intersection.

We understand that the project team currently plans to cross Rt. 102 along the eastern side of the intersection. We understand that the daily traffic volumes on Rt. 102 make it impractical to close the road to install the watermain via open trenching methods. Additionally, the anticipated proximity of the pipe alignment to the top of bedrock surface will make it difficult to provide appropriate cover along the entire directionally drilled arc. Therefore, it is anticipated that jack and bore or microtunnelling will need to be pursued as these methods will provide minimal disruption to traffic. By orienting the pipe crossing along the eastern portion of the Rt. 102 intersection, we believe that the pipe can be installed below Rt. 102 without having to drill through bedrock. However, bedrock could be shallower in the launching and receiving pits areas, so the Contractor will need to plan for this possibility. The Contractor may also need to plan for dewatering pit locations. Given the relatively shallow bedrock in this area of the Project, groundwater levels could correlate closely with precipitation events.

4.4.3 Gas Main Crossing

A gas main crosses Old Nashua Road at approximately STA. 46+75. We drilled three borings in the approximate area of this crossing (ON-09, ON-10, and ON-11) that indicate the bedrock is likely relatively shallow and may vary from approximately 1 to 2 feet below grade on the east side of the crossing (ON-11) and to 5 to 6 feet below grade on the west side of the crossing. Overburden is anticipated to consist of loose to medium dense sand, and although weathered bedrock was not encountered in these borings, it could be present in localized areas. The utility owner will not allow trenching over their utility, which eliminates open trenching as an alternative. The short crossing distance, depth of excavation required, and relatively shallow bedrock make a jack and bore/microtunneling option impractical. As such, the Project Team intends to install pipe via directional drilling at this crossing. We expect that the directional drilling path will be advanced entirely within bedrock.

4.4.4 Old Nashua Road to Boyd Road Crossing

The observed subsurface conditions at the site indicate that competent bedrock and weathered bedrock are anticipated to be shallow at this crossing. The two borings completed in the area (FB-01 and FO-01) were completed on either side of the ravine, so it is possible that bedrock is shallower within the ravine. We understand that the Project Team does not want to disturb the wetlands within the ravine, eliminating the open trenching option. Furthermore, the site topography and shallow bedrock on either side of the crossing make a jack and bore/microtunneling option unfeasible. Therefore, we understand that the Project Team currently plans to directionally drill at this location. We expect that the directional drilling path will be advanced mostly within bedrock.

¹ State of New Hampshire Department of Public Works and Highways, "Plans of Proposed Federal Aid Secondary Project S-29(6) N.H. Project No. P-7239 Hudson-Derry Road," recommended for approval on June 18, 1965, sheets 12 and 13.

5. GENERAL PIPELINE CONSTRUCTION RECOMMENDATIONS

5.1 Acceptable Bearing Surfaces for Open Trench Installation

Based upon Verdantas' current understanding of the proposed pipeline alignment and anticipated installation depths, the acceptable bearing surfaces for the proposed piping will primarily be undisturbed, approved prepared inorganic natural subgrades, or bedding fill placed above prepared and approved fill or approved bedrock surfaces. Although the pipeline is anticipated to induce very small loading to the subgrade soils, the occasional pockets of loose subgrade soils could experience minor differential settlement in some locations: this can be mitigated by aggressive compaction of those materials.

Verdantas recommends that natural undisturbed, inorganic subgrade and approved granular in-situ fill materials be compacted with a plate compactor prior to sand bedding and pipe installation. Any organic soil or disturbed natural soil (e.g., soft, disturbed silts and clays) are not regarded as being acceptable for support of new pipelines because of their high potential for load-induced settlement and should be over excavated and replaced. Bedrock surfaces should be prepared such that the surface is relatively smooth (i.e., absent of any prominent points that could cause stress to the pipe placed above) and any loose rock is removed prior to sand bedding and pipe installation.

5.2 Pipe Backfill

Procedures and materials for installing pipe, bedding and backfill, up to the roadway subbase elevation, should be completed in accordance with the current versions of the PWW Standard Details and "Technical Specification for Water Main, Hydrant and Service Installations." However, PWW calls for "common borrow" to be placed in 12 inch lifts above bedding sand, while the Town of Londonderry requires "suitable backfill" (common borrow) to be placed in 6 inch lifts. We recommend that the more stringent Town of Londonderry requirements be followed.

Procedures and materials for installing roadway subbase, base, and bituminous pavement sections should be installed in accordance with the current version of the Town of Londonderry's "Typical Details For Site and Roadway Infrastructure".

5.3 Water Management During Construction

Care must be taken during installation activities (i.e., trenching or pit excavation) to proactively manage potential groundwater infiltration along with surface water run-on and precipitation. We expect dewatering of groundwater to be likely in the area of Old Nashua Road between Bayberry Lane and Greeley Road based upon observation of water levels during our investigation and the expected depths of excavations. The obvious presence of groundwater was otherwise not encountered throughout most of the drilling locations, so dewatering may not be needed for pipe installation in other areas. However, given the relatively shallow depth to bedrock, groundwater fluctuations may occur seasonally and following precipitation events. Standard installation of temporary, localized sump pumps are expected to be sufficient to manage water from infiltration and precipitation within excavations. The contractor should be prepared to manage dewatering discharges in accordance with all applicable regulations. It

should be noted that Verdantas did not perform any analytical testing of groundwater encountered during our subsurface investigation.

5.4 Excavation Safety

Excavations should be cut to a stable slope or be temporarily braced, depending upon the excavation depths and the subsurface conditions encountered. Temporary construction slopes should be designed in compliance with applicable governing regulations including the Occupational Safety and Health Administration (OSHA). Based upon the soil samples recovered from the borings, the near-surface soils should be considered OSHA Type C soils. Temporary excavations should be sloped at not steeper than 1.5H:1V for excavations to a maximum depth of 20 feet below ground surface under dry, dewatered conditions.

Stockpiles should be placed at a distance away from the top of the excavation that is equal to at least the depth of the excavation. Excavation safety must consider loads caused by construction equipment and nearby traffic, as applicable. Surface drainage should be controlled to avoid flow of surface water into the excavations. Construction slopes should be reviewed for signs of mass movement, such as tension cracks near the crest or bulging at the toe. If potential stability problems are observed, work should cease, and the project geotechnical engineer should be contacted immediately. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the Contractor.

6. Limitations

Verdantas provided the recommendations contained within this report based upon an evaluation of subsurface conditions observed and/or reported and their relation to proposed construction, as documented in the report text, and attached materials. The evaluations described and recommendations made in this report pertain to the specific areas explored. Verdantas believes the subsurface explorations and evaluations described herein were performed in a manner consistent with the services that would have been provided by other geotechnical professionals under similar circumstances. However, given the variable nature of native soil deposits and bedrock formations, we cannot represent that the subsurface conditions identified in the boring logs and described in this report are exact, nor can we guarantee that our interpolation between or extrapolation from subsurface exploration locations is completely representative of actual conditions.

Should additional information become available regarding the proposed watermain alignment that is significantly different from that described in this report, or should subsurface conditions be found during construction that vary significantly from those observed during the subsurface explorations and summarized in this report, Verdantas should be given the opportunity to evaluate the data and modify its recommendations, if warranted.

This report has been prepared for specific application to the Site of the proposed project along portion sections of Old Nashua Road, Route 102, Bayberry Lane, Pendleton Lane, Treadway Lane, and Canterbury Lane, in Londonderry New Hampshire. No other warranty, expressed, or implied, is made. In addition, this report was prepared exclusively for Verdantas and the associated project team. The use of this report by other parties without written consent from Verdantas is hereby prohibited.

