



Little Neck, Ipswich, MA

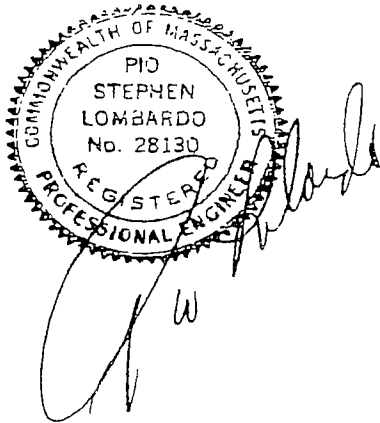
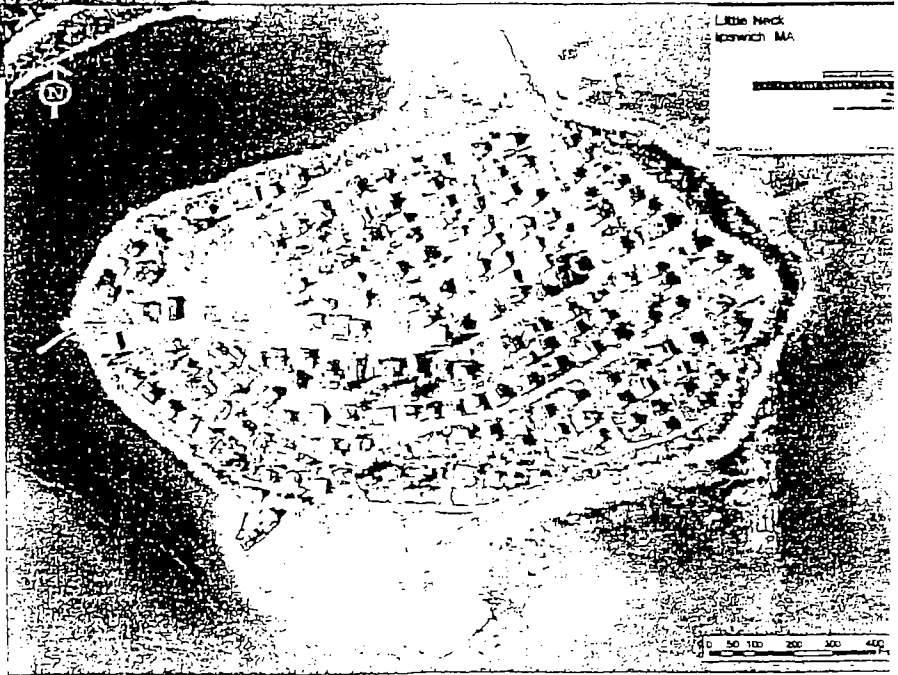
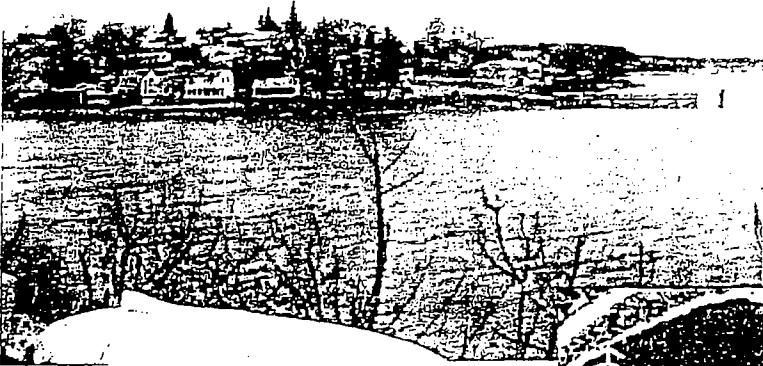
Wastewater Collection System  
Contract Specification

for

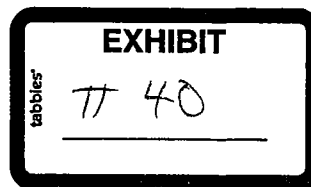
Feoffees of the Grammar School

December 28, 2002

Revised January 10, 2002



Submitted to:  
Feoffees of the Grammar School in the Town of Ipswich  
c/o Mr. Donald Whiston  
2 Jeffrey's Neck Road  
Ipswich, MA 01938



WS02881

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## BID INFORMATION

### SECTION 00100 INSTRUCTIONS TO BIDDERS

#### 1.0 COPIES OF CONTRACT DOCUMENTS.

- 1.1. Complete sets of Contract Documents may be obtained as stated in the Invitation to Bid. No partial sets will be issued. The Contract Documents may be examined at the locations identified in the Invitation to Bid.
- 1.2. Complete sets of Contract Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.
- 1.3. The submitted proposal shall include Sections 00300 Bid Proposal, 00410 Bid Bond, 00420 Statement of Bidder's Qualifications, 00430 Schedule of Major Subcontractors, 00450 Schedule of Major Equipment and 00480 Non-Collusion Affidavit fully executed.
- 1.4. Owner and Engineer, in making copies of Contract Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

#### 2.0 QUALIFICATION OF BIDDERS.

- 2.1. To demonstrate qualifications to perform the Work, each Bidder must prepare and submit a written statement of qualifications including financial data, a summary of previous experience, previous commitments and evidence of authority to conduct business in the jurisdiction where the Work is located. Each bid must contain evidence of Bidder's qualification to do business in Massachusetts where the Work is located or covenant to obtain such qualification prior to award of the Agreement. The Statement of Qualifications shall be prepared on the form provided by the Engineer.
- 2.2. In determining the Bidder's qualifications, the following factors will be considered: Work previously completed by the Bidder and whether the Bidder (a) maintains a permanent place of business, (b) has adequate plant and equipment to do the Work properly and expeditiously, (c) has the financial resources to meet all obligations incident to the Work, and (d) has appropriate technical experience.
- 2.3. Each Bidder may be required to show that he has handled former work so that no just claims are pending against such work. No Bid will be accepted from a Bidder who is engaged in any other work which would impair his ability to perform or finance this Work.

#### 3.0 EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF THE WORK.

- 3.1. It is the responsibility of each Bidder before submitting a Bid, to
  - a. examine the Contract Documents thoroughly,
  - b. visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the Work,

- c. familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work.
  - d. study and carefully correlate Bidder's observations with the Contract Documents, and
  - e. notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.
- 3.2 Information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site of the work is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof.
- 3.3 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.1 and 4.2 of the General Conditions.
- 3.4 Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface and Underground Facilities) at or contiguous to the site of the Work or otherwise which may affect cost, progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.
- 3.5 On request in advance, Owner or Engineer will assist each Bidder in obtaining access to the site to conduct such explorations and tests as Bidder deems necessary for submission of a Bid. Bidder shall restore the site to pre-existing condition as best as possible upon completion of such explorations and tests.
- 3.6 The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor.
- 3.7 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 3, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

#### 4.0 INTERPRETATIONS AND ADDENDA.

- 4.1. All questions about the meaning or intent of the Contract Documents are to be submitted in writing. Interpretation or clarifications considered necessary in response to such

questions will be issued only by Addenda. Questions received less than six days prior to the date for opening of the Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

- 4.2. Addenda may also be issued to modify the Contract Documents as deemed advisable by Owner or Engineer.
- 4.3. Addenda will be mailed or delivered to all parties recorded by Engineer as having received the Contract Documents. No addenda will be issued later than four days prior to the date for receipt of Bids or withdrawing the request for Bids.

#### 5.0 BID SECURITY.

Each Bid must be accompanied by Bid security in the amount stated in the Invitation to Bid. The required security must be in the form of a certified or bank cashier's check payable to Owner or a Bid Bond on the form enclosed herewith. The Bid Bond must be executed by a surety meeting the requirements of Paragraph 5.8 of the General Conditions for surety bonds. The Bid security of all Bidders will be retained until the successful Bidder has executed the Agreement and furnished the required security.

#### 6.0 CONTRACT TIME.

The number of days within which, or the date by which the Work is to be completed and ready for final payment (the Contract Time) are set forth in the Agreement.

#### 7.0 LIQUIDATED DAMAGES.

Provisions for liquidated damages are set forth in the Agreement.

#### 8.0 BID FORM.

- 8.1. The bid shall be submitted on the proposal form as provided in the book forming the Contract Documents for subject Work. The submitted proposal shall include Sections 00410 Bid Bond, 00420 Statement of Bidder's Qualifications, 00430 Schedule of Major Subcontractors, 00450 Schedule of Major Equipment and 00480 Non-Collusion Affidavit.
- 8.2. Bid Forms must be completed in ink or typed. All lump sum prices on the form must be stated in words and numerals; in case of a conflict, words will take precedence.
- 8.3. Bids by corporations must be executed in the corporate name by the president or a vice-president (or other appropriate officer accompanied by evidence of authority to sign) and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the corporate name.
- 8.4. Bids by partnerships must be executed in the partnership name and signed by a partner, his title must appear under his signature and the official address of the partnership must be shown below the signature.

- 8.5 Bids by joint venture shall be signed by each participant in the joint venture or by an authorized agent of each participant. The full name of each person or company interested in the Bid shall be listed on the Bid Form.
- 8.6 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- 8.7 No alterations in Bids, or in the printed forms therefore, by erasures, interpolations, or otherwise will be acceptable unless each such alteration is signed or initialed by the Bidder; if initialed, Owner may require the Bidder to identify any alteration so initialed.
- 8.8 The address and telephone number for communications regarding the Bid shall be shown.

#### 9.0 BID PRICING.

Bids must be priced as set forth in the Bid Schedule.

#### 10.0 SUBMISSION OF BIDS.

- 10.1. Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the title of the Work, and name and address of the Bidder and accompanied by the Bid security in the form specified in Section 5.0 of the instructions, and Non-collusion Affidavit. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.
- 10.2. Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened. Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.
- 10.3. Oral, telephonic, or telegraphic Bids are invalid and will not receive consideration.
- 10.4. No Bidder may submit more than one Bid. Multiple Bids under different names will not be accepted from one firm or association.

#### 11.0 MODIFICATION AND WITHDRAWAL OF BIDS

- 11.1. Bids may be modified or withdrawn by an appropriate document duly executed (in a manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.
- 11.2. Bids may also be modified or withdrawn in person by the Bidder or an authorized representative provided he can prove his identity and authority.
- 11.3. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

#### 12.0 OPENING OF BIDS.

Bids will be opened by Owner.

### 13.0 BIDS TO REMAIN OPEN SUBJECT TO ACCEPTANCE.

All Bids shall remain open for sixty (60) days after the day of the Bid opening, but Owner may, in his sole discretion, release any Bid and return the Bid Security prior to that date.

### 14.0 AWARD OF AGREEMENT.

- 14.1. Owner reserves the right to reject any and all Bids, to waive any and all informalities, to negotiate Agreement terms with the Successful Bidder, and the right to disregard all nonconforming, non-responsive, unbalanced or conditional Bids. Also, Owner reserves the right to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Work to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- 14.2. Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations is submitted as requested by Owner. Owner also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.
- 14.3. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidder's proposed Subcontractors and other persons and organizations to do the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- 14.4. If the Agreement is to be awarded, it will be awarded to the lowest Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interest of the Work.
- 14.5. If the Agreement is to be awarded, Owner will give the Successful Bidder a Notice of Award within sixty (60) days after the date of the Bid opening.

### 15.0 CONTRACT SECURITY.

Paragraph 5.8 of the General Conditions and the Supplementary Conditions set forth Owner's requirements as to Performance and other Bonds. When the Successful Bidder delivers the executed Agreement to the Owner, it shall be accompanied by the required Securities.

### 16.0 SIGNING OF AGREEMENT.

When Owner gives a Notice of Award to the Successful Bidder, within ten days thereafter, Contractor shall deliver to Owner five sets of the required Security Bonds and Insurance forms. Within ten days thereafter, Owner shall deliver two fully signed sets of Contract Documents to the Contractor.

No Agreement is binding upon the Owner until it has been executed by the Owner and delivered to the Contractor.

17.0 TAXES.

Owner is exempt from Massachusetts State Sales and Use Taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Contract Amount.