Prepared by:

Reviewed by:



Cameron J. Stuart, P.E.
Geotechnical Engineer
cjstuart@verdantas.com

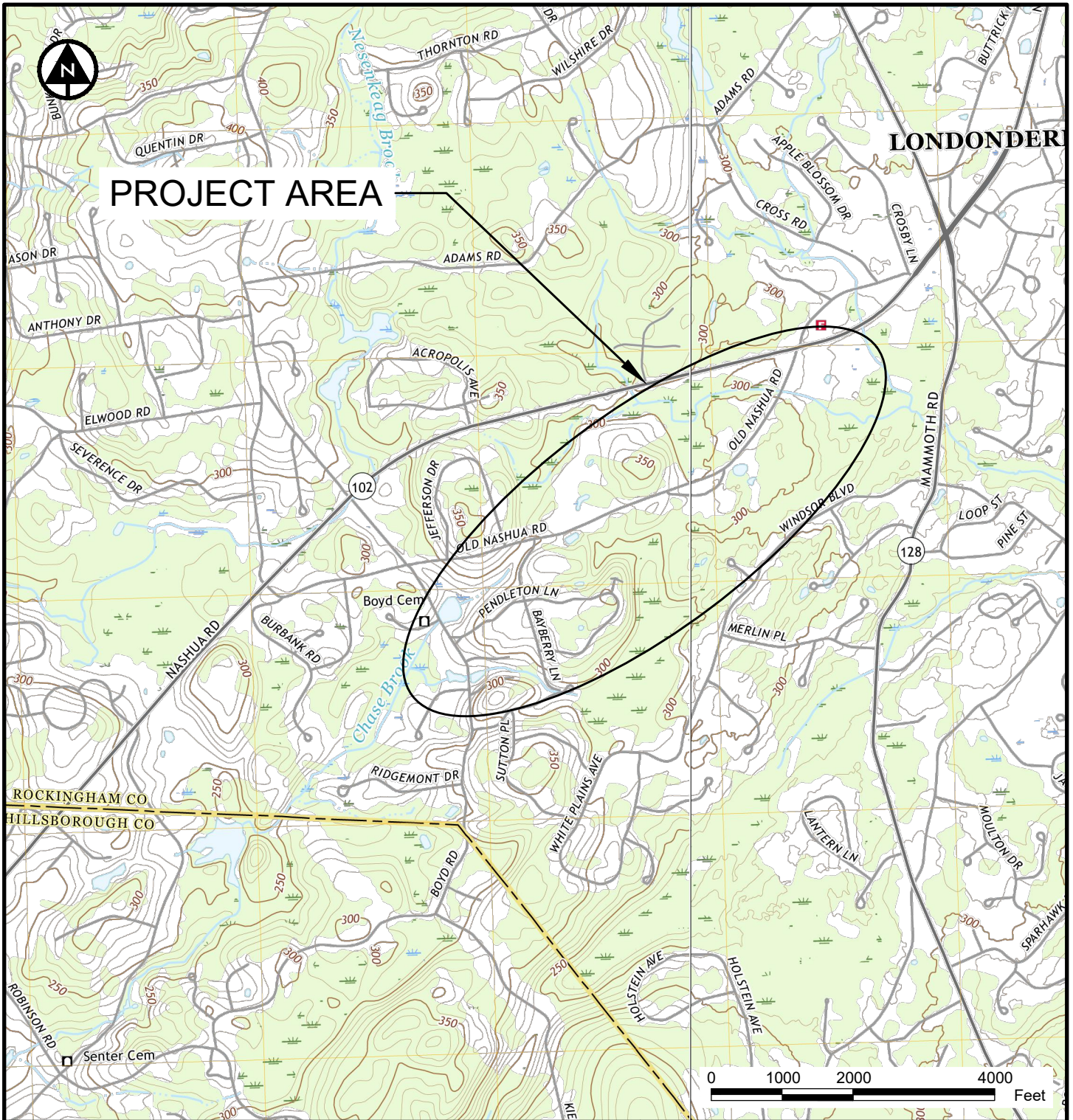


Michael C. Penney, P.E.
Director of Engineering/ Principal
mcpenny@verdantas.com

Date: October 28, 2024

Figure 1

Site Locus



z:\project_files\pdr-rollingmeadows\16063 - rolling meadow condos\verdan\as_folders\geotechnical\figures\site_plan.dwg 9/16/2024 4:59 PM

SOURCE
 USGS NASHUA NORTH, NH TOPOGRAPHIC QUADRANGLE 2021
 CONTOUR INTERVAL: 10 FEET
 USGS WINDHAM, NH TOPOGRAPHIC QUADRANGLE 2021
 CONTOUR INTERVAL: 20 FEET



Londonderry~Rockingham County~New Hampshire
 Old Nashua Road

Project Number
16063

Date
9/16/2024

Author
LTV

Scale
1" = 200'

Figure
1

SITE LOCUS

GEOTECHNICAL INVESTIGATION REPORT
 ROLLING MEADOWS

Figure 2

Boring Location Plan Overview



FIELD DATA

BORING ID	DEPTH TO REFUSAL (FT)
FB-01	11
FO-01	6
P-01	3
P-02	2.5
P-03	9
T-01	NOT ENCOUNTERED
T-02	NOT ENCOUNTERED
T-03	5.5
C-01	7.4
C-02	27
B-01A	6
B-01B	NOT ENCOUNTERED
B-02	NOT ENCOUNTERED
B-03	1.5
B-04	2.5
B-05	NOT ENCOUNTERED
ON-01	2
ON-02	9
ON-03	NOT ENCOUNTERED
ON-04	6
ON-05	NOT ENCOUNTERED
ON-06	NOT ENCOUNTERED
ON-07	NOT ENCOUNTERED
ON-08	9.5
ON-09	5.5
ON-10	6
ON-11	1.3
ON-12	0.5
ON-13	8.7
ON-14	0.5
ON-16	8.5

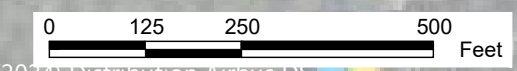
- LEGEND:**
- BORING LOCATION
 - BORING LOCATION W/ ROCK CORE
 - PROPOSED WATERMAIN ALIGNMENT



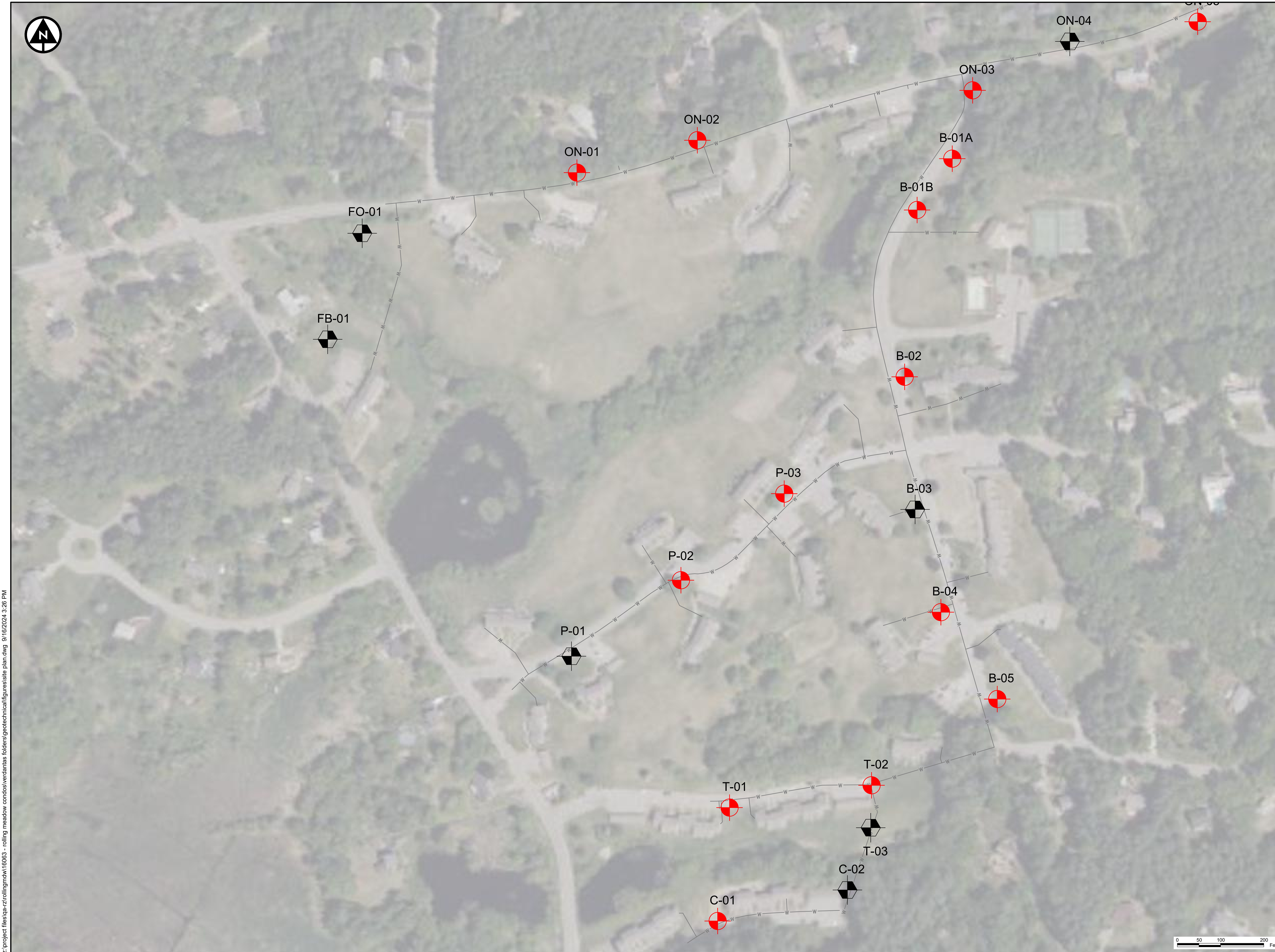
Londonderry-Rockingham County-New Hampshire		Project Number 16063
Date	9/16/2024	
Author	LTV	
Scale	1" = 250'	
Figure	2.1	