(END OF SECTION)

**SECTION 00300 – BID PROPOSAL**

Project: Little Neck Wastewater Collection System

Place: Little Neck, Ipswich, MA

Date: \_\_\_\_\_

1. In compliance with your invitation for bids dated \_\_\_\_\_, and subject to all conditions thereof, the undersigned \_\_\_\_\_, a Corporation incorporated in the State of \_\_\_\_\_, a \_\_\_\_\_ consisting of \_\_\_\_\_, an individual trading as \_\_\_\_\_ of the City of \_\_\_\_\_, State of \_\_\_\_\_ hereby proposes to furnish and do everything required by the Contract Documents to which this refers at the lump sum or unit prices shown for each bid item on the following Bid Schedule. (The Bid Schedule lists the various divisions of construction contemplated in the Contract Documents, together with an estimate of the units of each for unit price items. With these units as the basis for unit cost items, the bidder will extend each item, using the cost he inserts in the unit column. Any total cost found inconsistent with the unit cost when the bids are examined will be deemed in error and corrected to agree with the unit cost which shall be considered correct.)
2. The undersigned bidder does hereby declare and stipulate that this proposal is made in good faith, without collusion or connection with any other person or persons bidding for the same Work, and that it is made in pursuance of and subject to all the terms and conditions of the Invitation to Bid and Instructions to Bidders, the Agreement, the Contract Drawings, and the Specifications pertaining to the Work to be done, all of which have been examined by the undersigned.
3. The undersigned has examined the location of the proposed Work, the Drawings, Specifications, and other Contract Documents and is familiar with the local conditions at the place where the Work is to be performed.
4. Accompanying this bid is a certified or cashier's check or standard bid bond in the sum of \_\_\_\_\_ (\$ \_\_\_\_\_) in accordance with the Invitation to Bid and Instructions to Bidders.
5. The undersigned bidder agrees to execute the Agreement and a Performance Bond and a Payment Bond for the amount of the total of this Bid within ten (10) calendar days from the date when the written Notice of the Award of the Agreement is delivered to him at the address given on this Bid. The name and address of the corporate surety with which the Bidder proposes to furnish the specified Performance and Payment Bonds is \_\_\_\_\_.
6. The undersigned Bidder agrees to abide by the requirements of Executive Order No. 11246, as amended.
7. All the various phases of Work enumerated in the Contract Documents with their individual jobs and overhead, whether specifically mentioned, included by implication or appurtenant thereto, are to be performed by the Contractor under one of the items listed in the Bid Schedule, irrespective of whether it is named in said list.

- 8 Payment for Work performed will be in accordance with the Bid Schedule subject to changes as provided in the Contract Documents.
- 9 The undersigned Bidder hereby acknowledges receipt of Addenda No. \_\_\_\_\_ through \_\_\_\_\_.

PRICES

Prices submitted by the Bidder shall include all labor, materials, transportation, shoring, removal, dewatering, overhead, profit, insurance, permits, etc., to cover the completed Work.

BIDDER acknowledges that the Owner has the right to delete items in the Bid or change quantities at his sole discretion without affecting the Agreement or prices of any item so long as the deletion or change does not exceed twenty-five percent (25%) of the total Contract Amount.

QUANTITIES

The approximate quantities of Work to be completed in place under the Agreement at unit prices are identified in the "Bid Schedule" and are for the purpose of comparing bids. These quantities have been estimated from the Contract Documents. The quantities used are for the general information of the bidder and represent the major items of the work to be done. Minor items and minor details are not listed but shall be part of the complete Agreement.

RESPECTFULLY SUBMITTED:

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Title: \_\_\_\_\_

License Number (If Applicable): \_\_\_\_\_

(SEAL - IF BID is by a corporation)

ATTEST: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

TELEPHONE: \_\_\_\_\_



**Little Neck Wastewater Collection System**  
**Feoffees of the Grammar School in the Town of Ipswich**  
**BID SCHEDULE A**

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	Mobilization/Demobilization (maximum 5%),	LS	1		
2.	Excavation Below Normal Grade	CY	500*		
3.	Rock Excavation and Disposal	CY	500*		
4.	Bank Run Gravel	CY	200*		
5.	Additional Common Fill	CY	200*		
6.	Additional Screened Gravel	CY	200*		
7.	Additional Crushed Stone	CY	200*		
8.	Dewatering	LF	1,000*		
9.	Sheeting Left In Place	SF	2,000*		
10A.	8" Diameter PVC Gravity Sewer Pipe	LF	8,500		
10B.	3" Diameter PVC Force Main	LF	1,900		
11A.	6" Diameter PVC House Lateral Connections	LF	6,200		
11B.	8" by 6" Diameter PVC Service Wye or Tee	EA	168		
11C.	6" Sewer Chimney	VF	900		
12A.	4' Diameter Manholes	VF	440		
12B.	5' Diameter Manholes	VF	120		
12C.	Manhole Frames and Covers with Inflow Inserts	EA	56		
12D.	Manhole Frames and Covers with Bolted and Gasketed Covers	EA	10		
12E.	8" Inside Drop Connections	VF	25		
13A.	Gravel Base Course	SY	3,350		
13B.	Bituminous Concrete Binder Course	SY	6,700		

13C	Bituminous Concrete Surface Course	SY	11,750		
13D	Pavement Leveling Course	TONS	100*		
13E	Filter Fabric	SY	500*		
14A	Removal and Relocation of Existing Cross-Drains	EA	5*		
14B	Removal and Relocation of Existing, In-Service Electric Conduit	LF	500*		
14C	Removal and Proper Disposal of Existing, Out-Of-Service Electric Conduit	LF	500*		
14D	Removal and Relocation of Existing, In-Service Water Main	LF	500*		
14E	Removal and Proper Disposal of Existing, Out-Of-Service Water Main	LF	500*		
14F	Removal and Relocation of Existing, In-Service Cable/Telephone Conduit	LF	500*		
14G	Removal and Proper Disposal of Existing, Out-Of-Service Cable/Telephone Conduit	LF	500*		
14H	Proper Abandonment of Existing Septic Tanks/Cesspools	EA	200*		
15A	Submersible Wastewater Pumping Station #1	LS	1		
15B	Submersible Wastewater Pumping Station #2	LS	1		
16.	Loaming and Seeding	SY	500*		
17.	Test Pit Excavation	CY	100*		
18.	Hay Bales and Silt Fence	LF	2,000*		
19.	Engineer's Field Office	LS	1		
20.	Temporary 1,000 Gallon Tight Tanks	EA	5*		
21.	Trench Dams	EA	60		
22.	New Electrical Conduits	LF	3,700		
23A.	Overflow Tank for Pump Station #1	EA	1		

23B.	Overflow Tank for Pump Station #2	EA	1	_____	_____
24.	Force Main to Gate for Future Use	LF	900	_____	_____
<b>TOTAL</b>				_____	_____

\* Indeterminate quantity assumed for comparison of bids

TOTAL (IN WORDS) BID SCHEDULE A:

SECTION 00400 – SUPPLEMENTS TO BID PROPOSAL

- 00410 Bid Bond
- 00420 Statement of Bidder's Qualifications
- 00430 Schedule of Major Subcontractors
- 00450 Schedule of Major Equipment
- 00480 Non-collusion Affidavit of Prime Bidder

**SECTION 00410 – BID BOND**

KNOW ALL MEN BY THESE PRESENTS: that we, the undersigned \_\_\_\_\_  
\_\_\_\_\_ as Principal, and \_\_\_\_\_  
as Surety, are hereby held and firmly bound unto \_\_\_\_\_  
in the sum of \$ \_\_\_\_\_ for the payment of which, well and  
truly to be made, we hereby jointly and severally bind ourselves, successors, and assigns.

THE CONDITION of this obligation is such that whereas the Principal has submitted to \_\_\_\_\_  
\_\_\_\_\_ a certain BID, attached hereto and hereby made a part  
hereof to enter into an Agreement in writing for the following Work: Construction of the Little  
Neck, Ipswich, MA Wastewater Collection System.

NOW THEREFORE,

- a. If said BID shall be rejected, or
- b. If said BID shall be accepted and the Principal shall execute and deliver an Agreement in the form of the Agreement attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said Agreement, and for payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the Agreement created by the acceptance of said BID, then this obligation shall be void; otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the Owner may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

Surety

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

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 Massachusetts.

SECTION 00420 – STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder: \_\_\_\_\_
2. Permanent main office address: \_\_\_\_\_
3. When organized: \_\_\_\_\_
4. If a corporation, where incorporated: \_\_\_\_\_
5. How many years have you been engaged in the contracting business under your present firm or trade name? \_\_\_\_\_
6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
7. General character of work performed by your company: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
8. Have you ever failed to complete any work awarded to you? \_\_\_\_\_  
If so, where and why? \_\_\_\_\_  
\_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
9. Have you ever defaulted on a contract? \_\_\_\_\_  
If so, where and why? \_\_\_\_\_  
\_\_\_\_\_

10. List the more important projects recently completed by your company, stating the approximate cost of each, and the month and year completed, location and type of construction.

11. List your major equipment available for this Work.

12. Experience in construction work similar in importance to this Work:

13. Background and experience of the principal members of your organization, including officers:

14. Credit available: \$ \_\_\_\_\_

15. Bank reference: \_\_\_\_\_

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner? \_\_\_\_\_

17. Are you licensed as an Excavator, Pipeline Constructor or any other title? \_\_\_\_\_  
If yes, in what city, county and state? \_\_\_\_\_  
What class, license and numbers? \_\_\_\_\_  
\_\_\_\_\_

Note: The CONTRACTOR must be or become licensed in the city or county for which or where this Work is to be performed.

18. Do you anticipate subcontracting work under this Agreement? \_\_\_\_\_  
If yes, what percent of total Work? \_\_\_\_\_

19. Are any lawsuits pending or threatened against you or your firm at this time? \_\_\_\_\_  
If yes, DETAIL \_\_\_\_\_

20. What are the limits of your public liability?  
DETAIL \_\_\_\_\_

What company? \_\_\_\_\_

21. What are your company's bonding limitations? \_\_\_\_\_

22. Have you ever been assessed liquidated damages for failure to complete a project within the Contract Time? \_\_\_\_\_  
If so, when and where? \_\_\_\_\_

23. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recital comprising this Statement of Bidder's Qualifications.

Dated at: \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_

Name of Bidder

By: \_\_\_\_\_

Name & Title: \_\_\_\_\_

State of: \_\_\_\_\_ )

)

County of: \_\_\_\_\_ )



Being duly sworn deposes and says that he is \_\_\_\_\_  
of \_\_\_\_\_ (Name of Organization) and that the answers to  
the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

Notary Public

My commission expires \_\_\_\_\_.

SECTION 00430 – SCHEDULE OF MAJOR SUBCONTRACTORS

Item	Subcontractor
Earthwork, Yard Piping	
Dewatering	
Electrical	
Controls and Instrumentation	
Mechanical Piping	

SECTION 00450 – SCHEDULE OF MAJOR EQUIPMENT

Item	Manufacturer or Supplier
Packaged Pump Stations	

Note: In connection with the major items of equipments to be furnished and installed, the Bidder does expressly agree to the following provision:

Should the Bidder indicate more than one manufacturer; or fail to indicate a manufacturer, the Owner shall have the specific right to make the selection at no additional cost to the Owner.

SECTION 00480 - NONCOLLUSION AFFIDAVIT OF PRIME BIDDERS

State of \_\_\_\_\_ )

)SS

County of \_\_\_\_\_ )

Being first duly sworn, deposes and says that:

1. He is \_\_\_\_\_ of \_\_\_\_\_  
(Title) \_\_\_\_\_  
the Bidder that has submitted the attached Bid;
2. He is fully informed respecting the preparation and content of the attached Bid and of all pertinent circumstances respecting such Bid.
3. Such Bid is genuine and is not a collusive or sham Bid;
4. Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm, or person to submit a collusive or sham Bid in connection with the Agreement for which the attached Bid has been submitted or to refrain from bidding in connection with such Agreement, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference in the attached Bid or any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner or any other person interested in the proposed Agreement; and
5. The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

Signed: \_\_\_\_\_

Title: \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

Notary Public:

My commission expires: \_\_\_\_\_

CONTRACT DOCUMENTS

SECTION 00500 – AGREEMENT FORMS

00510	Notice of Award
00520	Agreement
00530	Notice to Proceed

SECTION 00510 – NOTICE OF AWARD

DATE: \_\_\_\_\_

TO: \_\_\_\_\_

DESCRIPTION OF WORK: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

OWNER: Feoffees of the Grammar School in the Town of Ipswich

You are hereby notified that your Bid dated \_\_\_\_\_, 200\_\_\_\_ for the above Work has been considered.

You are the apparent Successful Bidder and an Agreement for the Work will be executed.

The Contract Amount is \_\_\_\_\_ Dollars,  
(\$ \_\_\_\_\_).

You must comply with the following conditions within ten (10) days of the date of this Notice of Award.

You must deliver to the Engineer, Lombardo Associates, Inc. at 49 Edge Hill Road, Newton, MA 02467, five sets of the Contract Security (Bonds) and Insurance Forms as specified in the Instructions to Bidders, General Conditions (Article 5) and Supplementary Conditions.

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.

OWNER: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

**SECTION 00520 – AGREEMENT**

STATE OF: Massachusetts )

)ss.

COUNTY OF: \_\_\_\_\_ )

THIS AGREEMENT AND FORMAL CONTRACT, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_, by and between Feoffees of the Grammar School in the Town of Ipswich, MA, party of the first part, hereinafter called the "OWNER", and, \_\_\_\_\_ a (Individual, Partnership, or Corporation) of the City of \_\_\_\_\_, County of \_\_\_\_\_, State of \_\_\_\_\_, hereinafter called the "CONTRACTOR" party of the second part, WITNESSETH, that whereas the OWNER intends to construct the Little Neck, Ipswich, MA Wastewater Collection System, hereinafter called the Work, in accordance with the Drawings, Specifications, and other Contract Documents prepared by Lombardo Associates, Inc., dated \_\_\_\_\_.

NOW, THEREFORE, the OWNER and CONTRACTOR for the considerations hereinafter set forth, agree as follows:

1. The CONTRACTOR agrees to furnish all the necessary labor, materials, equipment, tools and services necessary to perform and complete in a workmanlike manner all work required for the construction of the Work, in strict compliance with the Contract Documents herein mentioned, which are hereby made a part of the Agreement, including the following Addenda:

Addendum No.	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- a. Contract Time: The CONTRACTOR agrees to commence work under this Contract in accordance with the written Notice to Proceed, and to finally complete the Work within 120 calendar days of the commencement of the Contract Time as defined in the General Conditions of the Contract.

- b. Sub-Contractors: The CONTRACTOR agrees to bind every sub -contractor by the terms of the Contract Documents. The Contract Documents shall not be construed as creating any contractual relation between the Sub-Contractor and the OWNER.
2. The OWNER agrees to pay, and the CONTRACTOR agrees to accept, in full payment for the performance of this Agreement, and in accordance with Section 00300 of the Contract Documents, the Contract Amount of:  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_ ),  
plus any and all sums to be added and/or deducted resulting from all extra and/or omitted work in connection therewith, as authorized under the terms as stated in the General and Supplementary Conditions, all in accordance with the terms as stated in the Contract Documents.
- a. Progress Payments will be made in accordance with the General and Supplementary Conditions of the Contract Documents.
  - b. Progress Payments will be in the amount equal to ninety percent (90%) of the calculated value of the Work completed until fifty percent (50%) of the work required by the Contract Documents has been completed. At such time, OWNER shall have retained funds to five percent (5%) of the total Contract Amount. The amount retained, as provided above will be withheld by the OWNER until completion of the Agreement to ensure faithful completion of the Work under the terms of the Contract Documents.
  - c. Upon completion and acceptance of the Work in accordance with the Contract Documents, OWNER shall pay the remainder of the Contract Amount after publication by the OWNER in accordance with Massachusetts statutory requirements.

3. Contract Documents

It is hereby mutually agreed that the following list of instruments, plans, specifications, and documents which are attached hereto, bound herewith or incorporated herein by reference shall constitute the Contract Documents, all of which are made a part hereof, and collectively evidenced and constitute the Agreement between the parties hereto, and they are fully a part of the Agreement as if they were set out verbatim and in full herein, and are designated as follows:

- a. Instructions to Bidders
- b. Bid Proposal
- c. Bid Bond
- d. Notice of Award
- e. Agreement
- f. Performance and Payment Bonds



- g. Certificates of Insurance, Policy Endorsement
  - h. Notice to Proceed
  - i. General Conditions
  - j. Supplementary Conditions
  - k. Technical Specifications
  - l. Drawings
  - m. Submittal Packet
  - n. Addenda
4. Liquidated Damages

OWNER and CONTRACTOR recognize that time is of the essence in this Agreement and that the OWNER will suffer financial loss if the Work is not complete within the time specified in paragraph 1.a) above, plus any extensions thereof allowed in accordance with the General Conditions. They also recognize the delays, expense and difficulties involved in proving, in a legal proceeding, the actual loss suffered by OWNER if the Work is not complete on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER two thousand dollars (\$2,000) for each calendar day that expires after the time specified in paragraph 1.a) for final completion until the Work is finally complete.

5. Contractor Representations

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- a. CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality, and with all local conditions and federal, state, and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.
- b. CONTRACTOR has studied carefully the Contract Documents and all other items otherwise affecting cost, progress or performance of the Work which were relied upon by the Engineer in the preparation of the Contract Drawings and Specifications and which have been identified in the Supplementary Conditions as a part of the Contract Documents.
- c. CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to in paragraph 5.b) as he deems necessary for the performance of the Work at the Contract Amount, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional

examinations, investigations, tests, reports or similar data are or will be required by CONTRACTOR for such purposes

- d. CONTRACTOR has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.
- e. CONTRACTOR has given Engineer written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to CONTRACTOR.

6. Miscellaneous

- a. Terms used in this Formal Contract which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.
- b. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- c. OWNER and CONTRACTOR each binds himself, his partners, successors, assigns, and legal representatives to the other party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.
- d. No mechanic, contractor, sub-contractor, material man or other person can or will contract for or in any manner have or acquire any lien upon the Work covered by this Agreement, or the land upon which the same is situated.
- e. The Engineer is: Lombardo Associates, Inc. Located at 49 Edge Hill Road, Newton, MA 02467. Attn: Pio Lombardo.

SIGNATURES:

OWNER: Feoffees of the Grammar School in the Town of Ipswich

DATE: \_\_\_\_\_

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

ATTEST: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

Address for giving notices:

CONTRACTOR: \_\_\_\_\_

DATE: \_\_\_\_\_

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

ATTEST: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

Address for giving notices:

SECTION 00530 - NOTICE TO PROCEED

TO \_\_\_\_\_

DESCRIPTION OF WORK: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

OWNER: Feoffees of the Grammar School in the Town of Ipswich

This notice is to advise you:

That the required Contractor's Performance Bond, Payment Bond and Certificates of Insurance and Policy Endorsement have been received by the Owner.

That the Agreement covering the above-described Work has been fully executed by the Contractor and the Owner.

That the Owner has approved the said Contract Documents.

That the Contract Time commences upon execution of this Notice to Proceed by the Owner.

Therefore, as the Contractor for the above described Work, you are hereby authorized and directed to proceed within ten (10) calendar days from receipt of this notice as required by the Agreement.

Dated this \_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_.

OWNER: Feoffees of the Grammar School in the Town of Ipswich

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

ACKNOWLEDGMENT OF NOTICE

Receipt of this Notice to Proceed is hereby acknowledged this \_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_.

CONTRACTOR: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

**SECTION 00600 – BONDS AND CERTIFICATES**

- 00610 Performance Bond
- 00615 Payment Bond
- 00630 Certificate of Substantial  
Completion
- 00640 Certificate of Final Acceptance
- 00650 Lien Waiver Release (Contractor)
- 00651 Lien Waiver Release  
(Subcontractor)
- 00660 Consent of Surety

SECTION 00610 – PERFORMANCE BOND

Bond No

KNOW ALL MEN BY THESE PRESENTS that

(Firm) \_\_\_\_\_

(Address): \_\_\_\_\_

(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm): \_\_\_\_\_

(Address): \_\_\_\_\_

hereinafter referred to as "the Surety", are held and firmly bound unto the Owner, in the 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, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Agreement with the Owner, dated the \_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_, a copy of which is hereto attached and made a part hereof for the performance of the Work, Construction of the Little Neck, Ipswich, MA Wastewater Collection System.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms and conditions of said Agreement during the original Contract Time thereof, and any extensions thereof which may be granted by the Owner, with or without Notice to the Surety and during the life of the warranty period, and it shall satisfy all claims and demands incurred under such Agreement, and shall fully indemnify and save harmless the Owner from all cost 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, and 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 Agreement or to the Work to be performed thereunder or the Contract Documents 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 Agreement or to the Work or to the Contract Documents.

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 five (5) counterparts, each one of which shall be deemed an original, this \_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_.

PRINCIPAL

ATTEST: \_\_\_\_\_

Principal: \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

(Address)

(Corporate Seal)

SURETY

ATTEST: \_\_\_\_\_

Principal: \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

(Address)

(Surety Seal)

NOTE: Date of Bond must not be prior to date of Agreement.

IMPORTANT: Surety Company must be authorized to transact business in the State of Massachusetts and be acceptable to the Owner.

SECTION 00615 - PAYMENT BOND

Bond No \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, that

(Firm) \_\_\_\_\_

(Address): \_\_\_\_\_

(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm): \_\_\_\_\_

(Address): \_\_\_\_\_

hereinafter referred to as "the Surety", are held and firmly bound unto the Owner, in the 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, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Agreement with the Owner, dated the \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_; a copy of which is hereto attached and made a part hereof for the performance of the Work, Construction of the Little Neck, Ipswich, MA Wastewater Collection System.

NOW, THEREFORE, if the Principal shall make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the Work provided for in such Agreement, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, repairs on machinery, equipment and tools, consumed, rented or used in connection with the execution of such Work, and all insurance premiums on said Work, and for all labor, performed in such Work whether by Subcontractor or otherwise, 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 Agreement or to the Work to be performed thereunder or the Contract Documents 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 Agreement or to the Work or to the Contract Documents.

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 five (5) counterparts, each one of which shall be deemed

an original, this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_.



PRINCIPAL

ATTEST: \_\_\_\_\_

Principal: \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

(Address)

(Corporate Seal)

SURETY

ATTEST: \_\_\_\_\_

Principal: \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

(Address)

(Surety Seal)

NOTE: Date of Bond must not be prior to date of Agreement.

IMPORTANT: Surety Company must be authorized to transact business in the State of Massachusetts and be acceptable to the Owner.

(Surety Seal)

SECTION 00630 – CERTIFICATE OF SUBSTANTIAL COMPLETION

TO \_\_\_\_\_

DESCRIPTION OF WORK: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

OWNER: Feoffees of the Grammar School in the Town of Ipswich

DATE OF SUBSTANTIAL COMPLETION: \_\_\_\_\_

DATE OF AGREEMENT \_\_\_\_\_

The Work performed under this Agreement has been reviewed by authorized representatives of the Owner, Contractor, and the Engineer and the Work (or specified part of the Work, as indicated above) is hereby declared to be substantially complete on the above stated date.

A tentative list of items to be completed or corrected is appended hereto. This list may not be fully inclusive, and the failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents.

ENGINEER: Lombardo Associates, Inc.

Date: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

The Contractor accepts this Certificate of Substantial Completion and agrees to complete and correct the items on the tentative list within the time indicated.

CONTRACTOR: \_\_\_\_\_

Date: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

The Owner accepts the Work or specified parts of the Work as substantially complete and will assume full possession of the Work or specified part of the Work. The responsibility for utilities, security, and insurance under the Contract Documents shall be as set forth under "Remarks" below.

OWNER: Feoffees of the Grammar School in the Town of Ipswich Date: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Remarks: \_\_\_\_\_

SECTION 00640 – CERTIFICATE OF FINAL ACCEPTANCE

DATE: \_\_\_\_\_

TO: \_\_\_\_\_

DESCRIPTION OF WORK: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

OWNER: Feoffees of the Grammar School in the Town of Ipswich

Gentlemen:

You are hereby notified that the Owner has accepted the Work.

A check is attached hereto in the amount of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ ) as final payment for all work done, subject to the terms of the Contract Documents which are dated \_\_\_\_\_, 200\_\_\_\_.

In conformance with the Contract Documents for the Work, your obligations and warranty period will continue for the specified time from the date as set forth herein above, until day of \_\_\_\_, 200\_\_ per the Supplementary Conditions.