BORING LOCATION PLAN OVERVIEW

Rolling Meadow Condominium Association
Watermain Interconnection



z:\project files\rollingmeadow\16063 - rolling meadow condos\verdantas folders\geotechnical\figures\site plan.dwg 9/16/2024 3:26 PM



FIELD DATA

BORING	DEPTH TO REFUSAL (FT)
FB-01	11
FO-01	6
P-01	3
P-02	2.5
P-03	9
T-01	NONE
T-02	NONE
T-03	5.5
C-01	7.4
C-02	27
B-01A	6
B-01B	NONE
B-02	NONE
B-03	1.5
B-04	2.5
B-05	NONE
ON-01	2
ON-02	9
ON-03	NONE
ON-04	6
ON-05	NONE
ON-06	NONE
ON-07	NONE
ON-08	9.5
ON-09	5.5
ON-10	6
ON-11	1.3
ON-12	0.5
ON-13	8.7
ON-14	0.5
ON-16	8.5

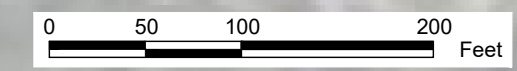
- LEGEND:**
- BORING LOCATION
 - BORING LOCATION W/ ROCK CORE
 - PROPOSED WATERMAIN ALIGNMENT



Londonderry-Rockingham County-New Hampshire		Project Number 16063
Date	9/16/2023	
Author	LTV	
Scale	1" = 100'	
Figure		2.2

BORING LOCATION PLAN (WEST)

Rolling Meadow Condominium Association
Watermain Interconnection






z:\project files\qa-rz\rollingmew16063 - rolling meadow condos\verdantas folders\geotechnical\figures\site plan.dwg 9/16/2023 3:26 PM



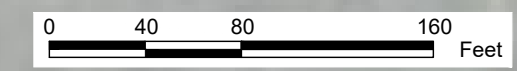
FIELD DATA

BORING	DEPTH TO REFUSAL (FT)
FB-01	11
FO-01	6
P-01	3
P-02	2.5
P-03	9
T-01	NONE
T-02	NONE
T-03	5.5
C-01	7.4
C-02	27
B-01A	6
B-01B	NONE
B-02	NONE
B-03	1.5
B-04	2.5
B-05	NONE
ON-01	2
ON-02	9
ON-03	NONE
ON-04	6
ON-05	NONE
ON-06	NONE
ON-07	NONE
ON-08	9.5
ON-09	5.5
ON-10	6
ON-11	1.3
ON-12	0.5
ON-13	8.7
ON-14	0.5
ON-16	8.5

- LEGEND:**
-  BORING LOCATION
 -  BORING LOCATION W/ ROCK CORE
 -  PROPOSED WATERMAIN ALIGNMENT



Londonderry-Rockingham County-New Hampshire		Project Number 16063
Date 9/16/2024		Author LTV
Scale 1" = 80'		Figure 2.3
BORING LOCATION PLAN (CENTRAL)		
Rolling Meadow Condominium Association Watermain Interconnection		






z:\project files\qz\rolling\m\16063 - rolling meadow condos\verdantas folders\geotechnical\figures\site plan.dwg 9/16/2024 3:26 PM



FIELD DATA

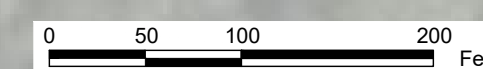
BORING	DEPTH TO REFUSAL (FT)
FB-01	11
FO-01	6
P-01	3
P-02	2.5
P-03	9
T-01	NONE
T-02	NONE
T-03	5.5
C-01	7.4
C-02	27
B-01A	6
B-01B	NONE
B-02	NONE
B-03	1.5
B-04	2.5
B-05	NONE
ON-01	2
ON-02	9
ON-03	NONE
ON-04	6
ON-05	NONE
ON-06	NONE
ON-07	NONE
ON-08	9.5
ON-09	5.5
ON-10	6
ON-11	1.3
ON-12	0.5
ON-13	8.7
ON-14	0.5
ON-16	8.5

LEGEND:

-  BORING LOCATION
-  BORING LOCATION W/ ROCK CORE
-  PROPOSED WATERMAIN ALIGNMENT



Londonderry-Rockingham County-New Hampshire		Project Number 16063
Date 9/16/2024		Author LTV
Scale 1" = 100'		Figure 2.4
Rolling Meadow Condominium Association Watermain Interconnection		



Appendix A

Soil Boring Logs

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: B-01A

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Bayberry Lane

42.834050 N 71.383300 W

Foreman: Rodney Dean

Ground Surface Elevation: 302'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/15/2024

Date Completed: 8/15/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/15/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE	
	#	Pen/Rec (in)	Depth (ft)	Blows/6"					
0	S1	24/19	0-2	4	S1 Upper 9": Medium dense, dark brown, fine SAND, little Organic Silt, trace fine roots, dry.	TOPSOIL			
1				5					
2	S2	24/16	2-4	9	S2 Dense, tan, fine to coarse SAND, little Gravel, trace Silt, damp.	NATIVE SANDS			
3				16					
4	S3	24/18	4-6	28			S3 Dense, tan, fine to coarse SAND, little Gravel, trace Silt, damp.		
5				21					
6	S4	24/18	6-8	17	S4 Dense, tan, fine to coarse SAND, some Gravel, trace Silt, damp.				
7				23					
8	S5	24/22	8-10	21			S5 Very dense, tan, fine to coarse SAND, some Gravel, trace Silt, damp.		
9				42					
10				66					
11									
12					Boring Terminated at 10' BGS No Refusal Encountered				
13									
14									
15									
16									
17									
18									
19									
20									

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: B-01B

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Bayberry Lane

42.833725 N 71.383606 W

Foreman: Rodney Dean

Ground Surface Elevation: 304'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/15/2024

Date Completed: 8/15/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/15/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/3	0-2	4	S1 Upper 7": Medium dense, dark brown, fine SAND, little Organic Silt, trace fine roots, dry.	TOPSOIL		
1				11				
				9	Lower 8": Medium Dense, Brown, fine to coarse SAND, little Gravel, trace Silt, damp.	SAND FILL		
2				10				
	S2	24/10	2-4	13	S2 Medium dense, tan, fine to medium SAND, trace fine Gravel, trace Silt, damp.	NATIVE SANDS		
3				12				
				13				
4	S3	24/6	4-6	8	S3 Medium dense, tan, fine to medium SAND, trace Silt, damp.			
5				7				
				8				
6	S4	24/20	6-8	10	S4 Medium dense, tan, fine to coarse SAND, some fine Gravel, trace Silt, damp.			
7				11				
				15				
8	S5	24/19	8-10	22	S5 Very dense, tan, fine to coarse SAND, little Gravel, trace Silt, damp.			
9				30				
				29				
10				40				
10					Boring Terminated at 10' BGS No Refusal Encountered			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: B-02

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Bayberry Lane

42.832667 N 71.383719 W

Foreman: Rodney Dean

Ground Surface Elevation: 313'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/15/2024

Date Completed: 8/15/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/15/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/3	0-2	4	S1 Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				11				
				9				
2	S2	24/10	2-4	13	S2 Medium dense, brown, fine to coarse SAND, trace Silt, trace Gravel, damp.	SAND FILL		
3				12				
				13				
4	S3	24/6	4-6	8	S3 Upper 3": Medium dense, brown, fine to coarse SAND, trace Silt, trace Gravel, damp.	NATIVE SANDS		
5				7				
				8	Lower 3": Medium dense, tan, fine to medium SAND, little Silt, damp.			
6	S4	24/20	6-8	10	S4 Medium dense, tan, fine to medium SAND, little Silt, trace Gravel, damp.	NATIVE SANDS		
7				11				
				15				
8	S5	24/19	8-10	22	S5 Very dense, tan, fine to medium SAND, little Silt, trace Gravel, trace Silt, damp.	NATIVE SANDS		
9				30				
				29				
10				40	Boring Terminated at 10' BGS No Refusal Encountered	NATIVE SANDS		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: B-03
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Bayberry Lane 42.831825 N 71.383633 W
Foreman: Rodney Dean	Ground Surface Elevation: 329' Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/15/2024 Date Completed: 8/15/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle:	Type:	Date	Depth (ft)	Reference	Stabilization		
Truck	Auto (SPT)	08/15/2024	Not Encountered	NA	NA		
Model: CME 55	Hammer (lb): 140						
Method: 4.25" Hollow-Stem Auger	Fall (in): 30						

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	19/16	0-1.6	3	S1 Upper 9": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry. Lower 7": Very dense, grey-brown, WEATHERED ROCK, damp.	TOPSOIL		
1				7				
2				42		WEATHERED BEDROCK		
3				50/1"				
4					Rollerbit ahead to 4.5ft to set casing.			
5	C1	55.2/60	4.5-9.5		C1 Light grey, fine to coarse grained, highly Fractured Rock, Berwick Formation, very hard, RQD: 32%.	BEDROCK		
6								
7								
8					Rock Coring Rate (min:sec) 4.5 - 5.5 ft: 01:28; 5.5 - 6.5 ft: 03:47; 6.5 - 7.5 ft: 03:04; 7.5 - 8.5 ft: 01:32; 8.5 - 9.5 ft: 02:10			
9								
10					Boring Terminated at 9.5' BGS			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Fracture in rock, lost water
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: B-04
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Bayberry Lane	42.831172 N 71.383414 W
Foreman: Rodney Dean	Ground Surface Elevation: 327'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/15/2024	Date Completed: 8/15/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)	Date	Depth (ft)	Reference	Stabilization		
Model: CME 55	Hammer (lb): 140	08/15/2024	Not Encountered	NA	NA		
Method: 4.25" Hollow-Stem Auger	Fall (in): 30						

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/19	0-2	2	S1 Upper 9": Dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				8				
				24	Lower 10": Dense, grey-brown, WEATHERED ROCK, damp.	WEATHERED ROCK		
2				19				
	S2	10/5	2-2.5	53	S2 Very dense, grey-brown, WEATHERED ROCK, damp.			
3				50/4"				
4					Boring Terminated at 2.5' BGS Auger refusal in weathered bedrock			
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: B-05

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Bayberry Lane

42.830619 N 71.382931 W

Foreman: Rodney Dean

Ground Surface Elevation: 316'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/14/2024

Date Completed: 8/14/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/14/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/20	0-2	4	S1 Upper 4": Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				7				
				10	Lower 16": Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel, damp.	SAND FILL		
2	S2	24/14	2-4	7	S2 Upper 6": Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel, damp.			
				9				
3				4	Lower 8": Loose, brown, fine SAND, some Silt, trace fine Roots, damp.	SAND WITH ORGANICS		
				3				
4	S3	24/17	4-6	3	S3 Medium dense, tan, fine to coarse SAND, trace fine Gravel, seams of dark brown Silt, damp.	NATIVE SANDS		
5				4				
				5				
6	S4	24/10	6-8	8	S4 Medium dense, tan, fine to coarse SAND, trace fine Gravel, seams of dark brown Silt, damp.			
7				13				
				15				
8	S5	24/23	8-10	15	S5 Dense, tan, fine SAND, little Silt, trace Gravel, damp.			
				14				
9				18				
				30				
10					Boring Terminated at 10' BGS No Refusal Encountered			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: C-01

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch	Boring Location: Canterbury Lane	42.829220 N 71.385350 W
Foreman: Rodney Dean	Ground Surface Elevation: 294'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 7/8/2024	Date Completed: 7/8/2024

GROUNDWATER MEASUREMENTS							
DRILLING METHOD		SAMPLER		Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck		Type: Auto (SPT)		07/08/2024	Not Encountered	NA	NA
Model: CME 55		Hammer (lb): 140					
Method: 4.25" Hollow-Stem Auger		Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/15	0-2	2	S1 Upper 8": Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				5			Lower 6": Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt, damp.	
2	S2	24/17	2-4	8	S2 Upper 10": Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt, damp. Lower 7": Medium dense, grey, pulverized ROCK, dry.	SAND FILL		
3				14			S3 Medium dense, tan, fine to medium SAND, little Silt, damp.	NATIVE SANDS
4	S3	24/13	4-6	10	S4 Very dense, tan, fine to coarse SAND, trace Silt, trace fine Gravel, damp.	BEDROCK		
5				10			Boring terminated at 7.4' BGS. Auger refusal encountered on suspected bedrock.	BEDROCK
6	S4	17/16	6-7.4	7	50/5"	BEDROCK		
7				6				BEDROCK
8				50/5"		BEDROCK		
9								BEDROCK
10						BEDROCK		
11								BEDROCK
12						BEDROCK		
13								BEDROCK
14						BEDROCK		
15								BEDROCK
16						BEDROCK		
17								BEDROCK
18						BEDROCK		
19								BEDROCK
20						BEDROCK		

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Possible start of weathered zone.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: C-02
Project: Water Line Investigation	Sheet: 1 of 2
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Canterbury Lane 42.829410 N 71.384230 W
Foreman: Rodney Dean	Ground Surface Elevation: 295.5' Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 7/8/2024 Date Completed: 7/9/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck		Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 55		Hammer (lb): 140		07/08/2024	21'	Ground Surface	During Drilling
Method: 4.25" Hollow-Stem Auger		Fall (in): 30		07/09/2024	18.37'	Ground Surface	16 hours Post Drilling

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/14	0-2	2	S1 Upper 8": Loose, dark brown, fine SAND, little organic Silt, trace fine Roots, damp.	TOPSOIL		
1				3				
2				4				
2	S2	24/10	2-4	2	S2 Very loose, brown, fine to medium SAND, trace Gravel, trace Silt, damp.			
3				2				
4				2				
4	S3A	24/11	4-6	3	S3 Upper 6": Loose, brown, fine to medium SAND, trace Gravel, trace Silt, damp. Lower 5": Loose, tan, fine to medium SAND, trace Silt, damp.	SAND FILL		
5				5				
6				3				
6	S4	24/13	6-8	1	S4 Very loose, brown and light brown, fine SAND, little Silt, damp.			
7				1				
8				1				
8	S5	24/13	8-10	3				
9				2	S5 Loose, tan, fine to medium SAND, trace Silt, damp.			
10				3				
10	S6	24/12	10-12	5				
11				5				
12				8				
14	S7	24/13	14-16	10	S7 Medium dense, grey, fine to medium SAND, trace Gravel, trace Silt, wet.	NATIVE SANDS		
15				13				
16				14				
17				20				
19	S8	24/8	19-21	10	S8 Medium Dense, tan, fine to coarse SAND, trace Silt, wet.			
20				8				

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: C-02
Project: Water Line Investigation	Sheet: 2 of 2
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Canterbury Lane	42.829410 N 71.384230 W
Foreman: Rodney Dean	Ground Surface Elevation: 295.5'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 7/8/2024	Date Completed: 7/9/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck		Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 55		Hammer (lb): 140		07/08/2024	21'	Ground Surface	During Drilling
Method: 4.25" Hollow-Stem Auger		Fall (in): 30		07/09/2024	18.37'	Ground Surface	16 hours Post Drilling

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
20	S8	24/8	19-21	7	S9 Very dense, light grey and brown, fine SAND, little Silt, trace Gravel, wet.	NATIVE SANDS		
21				8				
22								
23								
24	S9	24/17	24-26	23				
25				29				
26				31				
27				37				
28								WEATHERED BEDROCK
29								
30	C1	55.2/60	29-34		C1 Light Grey, fine to coarse grained Rock, uniform throughout, several fractures and water loss observed, Berwick Formation, very hard, RQD:48%.	BEDROCK		
31								
32								
33								
34								
35					Boring Terminated at 34' BGS.			
36								
37								
38								
39								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association
Project: Water Line Investigation
Location: Londonderry, NH

Boring Identification: FB-01

Sheet: 1 of 2

Checked By: CJS **Date:** 09/11/24 **Project Number:** 16063

Drilling Company: Geosearch **Boring Location:** Field adjacent to Boyd Road 43.832917 N 70.388689 W
Foreman: Rodney Dean **Ground Surface Elevation:** 287.5' **Datum:** NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt **Date Started:** 8/15/2024 **Date Completed:** 8/15/2024

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)	Date	Depth (ft)	Reference	Stabilization
Model: CME 55	Hammer (lb): 140	08/15/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/15	0-2	1	S1 Upper 8": Very loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				1				
2				5	Lower 7": Very loose, brown, fine to medium SAND, trace Silt, trace Gravel, damp.	SAND FILL		
3	S2	24/15	2-4	4	S2 Medium dense, tan, fine to medium SAND, little Gravel, trace Silt, damp.	NATIVE SANDS		
4				8				
5				16				
6				22				
7	S3	24/15	4-6	14	S3 Dense, tan, fine to medium SAND, little Gravel, trace Silt, damp.			
8				22				
9				19				
10	S4	24/20	6-8	22	S4 Upper 10": Very dense, tan, fine to medium SAND, little gravel, trace Silt, damp.	WEATHERED ROCK		
11				25				
12				84	Lower 10": Very dense, brown, WEATHERED ROCK, damp.			
13				82				
14	S5	24/10	8-10	15	S5 Dense, brown and tan, fine SAND, little Silt, trace Gravel, damp.			
15				16				
16				16				
17				30				
18	S5	24/12	10-12	11	S6 Medium dense, tan, fine to medium SAND and WEATHERED ROCK, little Silt, trace Gravel, damp.			
19				15				
20				9				
				9				
					Predrill for coring - 15'			
15	C1	60/60	15-20		C1 Light grey, fine to coarse grained, uniform throughout, Berwick Formation, very hard, RQD: 88%.	BEDROCK		
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: FB-01