Sincerely,

OWNER: Feoffees of the Grammar School in the Town of Ipswich

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

ATTEST: \_\_\_\_\_

Title: \_\_\_\_\_

SECTION 00651 – LIEN WAIVER RELEASE (SUBCONTRACTOR)

TO: Feoffees of the Grammar School in the Town of Ipswich (hereinafter referred to as "the Owner")

DESCRIPTION OF WORK: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

SUBCONTRACTOR: \_\_\_\_\_

1. The undersigned does hereby release all claims, Mechanic's Liens Rights, Miller Act Claims (40 USCA 270), Stop Notice, Equitable Liens and Labor and Material Bond Rights resulting from labor and/or materials, subcontract work, equipment or other work, rents, services or supplies heretofore furnished in and for the construction, design, improvement, alteration, additions to or repair of the above described Work.
2. This release is given for and in consideration of the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ ) and other good and valuable consideration. If no dollar consideration is herein recited, it is acknowledged that other adequate consideration has been received by the undersigned for this release.
3. In further consideration of the Payment made or to be made as above set forth, and to induce the Contractor to make said payment, the undersigned agrees to defend and hold harmless the Owner and lender, if any, and Surety from any claim or claims hereinafter made by the undersigned or its Suppliers, Subcontractors or employees, servants, agents or assigns of such persons against the Work. The undersigned agrees to indemnify or reimburse all persons so relying upon this release for any and all sums, including attorney's fees and costs, which may be incurred as the result of any such claims.
4. It is acknowledged that the designation of the above Work constitutes an adequate description of the property and improvements for which the undersigned has received consideration for this release.
5. It is further warranted and represented that all such claims against the undersigned or the undersigned's Subcontractors or material suppliers have been paid or that arrangements, satisfactory to the Owner and Contractor, have been made for such payments.
6. It is acknowledged that this release is for the benefit of and may be relied upon by the Owner, the Contractor, the lender, if any, and the principal and Surety on any Performance and Payment bonds for the Work.
7. In addition to the foregoing, this instrument shall constitute a full, final and complete release of all rights, claims and demands of the undersigned against the Owner, Contractor, or Surety arising out of or pertaining to the above referenced Work. If partial, all rights and claims on the Work are released up to and including the day of \_\_\_\_\_, 200\_\_\_\_\_.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_.

SUBCONTRACTOR: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

STATE OF: \_\_\_\_\_)

) ss.

COUNTY OF: \_\_\_\_\_)

The foregoing release was subscribed and sworn to before me this \_\_\_ day of \_\_\_\_\_  
\_\_\_\_\_, 200\_\_\_\_\_, by \_\_\_\_\_

(as \_\_\_\_\_ of \_\_\_\_\_).

NOTARY PUBLIC

My commission expires: \_\_\_\_\_

SECTION 00660 – CONSENT OF SURETY

TO Feoffees of the Grammar School in the Town of Ipswich (hereinafter referred to as "the Owner"):

DESCRIPTION OF WORK: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

DATE OF AGREEMENT: \_\_\_\_\_

In accordance with the provisions of the Agreement between the Owner and the Contractor for the Work indicated above, \_\_\_\_\_  
on bond of (Surety) \_\_\_\_\_  
hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of its obligations to the Owner, as set forth in the said Surety Company's Bonds and the Contract Documents for the Work.

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_\_.

(Surety Company)

BY: \_\_\_\_\_

ATTACH: Power of Attorney and Certificate of Authority of Attorney(s)-in-Fact.

## CONDITIONS OF THE CONTRACT

### SECTION 00700 – GENERAL CONDITIONS

Article 1	Definitions
Article 2	Preliminary Matters
Article 3	Contract Documents: Intent and Reuse
Article 4	Physical Conditions
Article 5	Bonds and Insurance Requirements
Article 6	Scope of Work
Article 7	Execution of the Work
Article 8	Control of Material
Article 9	Legal Relations and Responsibility to the public
Article 10	Prosecution and Progress
Article 11	Measurement and Payment
Article 12	Warranty and Guarantee; Access to Work; Continuation of Work; Partial Utilization
Article 13	Work by Others
Article 14	Miscellaneous

## ARTICLE 1 – DEFINITIONS

Wherever used in these General Conditions or in the other sections of these Contract Documents, the following terms, or pronouns in place of them, have the meanings indicated which are applicable to both the singular and plural thereof:

- 1.1. AASHTO: The American Association of State Highway and Transportation Officials
- 1.2. ASA: The American Standards Association
- 1.3. ASTM: The American Society for Testing Materials
- 1.4. AWWA: The American Water Works Association
- 1.5. ADDENDA: Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents and the Contract Documents
- 1.6. AGREEMENT: The written agreement between Owner and Contractor covering the Work to be performed; other sections of these Contract Documents are attached to the Agreement and made a part thereof as provided therein.
- 1.7. APPLICATION FOR PAYMENT: The form accepted by the Engineer and Owner which is to be used by the Contractor in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents, Owner or Engineer.
- 1.8. BID: The offer or proposal of the Bidder submitted on the prescribed Bid Proposal form setting forth the costs for the Work to be performed.
- 1.9. BIDDER: Any individual, firm or corporation, submitting a proposal directly to the Owner for the Work contemplated, acting directly or through a duly authorized representative.
- 1.10. BONDS: Bid, performance and payment bonds and other instruments of security.
- 1.11. CHANGE ORDER: A written modification to the Contractor signed by the Engineer and the Owner authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Amount or the Contract Time issued after the effective date of the Agreement.
- 1.12. COMPLETION: The Work or a portion thereof, has progressed to a point where, in the opinion of the Engineer and the Owner it is totally complete, and the Engineer certifies that the Work is generally in accordance with the Contract Documents. The Contractor has fulfilled all of his obligations under the Contract Documents, except for certain continuing obligations. The aforementioned completion shall be sufficient to meet the requirements set forth for Final Payment and Acceptance in Paragraph 11.19 of the General Conditions. The terms "complete" and "completed" as applied to the Work refer to completion.
- 1.13. CONTRACT OR CONTRACT DOCUMENTS: The written agreement executed between the Owner and the successful bidder, covering the performance of the Work and the furnishing of labor and materials, by which the Contractor is bound to perform the Work and furnish the labor and materials, and by which the Owner is obligated to compensate him therefore at the mutually established and accepted Contract Amount. The Contract Documents shall include the Instructions to Bidders, Agreement, Notice of Award,



Addenda (which pertain to the Contract Documents, Contractor's Bid Proposal including documentation accompanying the Bid and Award), Bonds, Certificates of Insurance, these General Conditions, Supplementary Conditions, Technical Specifications, Drawings, and other items specifically identified in the Agreement together with all Modifications issued after the execution of the Agreement.

- 1.14. **CONTRACT AMOUNT:** The moneys payable by Owner to Contractor under the Contract Documents as stated in the Agreement.
- 1.15. **CONTRACT TIME:** The number of days for the completion of the Work as stated in the Agreement commencing with the date of the Notice to Proceed.
- 1.16. **CONTRACTOR:** The individual, partnership, firm, or corporation with whom Owner has entered into the Agreement, acting directly or through lawful agents or employees, primarily liable for the acceptable performance of the Work for which contracted, and also for the payment of all legal debts pertaining to the Work.
- 1.17. **DAY:** A calendar day of twenty-four hours measured from midnight to the next midnight.
- 1.18. **DEFECTIVE:** An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in the Contract Documents, or has been damaged prior to final payment.
- 1.19. **DISTRICT:** A legally constituted governmental entity established for the purpose of carrying on specific activities within definitely defined boundaries. Its governing body may be the Board of Supervisors or it may be composed of elected or appointed members. The District shall be represented by its authorized Board of Directors in accordance with its statutory powers.
- 1.20. **DRAWINGS:** The Contract Drawings or exact reproduction thereof, which graphically show the character and scope of the Work to be performed and which have been prepared or approved in concept by the Engineer and are referred to in and a part of, the Contract Documents.
- 1.21. **EFFECTIVE DATE OF THE AGREEMENT:** The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
- 1.22. **ENGINEER:** The person, firm, or corporation named as such in the Contract Documents.
- 1.23. **EQUIPMENT:** All machinery, together with the necessary parts supplied for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the Work.
- 1.24. **FEDERAL SPECIFICATIONS:** The Federal Specifications and Standards, and supplements, amendments, and indices thereto, are prepared and issued by the General Services Administration of the Federal Government. These may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20025.

- 1.25. FIELD ORDER: A written order to the Contractor issued by the Engineer effecting a change in the Work not involving an adjustment in the Contract Amount or an adjustment in the Contract Time.
- 1.26. INTENTION OF TERMS: Whenever, in these Specifications or upon the Drawings, the words "directed", "required", "permitted", "ordered", "designated", "prescribed", or words of like import, are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved", "acceptable", "satisfactory", or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner. Any reference to a paragraph or subparagraph within a section shall include the general provision of the section or sections and paragraph pertinent thereto.
- 1.27. LABORATORY: The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer.
- 1.28. MODIFICATION: (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) a Supplemental Agreement. A modification may only be issued after the effective date of the Agreement.
- 1.29. NOTICE OF AWARD: The written notice by Owner to the apparent successful Bidder stating that upon compliance by the apparent Successful Bidder with the conditions precedent enumerated therein, within the time specified, Owner will sign and deliver the Agreement.
- 1.30. NOTICE TO PROCEED: A written notice given by Owner to Contractor (with a copy to Engineer), the date of which fixes the Contract Time will commence to run and on which Contractor shall start to perform his obligation under the Contract Documents.
- 1.31. OWNER: The public body or authority, corporation, association, firm or individual with whom the Contractor has entered into the Agreement and for whom the Work is to be provided.
- 1.32. PAYMENT BOND: The approved form of security furnished by the Contractor and his Surety as a guarantee that he will pay in full all bills and accounts for materials and labor used in the execution of the Work, as provided by law.
- 1.33. PERFORMANCE BOND: The approved form of security furnished by the Contractor and his Surety as a guarantee of good faith and ability on the part of the Contractor to execute the Work in accordance with the terms of the Contract Documents.
- 1.34. PROJECT REPRESENTATIVE: An authorized representative of the Owner who is assigned to the Work or any part thereof.
- 1.35. PROJECT MANAGER: An authorized representative of the Owner who is assigned to the Work or any part thereof.
- 1.36. PROPOSAL: (See "BID")
- 1.37. SHOP DRAWINGS: All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by the Contractor, a Subcontractor, manufacturer, fabricator,

supplier or distributor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a manufacturer, fabricator, supplier or distributor and submitted by Contractor to illustrate material or equipment for some portion of the Work.

- 1.38. SPECIFICATIONS: A part of the Contract Documents consisting of written descriptions, of a technical nature, of materials, equipment, construction systems, standards and workmanship for execution of the work which may be included in the Contract Documents.
- 1.39. SUBCONTRACTOR: An individual, firm or corporation having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
- 1.40. SUBSTANTIAL COMPLETION: The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Engineer as evidenced by a written opinion as to Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part thereof) can be utilized or partially utilized for the purposes and in a manner for which it was intended; or if there be no such written opinion issued, when final payment is due in accordance with paragraph 11.19. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.
- 1.41. SUPERINTENDENT: Executive representative for the Contractor present on the Work at all times, authorized to receive and fulfill instructions from the Engineer and capable of superintending the Work efficiently.
- 1.42. SUPPLEMENTAL AGREEMENT: A written proposal and agreement executed by the Contractor and by the Owner with the consent of the Contractor's Surety, covering Work not included in the Contract Documents or as specified in paragraph 6.3 which is necessary or desirable to the proper completion of the Work.
- 1.43. SUPPLEMENTARY CONDITIONS: The part of the Contract Documents which amends or supplements the General Conditions and Technical Specifications.
- 1.44. SURETY: The corporate body or individuals who are bound by the Performance Bond and the Payment Bond with and for the Contractor, and which engage to be responsible for the entire and satisfactory fulfillment of the Agreement and for the payment of all debts incurred in fulfilling the Agreement.
- 1.45. WORK: The term "Work" shall be understood to mean the furnishing of all labor, materials, equipment, and other incidentals necessary or convenient to the successful completion of the Work and the carrying out of all the duties and obligations imposed by the Contract Documents and the entire completed execution or the various separately identifiable parts thereof required to be furnished under the Contract Documents.

(END ARTICLE 1)

## ARTICLE 2 – PRELIMINARY MATTERS

### PROPOSAL REQUIREMENTS AND CONDITIONS

#### Substitution of Equipment and Materials

- 2.1. Where items of equipment and/or materials are specifically identified by a manufacturer's name, model or catalog number, only such specific items may be used in the Bid unless prior written approval of other material has been obtained from the Engineer. Applications for such approval shall be submitted in duplicate at least six working days prior to Bid opening date. Applications for approval shall be accompanied by a typewritten listing of the specified manufacturer and catalog number and shall also state in typewritten detail any and all significant details in which each item requested for approval differs from the item specified. Failure to so list such information shall not relieve the Contractor from providing properly functioning or fitting materials, regardless of the approval action taken by the Engineer.

#### Rejection of Irregular Bid

- 2.2. Bids containing any omission, alternations of form, addition or conditions not called for, conditional or alternate Bids unless called for, incomplete Bids, or Bids otherwise regular which are not accompanied by acceptable Bid Securities, will be considered irregular and may be rejected. The Owner reserves the right to waive technicalities as to changes, alterations or reservations, and make the award to the best interest of the Owner.

#### Disqualification of Bidders

- 2.3. Any one or more of the following causes may be considered as sufficient for the disqualification of Bidder and the rejection of his Bid or:
- a. More than one Bid for the same Work from an individual, firm, partnership, or corporation under the same or different names;
  - b. Evidence of collusion among Bidders. Participants in such collusion may receive no recognition as Bidders for any future Work;
  - c. Unbalanced Bids in which the prices for some items are out of proportion to the prices for other items;
  - d. Failure to submit a price for each item of Work for which a Bid price is required by the Bid;
  - e. Lack of competency as revealed by the financial statement, experience, plant and equipment statements submitted;
  - f. Lack of responsibility as shown by past Work judged from the standpoint of workmanship and progress;
  - g. Uncompleted Work which, in the judgment of the Owner, might hinder or prevent the prompt completion of additional work if awarded;

- h. For being in arrears on existing contracts, in litigation with the Owner, or having defaulted on a previous contract;
- i. Lack of adequate bonds and/or insurance as required by the Contract Documents;
- j. Any other reason which in the discretion of Owner, renders Bidder unfit to perform the Work or gives the Owner cause to believe there is substantial likelihood that Bidder will default on the Agreement and it is therefore not in Owner's best interest to make such an award.

#### Materials Guaranty

- 2.4. Before any Agreement is awarded, Bidders may be required to furnish a complete statement of the origin, composition and manufacture of all or any materials to be used in the construction of the Work, together with samples, which samples may be subjected to the tests provided for in the Contract Documents to determine their quality and fitness for the Work.

#### Failure to Execute Agreement

- 2.5. Failure to comply with any of the requirements of the Bid Proposal to execute the Agreement within ten (10) days after the date of the Notice of Award or to furnish Bonds, Certificates of Insurance and other documents as required, shall be just cause for the annulment of the award. In the event of such annulment of the award, the amount of Bid Security shall become the property of the Owner, not as a penalty but as liquidated damages. Award may then be made to the next qualified Bidder, or the Work readvertised, or handled as the Owner may elect.

#### Copies of Contract Documents

- 2.6. Owner shall furnish to Contractor up to five copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

#### COMMENCEMENT OF CONTRACT TIME

##### Notice To Proceed

- 2.7. The Contract Time will commence to run in accordance with the Notice To Proceed which shall be issued no later than thirty days after the date of the Agreement.

##### Starting the Work

- 2.8. Contractor shall start to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the site of the Work prior to the date on which the Contract Time commences to run unless prior approval is given by Engineer and Owner.

Before Starting Construction

- 2.9. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error or discrepancy which Contractor may discover.
- 2.10. Within three days after the date of the Agreement (unless otherwise specified in the Supplementary Conditions), Contractor shall submit to Engineer for review an initial schedule indicating the starting and completion dates of the various stages of the Work, a preliminary schedule of Shop Drawing submissions, and an initial schedule of values of the Work where applicable.

Preconstruction Conference

- 2.11. Within five days after the date of the Agreement, but before Contractor starts the Work at the site, a conference will be held for review of the schedules referred to in paragraph 2.10, to establish procedures for handling Shop Drawings and other submittals and for processing Applications for Payment, and to establish such working understandings among the parties as to the Work as are not inconsistent with the Contract Documents.

(END OF ARTICLE 2)

## ARTICLE 3 – CONTRACT DOCUMENTS

### INTENT AND REUSE

#### Intent

- 3.1. It is the intent of this Agreement to describe a complete project which may be utilized for its intended purpose(s) as more fully described in the Contract Documents. The Contract Documents comprise the entire agreement between Owner and Contractor concerning the Work. They may be altered only by a written modification.
- 3.2. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If, during the performance of the Work, Contractor finds a conflict, error or discrepancy in the Contract Documents, he shall report it to Engineer in writing at once and before proceeding with the Work affected thereby; however, Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof or should reasonably have known thereof.
- 3.3. It is the intent of the Contract Drawings and Specifications to describe the complete Work (or part thereof) to be executed in accordance with the Contract Documents. Any Work that may reasonably be inferred from the Contract Drawings and Specifications as being required to produce the intended result shall be supplied whether or not it is specifically called for. When words which have a well-known technical or trade meaning are used to describe the Work, materials or equipment, such words shall be interpreted in accordance with such meaning.

Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the code of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual or code in effect at the time of opening of Bids (or, on the effective date of the Agreement if there were no Bids), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall change the duties and responsibilities of Owner, Contractor or Engineer, or any of their agents or employees from those set forth in the Contract Documents. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided for in paragraph 7.6.

- 3.4. The Contract Documents will be governed by the laws of the State of Massachusetts.

#### Reuse of Documents

- 3.5. Neither Contractor nor any Subcontractor, manufacturer, fabricator, supplier or distributor shall have or acquire any title to or ownership rights in any of the Contract Drawings and Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of the Engineer; and they shall not reuse any of them on extensions of the Work or any other project without written consent of the Owner and the Engineer and specific written verification or adoption by the Engineer.

(END ARTICLE 3)

## ARTICLE 4 – PHYSICAL CONDITIONS

### Investigations and Reports

- 4.1. Reference is made to the Supplementary Conditions for identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which have been relied upon by the Engineer in preparation of the Contract Drawings and Specifications. Such reports are not guaranteed as to accuracy or completeness and are not part of the Contract Documents.

### Unforeseen Physical Conditions

- 4.2. Contractor shall promptly notify Owner and Engineer in writing of any subsurface or latent physical conditions at the site or in any existing structure differing materially from those indicated or referred to in the Contract Documents. Engineer will promptly review those conditions and advise Owner in writing if further investigation or tests are necessary. Promptly thereafter, Owner shall obtain the necessary additional investigations and tests and furnish copies to the Engineer and Contractor. If the Engineer and Owner find that the results of such investigations or tests indicate that there are subsurface or latent physical conditions which differ materially from those identified in the Contract Documents, and which could not reasonably have been anticipated by Contractor after personal investigation and testing, a Change Order shall be issued incorporating the necessary revisions. No such change shall be approved unless asserted prior to Final Payment.

(END ARTICLE 4)



## ARTICLE 5 – BONDS AND INSURANCE REQUIREMENTS

### General

- 5.1. The Contractor shall not commence work under this Agreement until he has obtained all insurance required by these Contract Documents, and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence Work until all similar insurance required of the subcontractor has been obtained. The Contractor shall add the Owner and the Engineer together with their officers, agents and employees, to all relevant insurance policies as an additional named insured.

### Workmen's Compensation Insurance

- 5.2. The Contractor shall obtain and maintain during the life of this Agreement adequate Workmen's Compensation Insurance as prescribed by the Workmen's Compensation Act, as amended, of the State of Massachusetts. This insurance shall cover all of his employees employed for the work. If any of the Work is sublet, the Contractor shall require each of his subcontractors to provide similar coverage for all of the latter's employees to be engaged in such Work.

### Public Liability and Property Damage Insurance

- 5.3. The Contractor shall be required to carry Comprehensive General Liability/Auto Liability insurance to protect himself, his subcontractors, the Owner, and the Engineer, including any officer or agent of said Owner and Engineer, from claims for public liability or property damage which may arise from the operations under this Agreement, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them. The minimum limits of insurance are indicated in the Supplementary Conditions. Any subcontractor will be required to carry Comprehensive General Liability and Automobile Liability insurance in an amount equal to that required by the Contractor. The Comprehensive General Liability insurance will include as Additional Named Insureds: the Owner, the Engineer and each of their consultants, agents and employees. The Contractor shall furnish a policy endorsement in addition to Certificate of Insurance.

Contractor and his Insurance Provider agree that it will indemnify and hold harmless the Owner, the Engineer and all of their consultants, agents and employees from any loss, cost, damage, expense and liability including attorney's fees, by reason of property damage, personal injury, or death, such damage and injury of whatsoever nature or kind arising out of or as a result of the performance of the Work under this Agreement, or any negligent act or negligent failing to act, or on account of the use of improper or defective materials, or on account of any poor workmanship or on account of any act of omission or commission in connection with the performance of the Work by Contractor, its employees, agents and subcontractors.

Contractor agrees that the Comprehensive General Liability and Property Damage Insurance (including Automobile Liability and Property Damage Insurance), which the Contractor is required to maintain pursuant to the Contract Documents shall not act as a limitation on Contractor's obligation to indemnify the Owner, the Engineer and all of their consultants, agents and employees. The Comprehensive General Liability insurance shall include broad form property damage coverage, broad form contractual liability coverage and completed operations insurance.

## Property Insurance

- 5.4 Contractor shall purchase and maintain property insurance upon the Work to the full replacement value thereof. This insurance shall include the interests of Owner, Engineer, Contractor and Subcontractors in the Work, shall insure against the perils of fire, earthquake, flood and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment.

## Proof of Insurance

- 5.5. Prior to the commencement of any work under this Agreement, the Contractor shall furnish to the Owner certificates of insurance to prove that all required insurance is in force, and shall require any subcontractor to submit similar evidence before undertaking work under this Agreement. Each insurance policy shall contain a clause providing that it shall not be canceled or materially altered without thirty (30) days' written notice to the Owner and Engineer. Insurance obtained by the Contractor shall be subject to approval by the Owner for adequacy of protection. Neither approval by the Owner of any insurance supplied by a Contractor or subcontractor, nor failure to disapprove such insurance shall relieve the Contractor or subcontractors of their obligation to maintain in full force during the life of the Agreement all required insurance as set forth in this Article and in the Supplementary Conditions.

## Receipt and Application of Proceeds of Insurance

- 5.6. Any insured loss under the policies of insurance required by this Article or the Supplementary Conditions shall be adjusted with Owner and made payable to Owner as trustee for the insureds, as their interests may appear, subject to the requirements of paragraph 5.7. Owner shall deposit in a separate account any money so received, and he shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the Cost thereof covered by an appropriate Change Order.

## Adjustment and Settlement of Insurance Claims

- 5.7. Owner as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as trustee shall only make settlement with the insurers in accordance with such agreement as the parties in interest may reach.

## Performance, Payment and Other Bonds

- 5.8. Contractor shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These Bonds shall remain in effect until the expiration of the warranty period. Contractor shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the forms prescribed by the Contract Documents and be executed by such Sureties as (i) are licensed to conduct business in the State of Massachusetts and (ii) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Fiscal Service, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.
- 5.9. If the Surety on any Bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Work is located or it ceases to meet the requirements of clauses (i) and (ii) of Paragraph 5.8, Contractor shall within five (5) days thereafter substitute another Bond and Surety, both of which shall be acceptable to Owner.

#### Changes in Work Notice

- 5.10. If notice of any change affecting the general scope of the Work or change in the Contract Amount is required by the provisions of any Bond to be given to the Surety, it will be Contractor's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. Contractor shall furnish proof of such adjustment to Owner.

#### Term of Insurance Required

- 5.11. All insurance policies required pursuant to these Contract Documents shall remain in effect until final payment and at all times thereafter when Contractor may be correcting, removing or replacing defective Work in accordance with paragraph 12.5.

(END ARTICLE 5)

## ARTICLE 6 – SCOPE OF WORK

### Intent of Drawings and Specifications

- 6.1. The intent of the Contract Drawings and Specifications is to prescribe a complete work of improvement which the Contractor undertakes to do in full compliance with the Contract Documents, together with any authorized Modifications. The Contractor shall perform all items of work covered and stipulated in the Contract Documents together with any authorized modifications, all in accordance with the lines, grades, cross sections and dimensions shown on the Contract Drawings. The Contractor shall furnish, unless otherwise provided in the Contract Documents, all materials, equipment, implements, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the Work.
- 6.2. Should any construction or conditions which are not thoroughly or satisfactorily stipulated or set forth by the Contract Drawings and Specifications be anticipated on any proposed Work, Supplementary Conditions for such work may be prepared and attached to the Bid Proposal Form and Agreement, and shall be considered as part of the Contract Documents, the same as though contained fully therein. Should any Supplementary Condition conflict with the General Conditions, the Supplementary Condition will govern.