Project: Water Line Investigation

Sheet: 2 of 2

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Field adjacent to Boyd Road

43.832917 N 70.388689 W

Foreman: Rodney Dean

Ground Surface Elevation: 287.5'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/15/2024

Date Completed: 8/15/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck		Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 55		Hammer (lb): 140		08/15/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger		Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE	
	#	Pen/Rec (in)	Depth (ft)	Blows/6"					
20	C2	57.8/60	20-25		C2 Light grey, fine to coarse grained, uniform throughout, Berwick Formation, very hard, RQD: 96%. Rock Coring Rate (min:sec) 20 - 21 ft: 01:49; 21 - 22 ft: 01:54; 22 - 23 ft: 01:39; 23 - 24 ft: 01:51; 24 - 25 ft: 02:00	BEDROCK			
21									
22									
23									
24									
25					Boring Terminated at 25' BGS.				
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: FO-01

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Field adjacent to Old Nashua Road 42.833590 N 71.388390 W

Foreman: Rodney Dean

Ground Surface Elevation: 281' **Datum:** NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/15/2024 **Date Completed:** 8/15/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/15/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/11	0-2	1	S1 Upper 8": Very loose, dark brown, fine SAND, little Organic Silt, trace fine Roots, dry.	TOPSOIL		
1				2	Lower 3": Loose, grey, crushed ROCK, damp.			
2	S2	24/22	2-4	24	S2 Very dense, grey, crushed ROCK, damp.	WEATHERED BEDROCK		
3				48				
4				41				
4	S3	22/19	4-5.9	27	S3 Dense, grey and brown, crushed ROCK, damp.			
5				21				
6				24	Predrill for coring - 6'			
6	C1	28.8/60	6-11		C1 Light grey, fine to coarse grained ROCK, soft sand seam observed 30" into core, Berwick Formation, very hard, RQD: 48%.	BEDROCK		
7								
8								
9					Rock Coring Rate (min:sec) 6 - 7 ft: 00:57; 7 - 8 ft: 00:57; 8 - 9 ft: 00:36; 9 - 10 ft: 02:15; 10 - 11 ft: 02:11			
10								
11	C2	57.6/60	11-16		C2			
12								
13								
14								
15					Rock Coring Rate (min:sec) 11 - 12 ft: 01:57; 12 - 13 ft: 02:01; 13 - 14 ft: 03:01; 14 - 15 ft: 01:58; 15 - 16 ft: 04:17			
16					Boring Terminated at 16' BGS			
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Rock Outcrops observed in close proximity to boring location.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: ON-01
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Old Nashua Road	42.833970 N 71.386540 W
Foreman: Chris Stamas	Ground Surface Elevation: 322'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/12/2024	Date Completed: 8/12/2024

GROUNDWATER MEASUREMENTS					
DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/12/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/20	0-2	3	S1 Upper 7": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				3			Lower 13": Loose, brown, fine SAND, little Silt, trace Gravel, trace fine roots, damp.	SAND FILL
2	S2	3/2	2-2.3	50/3"	S2 Very Dense, grey, WEATHERED ROCK, dry.	WEATHERED BEDROCK		
3							S3 Very Dense, grey, WEATHERED ROCK, dry.	
4	S3	2/2	4-4.2	50/2"	Boring Terminated at 4.5' BGS Auger refusal Encountered			
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Possible start of weathered zone.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-02

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.834170 N 71.385500 W

Foreman: Chris Stamas

Ground Surface Elevation: 330'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/12/2024

Date Completed: 8/12/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/12/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/16	0-2	3	S1 Upper 4": Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				6	Lower 12": Medium dense, brown, fine to coarse SAND and GRAVEL, trace Silt, trace fine roots, damp.	GRAVEL and SAND FILL		
2				16				
3	S2	24/7	2-2.6	45	S2 Very dense, light brown, fine to coarse SAND and GRAVEL, trace Silt, dry.	GRAVEL and SAND FILL		
4				50/1"				
5	S3	24/7	4-4.7	28	S3 Very dense, brown, fine to coarse SAND and GRAVEL, little Silt, damp.	GRAVEL and SAND FILL		
6				50/2"				
7	S4	24/0	6-6.2	50/2"	S4 No Recovery.	WEATHERED BEDROCK		
8								
9	S5	11/11	8-8.9	41	S5 Very dense, dark to light brown, WEATHERED ROCK, damp.	WEATHERED BEDROCK		
10				100/5"				
11	S6	0/0	9.0-9.0	50/0"	S6 No Recovery Augers refusal at 9.1'	WEATHERED BEDROCK		
12								
13					Boring Terminated at 9.1' BGS Auger refusal Encountered	WEATHERED BEDROCK		
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-03

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.834480 N 71.383130 W

Foreman: Chris Stamas

Ground Surface Elevation: 298'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/12/2024

Date Completed: 8/12/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/12/2024	4'	Ground Surface	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/14	0-2	3	S1 Upper 8": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				4				
2	S2	24/8	2-4	5	S2 Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt, damp.	SAND FILL		
3				7				
4	S3	24/15	4-6	6	S3 Medium dense, brown, fine to medium SAND, trace Gravel, trace Silt, wet.	SAND FILL		
5				7				
6	S4	24/16	6-8	5	S4 Upper 11": Medium dense, brown, fine to medium SAND, trace Gravel, trace Silt, wet.	SAND FILL		
7				9				
8	S5	24/15	8-10	6	S5 Medium dense, grey, fine to course SAND, little Gravel, trace Silt, wet.	NATIVE SANDS		
9				9				
10				11	Boring Terminated at 10' BGS No Refusal Encountered			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Possible start of weathered zone.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-04

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.834790 N 71.382290 W

Foreman: Chris Stamas

Ground Surface Elevation: 301.5'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/12/2024

Date Completed: 8/12/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/12/2024	4'	Ground Surface	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/20	0-2	2	S1 Upper 7": Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				5				
2	S2	24/12	2-4	3	S2 Lower 13": Medium dense, dark brown, fine to coarse SAND, little Gravel, little Silt, damp.	SAND FILL		
3				4				
4				3				
5	S3	21/18	4-5.8	3	S3 Loose, brown, fine to medium SAND, trace Silt, damp.			
6				3				
7				6				
8				8				
9				50/3"	Auger refusal at 6'			
10	C1	54/60	6-11		C1 Light grey, fine to coarse grained ROCK, uniform throughout, several fractures and water loss observed, core dislodged from barrel, attempts to retrieve altered recovered core shape, Berwick Formation, very hard, RQD: 91%.	BEDROCK		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Rock Coring Rate (min:sec)
 6 - 7 ft: 02:57; 7 - 8 ft: 02:57; 8 - 9 ft: 02:11; 9 - 10 ft: 02:19; 10 - 11 ft: 01:58

Boring Terminated at 11' BGS.

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association
Project: Water Line Investigation
Location: Londonderry, NH

Boring Identification: ON-05

Sheet: 1 of 1

Checked By: CJS **Date:** 09/11/24 **Project Number:** 16063

Drilling Company: Geosearch **Boring Location:** Old Nashua Road 42.834910 N 71.381180 W

Foreman: Chris Stamas **Ground Surface Elevation:** 308.5' **Datum:** NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt **Date Started:** 8/13/2024 **Date Completed:** 8/13/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck		Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 85		Hammer (lb): 140		08/13/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger		Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/11	0-2	2	S1 Upper 7": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				3				
2	S2	24/8	2-4	2	S2 Very loose, brown, fine to coarse SAND and GRAVEL, trace Silt, damp.	SAND FILL		
3				1				
4				2				
5	S3	24/13	4-6	4	S3 Medium dense, brown to light brown, fine to coarse SAND, little Gravel, trace Silt, damp.	NATIVE SANDS		
6				4				
7				7				
8				9				
9	S4	24/18	6-8	13	S4 Dense, light brown, fine to medium SAND, little Gravel, little Silt, damp.	NATIVE SANDS		
10				23				
11				22				
12				22				
13	S5	24/18	8-10	17				
14				23	S5 Dense, light brown, fine to medium SAND, little Gravel, little Silt, damp.	NATIVE SANDS		
15				15				
16				23				
17				45				
18								
19								
20								

Boring Terminated at 10' BGS
No Refusal Encountered

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-06

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.835690 N 71.378930 W

Foreman: Chris Stamas

Ground Surface Elevation: 313'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/13/2024