### Changes and Increased or Decreased Quantities of Work

- 6.3. The Owner through the Engineer reserves and shall have the right to make such changes from time to time, in the Contract Documents, the character or quantity of the Work as may be considered necessary or desirable to complete fully and acceptably the proposed Work in a satisfactory manner, provided such alterations do not change the Contract Amount of the Work, based on the originally estimated quantities and the unit prices Bid or lump sum Bid, by more than twenty-five percent (25%). Should it become necessary, for the best interest of the Owner, to make changes in excess of that herein specified, the same shall be covered by Supplemental Agreement. The Contractor shall not start work on any alteration requiring a Supplemental Agreement until the Agreement setting forth the adjusted prices shall be executed by the Engineer, Owner and Contractor. In case a satisfactory adjustment in the Contract Amount cannot be reached for any item requiring a Supplemental Agreement, the Owner reserves the right to terminate the Agreement as it applies to the items in question and make such arrangements as may be deemed necessary to complete the Work as altered or decreased. Engineer may authorize minor changes in the Work not involving an adjustment of Contract Amount or Contract Time, which are consistent with the overall intent of the Contract Documents. Said minor changes shall be binding on Owner and Contractor, and shall be performed promptly by Contractor.

### Deleted Items

- 6.4. The Engineer may, in writing, order deleted from the Work any item other than major items found unnecessary to the Work and such deletion shall not be a waiver of any condition of the Agreement nor invalidate any of the provisions thereof. Major items may be deleted by Supplemental Agreements. The Contractor will be paid for all work done toward the completion of the item prior to such deletion as provided in paragraph 11.5.

#### Extra Work

- 6.5. Whenever any additional work, including but not limited to additional materials, equipment or labor, is necessary for the proper completion of the Work, and such work was not included in the Bid Proposal nor subject to a Supplemental Agreement, such work must be authorized by a Change Order approved by the Owner and the Engineer. Payment for such work shall be determined in the same manner as for Extra Work as specified in Paragraph 11.6.

When work is necessary to the proper completion of the Work for which no quantities or prices were given in the Bid Proposal, the same shall be called extra work and shall be performed by the Contractor when so authorized in writing by the Engineer and the Owner. Extra work shall be performed by the Contractor in accordance with the Contract Documents in a proper and workmanlike manner and as may be authorized by the Engineer and the Owner. Prices for extra work shall be itemized and covered by a written Modification submitted by the Contractor and approved by the Owner and Engineer prior to the actual starting of such work. Should the parties be unable to agree on unit prices or a lump sum for the extra work, or if this method is impractical, the Engineer may instruct the Contractor to proceed with the work on the basis of the Cost of the Work as hereinafter provided in Paragraph 11.6. Claims for extra work not authorized in writing by the Engineer and the Owner prior to the work being done will be rejected.

#### Final Cleaning Up

- 6.6. Upon completion of the Work and before acceptance and final payment will be made, the Contractor shall remove from the site of the Work all machinery, equipment, surplus, and discarded materials, rubbish, temporary structures, and stumps or portions of trees. He shall cut all brush and woods within the limits indicated and shall leave the site of the Work in a neat and presentable condition. Material cleared from the site of the Work and deposited on property adjacent, will not be considered as having been disposed of satisfactorily. The Contractor shall leave the site of the Work in a condition generally comparable to the original condition or as specified elsewhere in the Contract Documents.

(END ARTICLE 6)

## ARTICLE 7 – EXECUTION OF THE WORK

### Authority of Engineer

- 7.1. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of the materials furnished, the quality of the Work performed, the general manner of performance and the rate of progress of the Work. He shall decide all questions which may arise as to the interpretation of the Contract Drawings, General Conditions, Supplemental Conditions, and Specifications, all questions as to acceptable fulfillment of the Agreement, all disputes and mutual rights by the Contractors, if there be more than one Contractor on the Work, and, with the approval of the Owner, all questions as to compensation. The decision of the Engineer shall be final and he shall have executive authority to make effective such decisions and to request the Contractor to carry out all orders promptly.

### Drawings and Shop Drawings

- 7.2. The Contract Drawings will show details of all structures; lines and grade of roadways and utility systems, typical cross-sections of roadways; character of foundation; location and designation of all structures; and the general arrangement of circuits and outlets, location of switches, panels and other Work.

Contract Drawings and Specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both. Data presented on the Contract Drawings are as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is directed. The Contractor shall review all structural and mechanical drawings and adjust all Work to conform to all conditions shown therein. The mechanical drawings shall take precedence over all other Drawings.

Discrepancies between different Contract Drawings, or between Contract Drawings and Specifications, or regulations and codes governing the Work shall be brought to the attention of the Engineer in writing as soon as said discrepancies are noticed. In the event such discrepancies exist and the Engineer is not so notified, the Engineer shall reserve the right to exercise sole authority in making final decisions in resolution of such a conflict. It is mutually agreed that all authorized alterations affecting the requirements and information given on the Contract Drawings shall be in writing and approved by the Engineer. When at any time reference is made to "The Drawings", the interpretation shall be the Contract Drawings as affected by all authorized modifications then in effect. Contract Drawings will be supplemented by such Shop Drawings to be prepared by Contractor as are necessary to adequately control the Work.

- 7.2.1. After checking and verifying all field measurements and approving of Shop Drawings, Contractor shall submit to Engineer for review, in accordance with the accepted schedule of Shop Drawing submissions, six copies (unless otherwise specified in the Supplemental Conditions) of all Shop Drawings, which shall have been checked by and stamped with the approval of Contractor and identified as Engineer may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and like information to enable Engineer to review the information as required.

- 7.2.2. At the time of each submission, Contractor shall in writing call Engineer's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- 7.2.3. Engineer will review with reasonable promptness Shop Drawings and samples, but Engineer's review shall be only for conformance with the design concept of the Work and for compliance with the information given in the Contract Documents and shall not extend to means, methods, sequences, techniques or procedures of construction or to satisfy precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and resubmit new samples for Engineer's review. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contracts Documents.
- 7.2.4. Where a Shop Drawing or sample is required by the Contract Documents, no related Work shall be commenced until the submittal has been reviewed and approved by the Engineer.
- 7.2.5. Engineer's review of Shop Drawings or samples shall not relieve Contractor from responsibility for any deviations from the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and Engineer has given written concurrence and approval to the specific deviation, nor shall any concurrence or approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.
- 7.2.6. The cost of furnishing all shop drawings shall be borne by the Contractor. The Contractor will reimburse the Engineer for all associated costs if more than two review submittals are required for approval on any particular item.

#### Operating/Maintenance Manuals and Parts Lists

- 7.3. The Contractor shall submit five (5) complete Operating/Maintenance Manuals and Parts Lists to the Engineer for all items of mechanical and electrical equipment incorporated into the Work, unless specified otherwise in the Supplementary Conditions or Specifications.

#### As-Built Drawings

- 7.4. A set of Contract Drawings shall be maintained at the site of the Work, with all changes or deviations from the original drawings neatly marked thereon in brightly contrasting color. This shall be a separate set of drawings, not used for construction purposes, which shall be kept up to date as the job progresses and shall be made available for inspection by the Engineer at all times. Upon completion of the Agreement, this set of drawings shall be delivered to the Engineer.

### Conformity with Drawings and Allowable Deviations

- 7.5. Finished surfaces in all cases shall conform with lines, grade, cross-sections and dimensions shown on the Contract Drawings. Any deviation from the Contract Drawings, as may be required by the demands of construction, will in all cases be determined by the Engineer and authorized in writing.

### Coordination of Drawings and Specifications

- 7.6. The Contract Drawings and Specifications, and all supplementary drawings and documents, are essential parts of the Contract Documents, and a requirement occurring in one is just as binding as though occurring in all. They are intended to be cooperative to describe and provide for the complete Work. The Contractor shall not take advantage of any apparent error of omission in the Contract Drawings or Specifications. In the event the Contractor discovers any apparent conflict, error or discrepancy, he shall immediately call upon the Engineer for his interpretation and decision, and such decision shall be final. Any apparent error or discrepancy must be resolved before Contractor proceeds with the Work affected thereby.
- 7.6.1. In resolving such conflicts, errors and discrepancies, the Contract Documents shall be given preference in the following order (unless it would clearly be erroneous to do so): (1) Agreement; (2) Specifications; (3) Drawings.
- 7.6.2. Within the Specifications the order of precedence is as follows: (1) Addenda; (2) Supplementary Conditions; (3) Instructions to Bidders; (4) General Conditions; (5) Technical Specifications.
- 7.6.3. With reference to the Drawings the order of precedence is as follows: (1) Figures govern over scaled dimensions; (2) Detail drawings govern over general drawings; (3) Change Order drawings govern over Contract Drawings; (4) Contract Drawings govern over standard drawings; (5) Contract drawings govern over shop drawings.

### Cooperation of Contractor

- 7.7. The Contractor shall have available on the Work at all times one (1) copy of said Contract Drawings and Specifications, exclusive of the set designated for As-Built Drawings in Paragraph 7.4. The Contractor shall give to the Work the constant attention necessary to facilitate the progress thereof, and he shall cooperate with the Engineer and with other contractors in every way possible. The Contractor shall have a competent Superintendent on the Work at all times who is fully authorized as his agent on the Work; such superintendent shall be capable of reading and thoroughly understanding the Contract Drawings and Specifications and shall receive and fulfill instructions, suggestions and communications from the Engineer, or his authorized representative. The Superintendent shall have full authority to execute the Work specified in the Contract Documents without delay and to promptly supply materials, tools, plant equipment and labor as may be required to perform such Work. Such Superintendent shall be furnished irrespective of the amount of Work sublet. Said Superintendent shall have authority to act on behalf of Contractor. All communications given to the Superintendent shall be as binding as if given to Contractor.

### Construction Stakes



- 7.8. Unless otherwise directed in Section 00800, Supplementary Conditions, the Contractor will furnish and set construction stakes establishing all lines, grades and measurements necessary for the proper execution of the Work contracted for under this Agreement. The Owner will provide basic horizontal and vertical control. If construction surveys are provided by the Owner, the Contractor shall request that Owner provide engineering surveys and placement of construction stakes no less than 48 hours prior to the time such service is needed. The Contractor shall satisfy himself as to the accuracy of all measurements before constructing any permanent structure and shall not take advantage of any errors which may have been made in laying out the Work. The Contractor shall be held responsible for the proper preservation of all marks and stakes. Stakes provided by the Owner, which must be reset after initial placement, will be replaced at Contractor's expense at the current billable rate for a three-person survey crew. Said cost may be deducted from any funds due the Contractor.
- 7.9. The Engineer shall be authorized to inspect Work done and material furnished. Such observation may extend to any part of the Work and to preparation, fabrication, or manufacture of the materials to be used. The Engineer is authorized to call the attention of the Contractor to any failure of the Work or materials to conform to the Contract Documents. He shall have the authority to reject materials or suspend the Work not conforming to Contract Documents until any questions at issue can be referred to and decided between the Engineer and the Owner. If the Contractor refuses to suspend operations on verbal order, the Engineer shall issue a written order giving the reason for suspension of the Work. After placing the order in the hands of the Contractor, the Engineer shall immediately leave the job. Work done during the absence of the Engineer will not be accepted nor paid for. The Engineer shall in no case act as foreman or perform other duties for the Contractor, nor interfere with the management of the Work by the latter. Any advice which the Engineer may give the Contractor shall in no way be construed as releasing the Contractor from fulfilling all of the terms of the Contract Documents.

#### Tests and Inspections

- 7.10. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests or approvals.
- 7.11. If any law, ordinance, rule, regulation, code, or order of any public body having jurisdiction requires any Work (or part thereof) to specifically be inspected, tested or approved, Contractor shall assume full responsibility therefore, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval. Contractor shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with Owner's or Engineer's acceptance of a manufacturer, fabricator, supplier or distributor of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for review prior to Contractor's purchase thereof for incorporation in the Work. The cost of all other inspections, tests and approvals required by the Contract Documents shall be paid by Owner (unless otherwise specified). In the event any tests do not pass initially, and therefore must be performed again, all such extra tests shall be paid for by Contractor.
- 7.12. All inspections, tests or approvals other than those required by law, ordinance, rule, regulation, code or order of any public body having jurisdiction shall be performed by organizations acceptable to Owner, Contractor, and Engineer.

- 7.13 If any Work that is to be inspected, tested or approved is concealed without concurrence of Engineer, it must, if requested by Engineer, be exposed for observation. Such exposing shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to conceal such Work and Engineer has not acted with reasonable promptness in response to such notice.
- 7.14 Neither observations by Engineer nor inspecting, tests or approvals by others shall relieve Contractor of his obligations to perform the Work in accordance with the Contract Documents.
- 7.14.1 Any Work outside the normal five (5) day, forty (40) hour week may require that the Engineer be on the job. All inspection so required shall be done at the Contractor's expense at the Engineer's current billable rates and the cost thereof shall be deducted from any funds due Contractor. The Contractor shall notify the Engineer at least 48 hours in advance of starting any such overtime Work.

#### Uncovering Work

- 7.15. If the Engineer requests it, the Contractor shall, at any time before acceptance of the Work, remove or expose such portions of the finished Work that was not observed by the Engineer or that the Engineer believes has not met the requirements set forth in the Contract Documents. After examination, the Contractor shall restore said portions of the Work to the requirements of the Contract Documents. Should the Work thus exposed, examined, or tested prove acceptable, the exposing, or removing, and the replacing of the concealment or making good of the parts removed, shall be paid for as Extra Work; but should the Work so exposed, examined, or tested prove unacceptable, the exposing or removing, and the replacing of the concealment or making good of the parts removed, shall be at the Contractor's expense.

#### Removal of Defective and Unauthorized Work

- 7.16. All Work which has been rejected or condemned shall be repaired, or if it cannot be satisfactorily repaired, be removed and replaced at the Contractor's expense. Work done without lines and grades having been given, Work done beyond the lines and grades shown on the Contract Drawings, or as given, except as herein provided, Work done without proper inspection, or any extra or unclassified Work done without written authority and prior agreement in writing as to cost, will be done at the Contractor's risk and will be considered unauthorized and, at the option of the Engineer, may not be measured and paid for and may be ordered removed and replaced at the Contractor's expense. Upon the failure of the Contractor to repair satisfactorily or to remove and replace rejected, unauthorized, or condemned Work immediately after receiving formal notice from the Engineer, the Owner may recover for such defective Work on the Contractor's Bond or by action in a court having proper jurisdiction over such matters, or may employ labor and equipment and satisfactorily repair or remove and replace such Work and charge the cost of the same to the Contractor, which cost will be deducted from any money due him. In exercising his rights under this paragraph, Owner shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, Owner may exclude Contractor from all or part of the Work, take possession of all or part of the Work, and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Work and incorporated in the Work and all materials and equipment stored at the Work or for which Owner has paid

Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees such access to the Work as may be necessary to enable Owner to exercise his rights under this paragraph. All direct and indirect costs of Owner in exercising such rights shall be charged against Contractor in an amount verified by Engineer and agreed to by Owner, and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents and a reduction in the Contract Amount. Such direct and indirect costs shall include, in particular but without limitation, compensation for additional professional services required and all costs of repair and replacement of Work of others destroyed or damaged by correction, removal or replacement of Contractor's defective Work. Contractor shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by Owner of Owner's rights hereunder.

#### Disputed Claims for Extra Work

7.17. In case the Contractor deems extra compensation is due him for Work not clearly covered in the Contract Documents, or not ordered by the Engineer, he must submit in writing of his intention to make claim for such extra compensation before he begins the Work on which he bases the claim and shall afford the Engineer every facility for keeping strict account of the actual cost of the Work. Failure on the part of the Contractor to give such notification or to afford the Engineer proper facilities for keeping strict account of actual cost shall constitute a waiver of the claim for such extra compensation. The filing of such notice by the Contractor and keeping of costs by the Engineer shall not in any way be construed to prove the validity of the claim. When the Work has been completed, the Contractor shall within fifteen (15) days file his claim for extra compensation with the Engineer, who will present it to the Owner for consideration with his recommendations. Further written supporting data will be submitted to the Engineer within forty-five days of completion of the aforementioned Work unless Engineer allows an additional period of time to ascertain more accurate data. Owner and Engineer shall render a decision to Contractor within a reasonable period of time.

#### Visits to Site

7.18. Engineer will make visits to the site at intervals appropriate to the various states of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

Engineer's efforts will be directed toward providing for the Owner a greater degree of confidence that the completed Work will conform to the Contract Documents.

On the basis of such visits and on-site observations as an experienced and qualified professional, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work.

#### Rejecting Defective Work

7.19. Engineer will have authority to reject Work which is defective, and will also have authority to require special inspection or testing of the Work as provided in paragraph 7.15, whether or not the Work is fabricated, installed or completed.

(END ARTICLE 7)

## ARTICLE 8 – CONTROL OF MATERIAL

### Source of Supply and Quality of Materials

- 8.1. The source of supply of each of the materials required shall be reviewed and accepted by the Engineer before delivery is started. Representative preliminary samples of the character and quality specified may be submitted by the Contractor or producer for examination and testing. The results obtained from testing such samples may be used for preliminary review but will not be used as a final acceptance of the materials. All materials proposed to be used may be inspected or tested at any time during their preparation and use. If, after testing, it is found that sources of supply which have been reviewed and accepted do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish acceptable material from other sources acceptable to Engineer.

### Acceptance of Materials

- 8.2. Samples of all materials for test upon which is to be based the acceptance or rejection, shall be taken by the Engineer or his authorized representative at the discretion of the Engineer. Materials may be sampled either prior to shipment or after being received at the place of construction. All sampling, inspection, and testing shall be done in accordance with the methods hereinafter prescribed. The Contractor shall provide such facilities as the Engineer or his representative may require for conducting field tests and for collecting and forwarding samples. The Contractor shall not use or incorporate into the Work any materials represented by the samples until tests have been made and the material found to be acceptable. Only materials conforming to the requirements of these Contract Documents and which have been accepted by the Engineer or his authorized agents shall be used in the Work. Any material which, after acceptance, has for any reason become unfit for use shall not be incorporated into the Work.

### Cited Specifications, Samples and Tests

- 8.3. Except, as otherwise provided, sampling and testing of all materials, and the laboratory methods and testing equipment required under these Contract Documents, shall be in accordance with the most current edition of the standards set forth in the Technical Specifications. The testing of all samples shall be done at the expense of the Contractor at an independent laboratory accepted by the Engineer. The Contractor shall furnish the required samples without charge. All samples shall have been checked and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended. The Contractor shall give sufficient notification to the Engineer of the placing of orders for materials to permit testing.

### Storage

- 8.4. Materials shall be stored so as to insure the preservation of their quality and fitness for the Work. When considered necessary by the Engineer, they shall be placed on wooden platforms, or other hard, clean surfaces and not on the ground, and shall be placed under cover or otherwise protected when requested by the Engineer. Stored materials shall be located so as to facilitate prompt inspection.

## Substitution of Materials and Equipment

8.5 Whenever materials or equipment are specified or described in the Contract Drawings or Specifications by using the name of a proprietary item or the name of a particular manufacturer, fabricator, supplier or distributor, only such specific items may be used unless the name is followed by words indicating that an equal may be used. If the Contractor desires to use a substitute, the procedure for review by Engineer will be as set forth in paragraphs and below, and as supplemented in the Supplementary Conditions.

8.5.1. Requests for review of substitute items of material and equipment will not be accepted by Engineer from anyone other than Contractor. If Contractor wishes to furnish or use a substitute item of material or equipment, Contractor shall make written application to Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified. The application will state whether or not acceptance of the substitute for use in the Work will require a change in the Contract Drawings or Specifications to adapt the design to the substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of a license fee or royalty. All variations of the proposed substitute from that specified shall be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by Engineer in evaluating the proposed substitute. Engineer may require Contractor to furnish at Contractor's expense additional data about the proposed substitute. Engineer will be the sole judge of acceptability, and no substitute will be ordered or installed without Engineer's prior written acceptance. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

8.5.2. Engineer will record time required by Engineer and Engineer's consultants in evaluating substitutions proposed by Contractor and in making changes in the Contract Drawings or Specifications occasioned thereby. Whether or not Engineer accepts a proposed substitute, Contractor shall reimburse Owner for the charges of Engineer and Engineer's consultants for evaluating any proposed substitute.

8.5.3. In case of a difference in price, the Owner will exhibit sole discretionary authority to share with the Contractor or receive all benefit of the difference for any substitutions, and the Contract Amount shall be altered by Change Order should any benefit accrue to Contractor.

## Defective Materials

8.6. All materials not conforming to the requirements of the Contract Drawings or Specifications shall be considered defective. Whether in place or not, such material shall be removed immediately from the site of the Work, unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected,

shall be used until approval has been given. Upon failure of the Contractor to comply promptly with any order of the Engineer made under the provisions of this article, the Engineer shall have authority to remove defective materials and to deduct the cost of removal and replacement with specified materials from any moneys due or to become due the Contractor.

(END ARTICLE 8)

## ARTICLE 9 – LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

### Laws to be Observed

- 9.1. The Contractor is assumed to be familiar with all federal, state and local laws, codes, ordinances, and regulations which, in any manner, affect those engaged or employed in the Work or the material or equipment used in or upon the site of the Work, or in any way affect the conduct of the Work. No pleas of misunderstanding or ignorance on the part of the Contractor will, in any way, serve to modify the provisions of the Agreement. However, if Contractor observes that the Contract Drawings or Specifications are at variance with any relevant federal, state and local laws, codes, ordinances, and regulations, Contractor shall give Engineer prompt written notice thereof and any necessary changes shall be adjusted by an appropriate written Modification. The Contractor, at all times, shall observe and comply with all federal, state and local laws, codes, ordinances, and regulations in any manner affecting the conduct of the Work, and the Contractor and his Surety shall indemnify and save harmless the Owner, the Engineer and their consultants, agents and employees, 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.

### Permits and Licenses

- 9.2. Unless otherwise provided in the Supplementary Conditions, the Contractor shall procure all permits and licenses, pay all charges and fees including, but not limited to, all inspection charges of agencies having appropriate jurisdiction, and give all notices necessary and incidental to the due and lawful prosecution of the Work. Owner and Engineer shall assist Contractor, when necessary, in obtaining such permits and licenses. A copy of all permits and licenses procured by Contractor shall be supplied to Engineer within a reasonable period of time.

### Patented Devices, Materials and Processes

- 9.3. If the Contractor is required or desires to use any design, device, invention, product, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or patent owner and shall pay all license fees and royalties and assume all costs incident to said use in performance of the Work or incorporation of the Work. The Contractor and the surety shall indemnify and save harmless the Owner and Engineer from any and all claims for infringement by reason of the use of any such patented design, device, invention, product, material, or process or any trademark or copyright in connection with the Work agreed to be performed under this Agreement, and shall indemnify the Owner and Engineer for any costs, expense, and damages, including attorney's fees, which it may be obliged to pay for reason of any such infringement at any time during the prosecution, or after the completion of the Work.

### Sanitary Provisions

- 9.4. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the State Department of Health or of other authorities having jurisdiction thereover.



## Safety and Protection

- 9.5. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
- 9.6.1. All employees on the Work and other persons who may be affected thereby,
  - 9.6.2. All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site of the Work, and;
  - 9.6.3. Other property at the site of the Work or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of performing the Work.
- Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and utilities when prosecution of the Work may affect them. All damage, injury or loss to any property referred to in paragraph 9.6.2 or 9.6.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Contract Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor). Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and final payment has been made.
- 9.6.4. The Contractor shall be required to assume sole and complete responsibility for conditions at the site of the Work during the course of performing the Work, including the safety of all persons who may enter on to the site of the Work for any reason and the security of all property located on the site of the Work. The Contractor shall also be responsible for compliance with all applicable Federal, State and local regulations concerning the safety and security of the site of the Work. This requirement shall apply at all times during the course of the Agreement and not only to normal working hours.
- 9.6. The Contractor shall not close any road to the public except by express permission of the appropriate regulating authority. When the road under construction is being used by the traveling public, special attention shall be exercised to keeping both the subgrade and surfacing in such condition that the public can travel over same in comfort and safety. The Contractor shall cooperate with the appropriate authority in the regulation of traffic. If the Contractor constructs temporary bridges or temporary stream crossings, his responsibility for accidents or mishaps shall include the roadway approaches as well as the structures of such crossings.

- 9.7 Contractor shall designate a responsible member of his organization at the site of the Work whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by Contractor to Owner.

#### Emergencies

- 9.8. In emergencies affecting the safety or protection of persons or the Work or property at the site of the Work or adjacent thereto, Contractor, without special instruction or authorization from Engineer or Owner, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give Engineer prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby.

#### Barricades, Signs and Hazard Markings

- 9.9. The Contractor shall provide, erect and maintain all necessary barricades, signs, danger signals and lights to protect the Work and the safety of the public. Contractor shall comply with the provisions of any and all applicable Traffic Safety Manuals which may be published by a governmental entity having jurisdiction over the site of the Work. All barricades, signs and obstructions erected by the Contractor shall be illuminated at night and all devices for this purpose shall be kept burning from sunset to sunrise. The Contractor shall be held responsible for all damage to the Work due to failure of barricades, signs, lights and watchmen to protect it, and whenever evidence of such damage is found prior to acceptance, the Engineer may order the damaged portion immediately removed and replaced by the Contractor without cost to the Owner if, in his opinion, such action is justified. The Contractor's responsibility for necessary barricades, signs and lights shall not cease until the Work has been accepted.