Date Completed: 8/13/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/13/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/15	0-2	2	S1 Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				4				
				2				
				4				
2	S2	24/8	2-4	2	S2 Upper 4": Very loose, dark brown, fine SAND, little organic-Silt, trace fine roots, dry.			
3				2				
				1	Lower 4": Very loose, brown, fine to medium SAND, some Gravel, little Silt, damp.	SAND FILL		
4				2				
	S3	24/13	4-6	1			S3 Very loose, brown, fine to medium SAND, some Gravel, little Silt, damp.	
5				1				
				4				
				8				
6	S4	24/20	6-8	50	S4 Very dense, grey and brown, WEATHERED ROCK, dry.	WEATHERED BEDROCK		
7				80				
				85				
				90				
8	S5	13/13	8-9.1	77	S5 Very dense, grey and brown, WEATHERED ROCK, dry.			
9				94				
				50/1"				
10					Boring Terminated at 10.3' BGS No Auger Refusal, Weathered Rock Encountered			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Rock Outcrops observed in close proximity to boring location.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: ON-07
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Old Nashua Road	42.836080 N 71.377430 W
Foreman: Chris Stamas	Ground Surface Elevation: 320.5'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/13/2024	Date Completed: 8/13/2024

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)	Date	Depth (ft)	Reference	Stabilization
Model: CME 85	Hammer (lb): 140	08/13/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/14	0-2	3	S1 Upper 4": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				3				
				6	Lower 10": Loose, brown, fine to medium SAND, little Gravel, little Silt, damp.			
2	S2	24/14	2-4	10	S2 Medium dense, light brown, fine to medium SAND, some fine Gravel, little Silt, damp.	SAND FILL		
3				10				
4				8				
4	S3	24/15	4-6	8	S3 Medium dense, light brown, fine to medium SAND, some fine Gravel, little Silt, damp.			
5				10				
				15				
6	S4	24/18	6-8	16	S4 Upper 16": Dense, light brown, fine to medium SAND, some fine Gravel, little Silt, damp.			
7				16				
				23	Lower 2": Dense, light brown, WEATHERED ROCK, damp.	WEATHERED BEDROCK		
8	S5	24/20	8-10	16	S5 Dense, light brown, WEATHERED ROCK, damp.			
9				22				
				24				
10				28				
					Boring Terminated at 10' BGS No Refusal Encountered			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-08

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.836760 N 71.374960 W

Foreman: Chris Stamas

Ground Surface Elevation: 301'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/13/2024

Date Completed: 8/13/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/13/2024	7-8'	Ground Surface	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/14	0-2	2	S1 Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				3				
				7				
				10				
2	S2	24/3	2-4	5	S2 Loose, brown, fine to medium SAND, little Gravel, little Silt, damp.	SAND FILL		
3				4				
				6				
4	S3	24/7	4-6	2	S3 Loose, tan, medium to coarse SAND, trace Silt, damp.	NATIVE SANDS		
5				2				
				3				
6	S4	24/16	6-8	2	S4 Loose, tan, medium to coarse SAND, trace fine Gravel, trace Silt, dry.	NATIVE SANDS		
7				2				
				3				
8	S5	23/15	8-9.4	21	S5 Upper 7": Loose, tan, medium to coarse SAND, trace fine Gravel, trace Silt, wet.	WEATHERED BEDROCK		
9				35			Lower 8": Very dense, grey and brown, WEATHERED ROCK, wet.	
				18/5"				
10	C1	54/60	9.4-14.5		C1 Light grey, fine to coarse grained, uniform throughout, highly fractured, Berwick Formation, hard, RQD: 0%. Rock Coring Rate (min:sec) 9.5 - 10.5 ft: 01:52; 10.5 - 11.5 ft: 01:57; 11.5 - 12.5 ft: 02:47; 12.5 - 13.5 ft: 01:40; 13.5 - 14.5 ft: 01:57 Boring Terminated at 14.5' BGS	BEDROCK		
11								
12								
13								
14								
15								
16								
17								
18								
19								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Wet at bottom of S4 spoon.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-09

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.837770 N 71.372970 W

Foreman: Chris Stamas

Ground Surface Elevation: 320'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/13/2024

Date Completed: 8/13/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/13/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/16	0-2	2	S1 Upper 9": Very loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				2				
				1	Lower 13": Very loose, brown, fine SAND, little Silt, trace fine roots, damp.			
2				1				
	S2	24/18	2-4	4	S2 Medium dense, tan, fine SAND, little Silt, trace Gravel, damp.	SAND FILL		
3				9				
				12				
4				13				
	S3	18/18	4-5.5	10	S3 Dense, tan, fine SAND, little Silt, little Gravel, damp.			
5				17				
				31				
6				50/<1"	Boring Terminated at 5.5' BGS Auger refusal Encountered on suspected bedrock	BEDROCK		
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-10

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.838180 N 71.372250 W

Foreman: Chris Stamas

Ground Surface Elevation: 324'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/14/2024

Date Completed: 8/14/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/14/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/16	0-2	4	S1 Upper 3": Medium dense, dark brown, fine SAND, little Organic Silt, trace fine roots, dry.	TOPSOIL		
1				6	Lower 13": Medium dense, brown, fine to coarse SAND, little Gravel, little Silt, damp.			
2				7		S2 Medium dense, brown, fine to medium SAND and GRAVEL, trace Silt, damp.		
3	S2	24/9	2-4	7	SAND FILL			
4				6		S3 Loose, brown, fine to medium SAND, little Gravel, little Silt, damp.		
5				8	S3 24/15 4-6 3			
6				9		S4 No Recovery		
7	S4	4/0	6-6.3	50/4"	C1 Light grey, fine to coarse grained, uniform throughout, Berwick Formation, hard, RQD: 71%.		BEDROCK	
8	C1	56.4/60	6.3-11.3					
9					Rock Coring Rate (min:sec) 6.3 - 7.3 ft: 02:25; 7.3 - 8.3 ft: 01:55; 8.3 - 9.3 ft: 01:36; 9.3 - 10.3 ft: 01:45; 10.3 - 11.3 ft: 02:09			
10						Boring Terminated at 11.3' BGS		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-11

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.838890 N 71.371460 W

Foreman: Chris Stamas

Ground Surface Elevation: 326'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt

Date Started: 8/13/2024

Date Completed: 8/13/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/13/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	16/12	0-1.3	1	S1 Very loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				2 50/4"		BEDROCK		
2					Boring Terminated at 1.3' BGS Auger Refusal on suspected bedrock			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: ON-12
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Old Nashua Road	42.839480 N 71.371460 W
Foreman: Chris Stamas	Ground Surface Elevation: 317.5'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/13/2024	Date Completed: 8/14/2024

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)	Date	Depth (ft)	Reference	Stabilization
Model: CME 85	Hammer (lb): 140	08/13/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE	
	#	Pen/Rec (in)	Depth (ft)	Blows/6"					
0	S1	7/7	0-0.6	10	S1 Very dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL			
1				50/1"					
2					Rollerbit Refusal in Bedrock at 0.6'	BEDROCK			
3					Oversize Rollerbit to 4' to seat casing for coring				
4	C1	54/60	4-9		C1 Light grey, fine to coarse grained Rock, uniform throughout, highly fractured and water loss observed, Berwick Formation, extremely hard, RQD: 11%.				
5									
6									
7									
8							Rock Coring Rate (min:sec) 4 - 5 ft: 01:23; 5 - 6 ft: 01:36; 6 - 7 ft: 01:48; 7 - 8 ft: 01:39; 8 - 9 ft: 02:16		
9									
10							Boring Terminated at 9' BGS		
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-13

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.840230 N 71.370420 W

Foreman: Chris Stamas

Ground Surface Elevation: 297'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/13/2024

Date Completed: 8/13/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/13/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/10	0-2	3	S1 Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	FOREST MAT		
1				5				
				6				
2	S2	24/0	2-4	4	S2 Medium dense, No Recovery (pushing rock).	SAND FILL		
3				5				
				12				
4	S3	24/10	4-6	2	S3 Loose, brown and light brown, fine to coarse SAND, little Gravel, little Silt, damp.	WEATHERED BEDROCK		
5				3				
				4				
6	S4	24/16	6-8	17	S4 Very dense, grey and brown, WEATHERED ROCK, damp.	WEATHERED BEDROCK		
7				23				
				40				
8	S5	9/8	8-8.8	47	S5 Very dense, grey and brown, WEATHERED ROCK, damp.	Boring Terminated at 8.8' BGS Auger Refusal Encountered in Weathered bedrock		
9				58/3"				
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: ON-14
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Old Nashua Road	42.840700 N 71.370130 W
Foreman: Chris Stamas	Ground Surface Elevation: 292'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/13/2024	Date Completed: 8/13/2024

DRILLING METHOD		SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 85	Hammer (lb): 140		08/14/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger	Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	11/3	0-0.9	1	S1 Upper 2": Very dense, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				50/5"	Lower 1": Pulverized Rock	WEATHERED BEDROCK		
2					Boring Terminated at 0.9' BGS Auger Refusal Encountered on suspected bedrock			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: ON-16

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Old Nashua Road

42.842780 N 71.368870 W

Foreman: Chris Stamas

Ground Surface Elevation: 281'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/14/2024

Date Completed: 8/14/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/14/2024	Not Encountered	NA	NA
Model: CME 85	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/15	0-2	3	S1 Upper 7": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				5				
				4	Lower 8": Loose, brown, fine to medium SAND, little Silt, trace Gravel, damp.	SAND FILL		
2				5				
3	S2	24/3	2-4	5	S2 Medium dense, tan, fine to medium SAND, trace Silt, damp.	NATIVE SANDS		
				8				
				6				
4				9	S3 Medium dense, tan, fine to coarse SAND, little fine Gravel, trace Silt, damp.	NATIVE SANDS		
5	S3	24/7	4-6	7				
				9				
6				14	S4 Very dense, tan, fine to coarse SAND, some Gravel, trace Silt, damp.	NATIVE SANDS		
7	S4	24/15	6-8	15				
				46				
8				50	S5 Very dense, tan, fine to coarse SAND, some Gravel, trace Silt, damp.	NATIVE SANDS		
9	S5	7/7	8-8.6	36				
				50/1"				
10	C1	54/60	8.6-13.6		C1 Light grey, fine to coarse grained, uniform throughout, highly fractured, Berwick Formation, hard, RQD: 60%.	BEDROCK		
11								
12					Rock Coring Rate (min:sec) 8.6 - 9.6 ft: 01:07; 9.6 - 10.6 ft: 01:58; 10.6 - 11.6 ft: 01:59; 11.6 - 12.6 ft: 01:26; 12.6 - 13.6 ft: 01:33	BEDROCK		
13								
14					Boring Terminated at 13.6' BGS			
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. Rock Outcrops observed in close proximity
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: P-01	Sheet: 1 of 1
Project: Water Line Investigation		
Location: Londonderry, NH	Checked By: CJS	Date: 09/11/24
		Project Number: 16063

Drilling Company: Geosearch	Boring Location: Pendleton Lane	42.830900 N 71.386600 W
Foreman: Rodney Dean	Ground Surface Elevation: 291'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/14/2024	Date Completed: 8/14/2024

GROUNDWATER MEASUREMENTS					
DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/14/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/16	0-2	3	S1 Upper 4": Loose, dark brown, fine SAND, little organic Silt, trace fine roots, dry.	TOPSOIL		
1				4				
				4	Lower 12": Loose, brown, fine to coarse SAND, trace Silt, trace Gravel, damp.	SAND FILL		
2	S2	22/14	2-3.8	4	S2 Upper 7": Medium dense, brown, fine to coarse SAND and GRAVEL, little Silt, damp.	NATIVE SAND AND GRAVEL		
3				4				
				24	Lower 7": Medium dense, grey, WEATHERED ROCK, damp.	WEATHERED ROCK		
4	C1	57.6/60	4-9		C1 Light grey, fine to coarse grained, soft material at 1' crumbles in hand, Berwick Formation, very hard and uniform following soft layer, fractured, RQD: 88.5%.	HIGHLY WEATHERED BEDROCK		
5								
6								
7					Rock Coring Rate (min:sec) 4 - 5 ft: 01:40; 5 - 6 ft: 02:20; 6 - 7 ft: 01:58; 7 - 8 ft: 01:42; 8 - 9 ft: 01:35			
8								
9	C2	60/60	9-14		C2 Light grey, fine to coarse grained, uniform throughout, fractured, Berwick Formation, hard, RQD: 55%.	BEDROCK		
10								
11					Rock Coring Rate (min:sec) 9 - 10 ft: 02:31; 10 - 11 ft: 01:39; 11 - 12 ft: 01:45; 12 - 13 ft: 02:50; 13 - 14 ft: 02:10			
12								
13								
14					Boring Terminated at 14' BGS			
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: P-02
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Pendleton Lane	42.831380 N 71.385650 W
Foreman: Rodney Dean	Ground Surface Elevation: 312'	Datum: NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 8/14/2024	Date Completed: 8/14/2024

DRILLING METHOD		SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 55	Hammer (lb): 140		08/14/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger	Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	21/19	0-1.8	5	S1 Upper 4": Loose, dark brown, fine SAND, little Organic Silt, trace fine roots, dry. Middle 12": Loose, brown, fine to coarse SAND, trace Silt, trace Gravel, damp. Lower 3": Very dense, grey, WEATHERED ROCK, damp.	TOPSOIL		
1				10		SAND FILL		
2				17		WEATHERED BEDROCK		
3				50/3"	Boring Terminated at 2.5' BGS Auger refusal Encountered in weathered bedrock.			
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: P-03

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch

Boring Location: Pendleton Lane

42.831940 N 71.384760 W

Foreman: Rodney Dean

Ground Surface Elevation: 317'

Datum: NGCD 1929

Verdantas Engineer/Geologist: Alex Stiff

Date Started: 8/14/2024

Date Completed: 8/14/2024

GROUNDWATER MEASUREMENTS

DRILLING METHOD	SAMPLER	Date	Depth (ft)	Reference	Stabilization
Vehicle: Truck	Type: Auto (SPT)	08/14/2024	Not Encountered	NA	NA
Model: CME 55	Hammer (lb): 140				
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/15	0-2	8	S1 Medium dense, brown, fine to coarse SAND and GRAVEL, trace Silt, damp.	GRAVELY SAND		
1				10				
				9				
2				7	S2 Upper 12": Medium dense, brown, fine to coarse SAND and GRAVEL, trace Silt, damp.			
3	S2	24/3	2-4	8				
				7				
4				5	Lower 7": Medium dense, tan, fine to medium SAND, trace fine Gravel, trace Silt, damp.	NATIVE SANDS		
5	S3	24/7	4-6	7				
				7				
6				12	S4 Medium dense, tan, fine to medium SAND, trace fine Gravel, trace Silt, damp.			
7	S4	24/15	6-8	11				
				11				
8				10	S5 Very dense, grey-brown, WEATHERED ROCK, damp.	WEATHERED BEDROCK		
9	S5	9/7	8-8.8	105				
				75/3"				
10					Boring Terminated at 8.8' BGS Auger refusal in weathered bedrock			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association
Project: Water Line Investigation
Location: Londonderry, NH

Boring Identification: T-01

Sheet: 1 of 1

Checked By: CJS **Date:** 09/11/24 **Project Number:** 16063

Drilling Company: Geosearch **Boring Location:** Treadway Lane 42.82994 71.38524

Foreman: Rodney Dean **Ground Surface Elevation:** 279.5' **Datum:** NGCD 1929

Verdantas Engineer/Geologist: Alex Stitt **Date Started:** 7/8/2024 **Date Completed:** 7/8/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck		Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 55		Hammer (lb): 140		07/08/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger		Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE	
	#	Pen/Rec (in)	Depth (ft)	Blows/6"					
0	S1A	24/16	0-2	3	S1 Upper 6": Medium dense, dark brown, fine SAND, little Organic Silt, trace fine roots, dry.	TOPSOIL			
1				10					
2				12					
2	S2	24/16	2-4	9	S2 Medium dense, brown, fine to coarse SAND, little Silt, trace fine Gravel, damp.				
3				9					
4				9					
4	S3	24/13	4-6	3	S3 Very Loose, brown, fine SAND, some Silt, damp.	SAND FILL			
5				2					
6				2					
6	S4	24/12	6-8	3	S4 Loose, dark brown, fine to coarse SAND, some Silt, damp.				
7				3					
8				2					
8				3	Boring Terminated at 8' BGS. No Refusal Encountered.				
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association

Boring Identification: T-02

Project: Water Line Investigation

Sheet: 1 of 1

Location: Londonderry, NH

Checked By: CJS **Date:** 09/11/24

Project Number: 16063

Drilling Company: Geosearch **Boring Location:** Treadway Lane 42.83008 71.38402
Foreman: Rodney Dean **Ground Surface Elevation:** 286' **Datum:** NGCD 1929
Verdantas Engineer/Geologist: Alex Stitt **Date Started:** 7/8/2024 **Date Completed:** 7/8/2024

DRILLING METHOD		SAMPLER		GROUNDWATER MEASUREMENTS			
Vehicle: Truck		Type: Auto (SPT)		Date	Depth (ft)	Reference	Stabilization
Model: CME 55		Hammer (lb): 140		07/08/2024	Not Encountered	NA	NA
Method: 4.25" Hollow-Stem Auger		Fall (in): 30					

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE	
	#	Pen/Rec (in)	Depth (ft)	Blows/6"					
0	S1	24/18	0-2	5	S1 Upper 8": Medium dense, dark brown, fine SAND, little Organic Silt, trace fine roots, dry.	TOPSOIL			
1				3					
				10	Lower 10": Medium dense, brown, fine to medium SAND, little Silt, trace Gravel, damp.	SAND FILL			
2				9					
	S2	24/17	2-4	8	S2 Upper 14": Medium dense, light brown, fine to medium SAND, trace Silt, damp.	SAND FILL			
3				9					
				11	Lower 3": Medium dense, gray, pulverized ROCK, dry.	SAND FILL			
4				15					
	S3	24/13	4-6	3	S3 Upper 8": Medium Dense, Brown, Fine to Medium SAND, trace gravel, trace silt, wet	NATIVE SANDS			
5				16					
				14	Lower 5": Medium dense, light brown, fine SAND, some Silt, trace Gravel, damp.	NATIVE SANDS			
6				12					
	S4	15/12	6-7.3	9	S4 Very dense, light brown, fine SAND, some Silt, trace Gravel, damp.	NATIVE SANDS			
7				12					
				50/3"	S5 Very dense, brown, fine to medium SAND, little Silt, trace Gravel, damp.	NATIVE SANDS			
8									
	S5	24/18	8-10	9	S5 Very dense, brown, fine to medium SAND, little Silt, trace Gravel, damp.	NATIVE SANDS			
9				31					
				47	Boring terminated at 10' BGS. No refusal encountered.				
10				65					
11					Boring terminated at 10' BGS. No refusal encountered.				
12									
13									
14									
15									
16									
17									
18									
19									
20									

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

SOIL BORING LOG



Client: Rolling Meadows Condominium Association	Boring Identification: T-03
Project: Water Line Investigation	Sheet: 1 of 1
Location: Londonderry, NH	Checked By: CJS Date: 09/11/24 Project Number: 16063

Drilling Company: Geosearch	Boring Location: Treadway Lane	42.82981	71.33840
Foreman: Chris Stamas	Ground Surface Elevation: 282'	Datum: NGCD 1929	
Verdantas Engineer/Geologist: Alex Stitt	Date Started: 7/8/2024	Date Completed: 7/8/2024	

DRILLING METHOD	SAMPLER	GROUNDWATER MEASUREMENTS			
Vehicle: Truck	Type: Auto (SPT)	Date	Depth (ft)	Reference	Stabilization
Model: CME 85	Hammer (lb): 140	07/08/2024	7-8'	Ground Surface	NA
Method: 4.25" Hollow-Stem Auger	Fall (in): 30				

DEPTH (ft)	SAMPLE INFORMATION				SAMPLE DESCRIPTION	STRATUM DESCRIPTION	FIELD SCREENING (ppm)	NOTE
	#	Pen/Rec (in)	Depth (ft)	Blows/6"				
0	S1	24/14	0-2	1	S1 Medium dense, dark brown, fine SAND, little organic Silt, trace fine roots, damp.	TOPSOIL		
1				4				
				6				
				7				
2	S2	19/3	2-2.6	5	S2 Upper 4": Very dense, brown, fine SAND, little Silt, damp.	SAND FILL		
3				33	Lower 11": Very dense, gray, pulverized ROCK, dry.	WEATHERED BEDROCK		
4				54				
				50/<1"				
5	S3	7/4	5-5.5	50	S3 Very dense, dark gray, weathered ROCK, damp.	WEATHERED BEDROCK		
6				50/<1"				
7								
8								
9								
10	C1	60/60	10-15		C1 Light grey, fine to coarse grained, uniform throughout, fractured, Berwick Formation, very hard, RQD: 66%.	BEDROCK		
11								
12								
13								
14								
15					Rock Coring Rate (min:sec) 10 - 11 ft: 02:22; 11 - 12 ft: 01:40; 12 - 13 ft: 01:12; 13 - 14 ft: 01:46; 14 - 15 ft: 02:09			
16					Boring Terminated at 15' BGS.			
17								
18								
19								
20								

GRANULAR SOILS		COHESIVE SOILS		NOTES
Blows/ft.	Density	Blows/ft.	Consistency	
0-4	V. LOOSE	<2	V. SOFT	1. Boring locations are approximated using Google Earth imagery. 2. Rock Outcrops observed in close proximity to this boring location.
5-10	LOOSE	2-4	SOFT	
11-30	M. DENSE	4-8	M. STIFF	
31-50	DENSE	8-15	STIFF	
>50	V. DENSE	15-30	V. STIFF	
		>30	HARD	

Appendix B

Bedrock Core Photographs

BOREING	RUN #	DEPTH	RECOVERY	R&D
T-3	C1	10-15'	60/60	66%
C-2	C1	29-34'	55.2/60	48%



BORING	ROW	DEPTH	RECOVERY	RQD
FB-1	C1	15-20'	60/60	88%
FB-1	C2	20-25'	57.8/60	96%



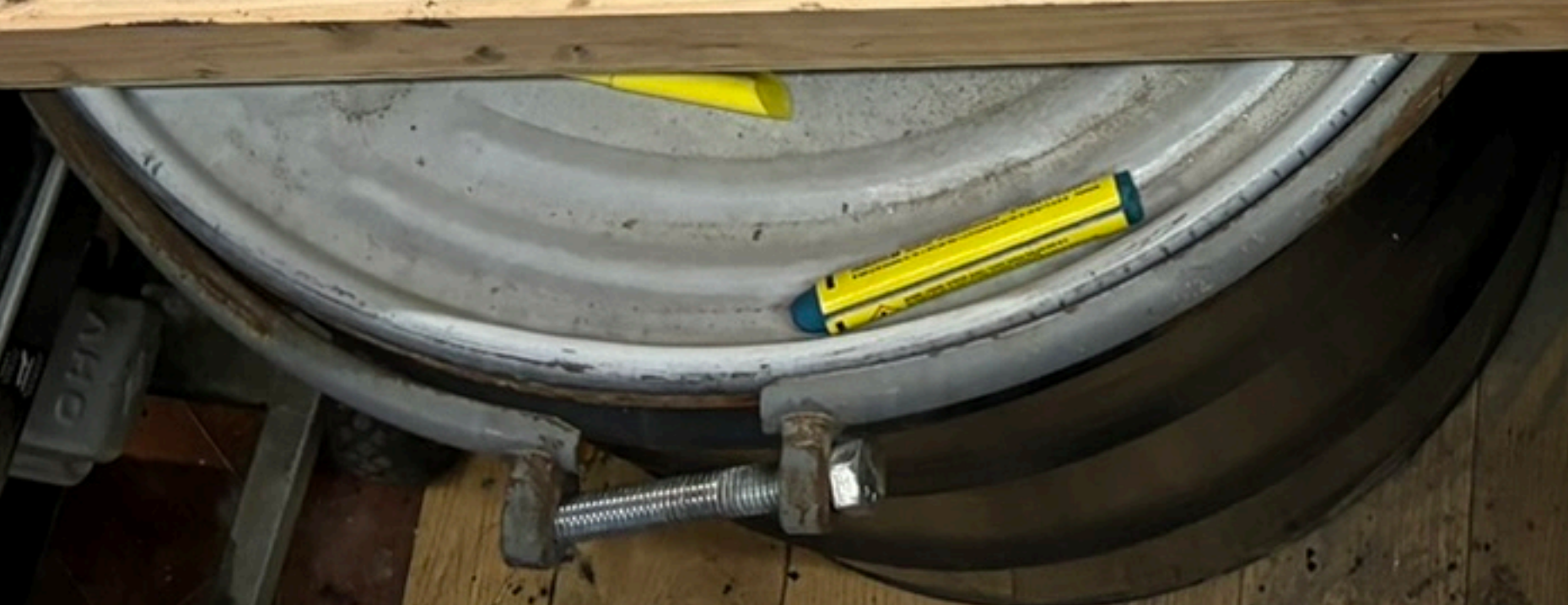
BORING	RUN #	DEPTH	RECOVERY	RQD
B-3	C1	4.5-9.5'	55.2/60	32%
FO-1	C1	6-11'	28.8/60	48%
FO-1	C2	11-16'	57.6/60	77%



BORING	RUN	DEPTH	RECOVERY	RQD
ON-4	C1	6-11	54/60	91%
ON-8	C1	9.5-14.5	54/60	0%



BORING	RUN	DEPTH	RECOVERY	RQD
ON-10	CI	6.3-11.3	56.4/60	71%
ON-16	CI	8.6-13.6	54/60	60%
ON-12	CI	4-9	34/60	11%



BORING	RUN	DEPTH	RECOVERY	RQD
P-1	C1	35-8' 4-9'	56.6/60	88.5%
P-1	C2	9-14'	60/60	55%