#### Use of Explosives

- 9.10. When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use the utmost care so as not to endanger life or property, and whenever directed, the number and size of the charges shall be reduced. The Contractor shall notify the proper representatives of any public service corporation, any company, or any individual, at least 48 hours in advance of any blasting which may damage his or their property on, along, or adjacent to the site of the Work. All explosives shall be stored in a secure manner and all storage places shall be marked clearly "DANGEROUS EXPLOSIVES", and shall be in care of competent watchmen at all times. Prior to the use or storage of explosives on the site of the Work the Contractor shall submit for review by the Owner, Engineer and other jurisdictional authority a "Blasting Plan" identifying all relevant procedures proposed to be utilized as may be required for review.

#### Protection and Restoration of Property

- 9.11. The Contractor shall not enter upon private property for any purpose without first obtaining permission, and he shall be responsible for the preservation of all public and private property, trees, fences, monuments, underground structures, etc., on and adjacent to the site of the Work and shall use every precaution necessary to prevent damage or injury thereto. He shall protect carefully, from disturbance or damage, all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their location, and shall not remove them until directed. He shall be responsible for all damage

or injury to property of any character resulting from any act, omission, neglect or misconduct in his or any subcontractor's manner, or method of executing said Work, or due to his or any subcontractor's non-execution of said Work, or at any time due to defective Work or materials, and said responsibility shall not be released until the Work has been completed and accepted. The Contractor's attention is directed to the importance of protecting all public utilities encountered in the execution of the Work. These may include telephone, telegraph and power lines, water lines, sewer lines, gas lines, railroad tracks, and other overhead and underground utilities. Before any excavation is begun in the vicinity of water lines, railroad tracks or structures, sewer lines, gas lines, or telephone conduits, each utility company concerned must be notified in advance of such excavation, and such excavation shall not be made until an authorized representative of the utility company concerned is on the site of the Work and has designated the location of their facilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work, or in consequence of the non-execution thereof on the part of the Contractor or subcontractor, Contractor shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done by repairing, rebuilding, or otherwise restoring, as may be directed, or he shall make good such damage or injury in an acceptable manner. In case of the failure on the part of the Contractor to restore such property or to have started action to make good such damage or injury, the Engineer may, upon forty-eight (48) hours' notice, proceed to direct the repair, rebuilding of or otherwise restore such property as may be deemed necessary and the cost thereof will be deducted from any moneys due or which may become due the Contractor under the Contract Documents. The cost of damages due to Contractor's operation or cost of protecting utilities where required to permit construction under the Contract Documents shall be included in the original Contract Amount for the Work.

#### Responsibility for Damage Claims

9.12. To the fullest extent permitted by law, the Contractor and his Surety shall indemnify and save harmless the Owner and Engineer and all of their officers, agents and employees from all suits, actions, or claims of any character brought on account of any injuries or damages sustained by any person or property in consequence of any neglect in safeguarding the Work, or through the use of unacceptable materials in the execution of the Work, or on account of any act or omission by the said Contractor, Subcontractor, their agents and employees, or on account of the use, misuse, storage or handling of explosives, or on account of any claims or amounts recovered for any infringement of patent, trademark, or copyright, or from any claims or amounts arising or recovered under the state's Compensation laws, or any other law, by-law, ordinance, order or decree, and so much of the money due the said Contractor by virtue of the Contract Documents, as shall be considered necessary by the Owner, may be retained or, in case no money is due, his Surety shall be held until such suit or suits, action or actions, claim or claims, for injuries or damages as aforesaid, shall have been settled and satisfactory evidence to that effect furnished to the Owner.

#### Contractor's Responsibility for the Work

9.13. Until the final acceptance of the Work by the Engineer as evidenced in writing, the Contractor shall have the charge and care thereof and shall take every necessary precaution against injury or damage to any part thereof by the action of the elements or

from any other cause, and the Contractor at his own expense shall rebuild, repair, restore and make good all injuries or damages to any portion of the Work occasioned by any causes before its completion and acceptance. In case of suspension of Work for any cause whatever, the Contractor shall be responsible for all materials and shall properly store them, if necessary, and shall provide suitable drainage, barricades and warning signs where necessary. The Contractor shall make good or replace at his own expense and as required, any material which may be broken, lost through fire, theft, or otherwise damaged, or in any way made useless for the purpose and use intended by these Contract Drawings and Specifications prior to final payment for the Work even though such breakage, damage, loss or uselessness may result from causes beyond the control of the Contractor.

#### No Waiver of Legal Rights

- 9.14. Inspection by the Engineer or by any of his duly authorized representatives; any order, measurement or certificate by the Engineer; any order by the Owner for the payment of money, any payment for or acceptance of any Work or any extension of time; or any possession taken by the Owner shall not operate as a waiver of and provision of the Contract Documents, or any power therein provided, or any waiver of any other or subsequent breach. The Owner reserves the right to correct any error that may be discovered in any estimate that may have been paid, and to adjust the same to meet the requirements of the Contract Documents. The Owner reserves the right to claim and recover, by process of law, sums as may be sufficient to correct any error or make good any deficit in the Work resulting from such error, dishonesty, or collusion upon conclusive proof of collusion or dishonesty between the Contractor or his agents and any person including the Engineer or his assistants discovered in the Work after the final payment has been made.

#### Limitation of Responsibility

- 9.15. Owner or Engineer will not be responsible for Contractor's means, methods, techniques, sequences or procedures in performing the Work, or the safety precautions and programs incident thereto, and Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.16. Owner or Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractors, or of the agents or employees of any Contractor or Subcontractor, or of any other persons at the site of the Work or otherwise performing any of the Work.
- 9.17. Neither Owner's or Engineer's authority to act under the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Engineer to Contractor, any Subcontractor, any manufacturer, fabricator, supplier or distributor, or any of their agents or employees or any other person performing any of the Work.

#### Rights-of-Way

- 9.18. The Owner will furnish all lands and rights-of-way required for completion of the Work. In acquiring right-of-way, the Owner will proceed as expeditiously as possible, but in the event all rights-of-way or easements are not acquired prior to the commencement of the Work the Contractor shall begin work on such lands and rights-of-way that have been

acquired. In the event of litigation or other delays in acquiring right-of-way, the Contract Time allowed herein for completion will be extended to compensate for the time actually lost by such delay. If the Owner is solely responsible for such delay, the Contractor shall be entitled to an adjustment to the Contract Amount as negotiated with the Owner.

#### Use of Premises

- 9.19. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workmen to areas permitted by law, ordinances, permits or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.

(END ARTICLE 9)

## ARTICLE 10 – PROSECUTION AND PROGRESS

### Supervision

- 10.1. Contractor shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures utilized in the performance of the Work, but Contractor shall not be solely responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. Contractor shall be responsible to see that the finished Work complies accurately with the Contract Documents.

### Concerning Subcontractors

- 10.2. Contractor shall only employ subcontractors in accordance with the provisions set forth below:
- 10.2.1. Contractor shall not employ any Subcontractor or other person or organization (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection. A Subcontractor or other person or organization identified in writing to Owner and Engineer by Contractor prior to the Notice of Award and not objected to in writing by Owner or Engineer prior to the Notice of Award will be deemed acceptable to Owner and Engineer. Acceptance of any Subcontractor, other person or organization by Owner or Engineer shall not constitute a waiver of any right of Owner or Engineer to reject defective Work. If Owner or Engineer after due investigation has reasonable objection to any Subcontractor, other person or organization proposed by Contractor after the Notice of Award, Contractor shall submit an acceptable substitute and the Contract Amount shall be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate Change Order shall be issued. Contractor shall not be required to employ any Subcontractor, other person or organization against whom Contractor has reasonable objection.
- 10.2.2. Contractor shall be fully responsible for all acts and omissions of his Subcontractors and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that Contractor is responsible for the acts and omissions of persons directly employed by Contractor. Nothing in the Contract Documents shall create any contractual relationship between Owner or Engineer and any Subcontractor or other person or organization having a direct contract with Contractor, nor shall it create any obligation on the part of Owner or Engineer to pay or to see to the payment of any monies due any Subcontractor or other person or organization, except as may otherwise be required by law. Owner or Engineer may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of amounts paid to Contractor on account of specific Work done.

- 10.2.3. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or delineating the Work to be performed by any specific trade unless specifically required in said divisions and sections.
- 10.2.4. All Work performed for Contractor by a Subcontractor will be pursuant to an appropriate agreement between Contractor and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Contractor shall pay each Subcontractor a just share of any insurance monies received by Contractor on account of losses under policies issued pursuant to Article 5.

#### Prosecution of Work

- 10.3. The Contractor shall notify the Engineer at least forty-eight (48) hours in advance of the time he intends to start Work. The Contractor shall operate at such points as the Owner through the Engineer may direct. The Contractor shall conduct the Work in such a manner and with sufficient materials, equipment, and labor as is considered necessary to insure its completion within the Contract Time limit set forth in the Agreement. Should the prosecution of Work for any reason be discontinued by the Contractor, he shall notify the Engineer at least forty-eight (48) hours in advance of resuming operations.

#### Limitations of Operations

- 10.4. The Contractor shall at all times conduct the Work in such manner as will incur the least practicable interference with traffic and existing utility systems. No section of any road shall be closed to the public, nor any utility system put out of service except after permission has been granted by the representative Authority having jurisdiction. Each item of Work shall be prosecuted to completion without delay and in no instance will the Contractor be permitted to transfer his forces from uncompleted Work to new Work without prior written notification of the Contractor to the Engineer. The Contractor shall not open up Work to the prejudice of Work already started.

#### Schedules

- 10.5. At least ten (10) days prior to submitting the first application for a progress payment, Contractor shall (except as otherwise specified in the Supplementary Conditions) submit to Engineer an initial progress schedule, a final schedule of Shop Drawing submission and where applicable a schedule of values of the Work. These schedules shall be satisfactory in form and substance to Engineer. These schedules shall serve as the basis for progress payments during prosecution of the Work. Upon acceptance of the schedule of values by Engineer, it shall be incorporated into a form of Application for Payment acceptable to Owner and Engineer. The Contractor shall also forward to the Engineer as soon as practicable after the first day of each month, a progress schedule, a summary report of the progress of the various parts of the Work under the Contract Documents in the mills or shops and in the field, stating the existing status rate of progress, estimated time of completion and cause of delay, if any.

#### Character of Personnel and Equipment

- 10.6. The Contractor shall employ such superintendents, foremen, as are careful and competent, and the Engineer may request the dismissal of any person or persons

employed by the Contractor in, about, or upon the Work who shall misconduct himself or be incompetent or negligent in the proper performance of his or their duties, or neglects or refuses to comply with the Contract Documents given and such person or persons shall not be employed again thereon without the written consent of the Engineer. Should the Contractor continue to employ, or again employ, such person or persons, the Owner may withhold all pay estimates which are or may become due, or the Owner through the Engineer may suspend the Work until such orders are complied with. No preference or discrimination among citizens of the United States shall be made, except as may be required by special labor provisions. The Contractor shall furnish such equipment as is considered necessary for the prosecution of the Work in an acceptable manner and at a satisfactory rate of progress. All equipment, tools, and machinery used for handling materials and executing any part of the Work shall be subject to the approval of the Engineer and shall be maintained in a satisfactory working condition. Equipment used on any portion of the Work shall be such that no damage to the Work, roadways, adjacent property, or other objects will result from its use. The Agreement may be terminated if the Contractor fails to provide adequate equipment for the Work.

- 10.6.1. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, supplier or distributor, except as otherwise provided in the Contract Documents.

#### Temporary Suspension of Work

- 10.7. The Engineer, in consultation with Owner when time permits, shall have the authority to suspend the Work wholly or in part because of unfavorable weather or other essential conditions, or because of the failure on the part of the Contractor to properly prosecute the Work in accordance with the Contract Documents, to carry out orders or to remove defective material incorporated into the Work. The Contractor shall not suspend the Work without written authorization and prior to resuming Work shall give the Engineer adequate notice to afford opportunity to re-establish observation and inspection of Work being performed.

#### Determination and Extension of Contract Time for Completion

- 10.8. The Contractor shall perform fully, entirely, and in a satisfactory and acceptable manner the Work within the number of calendar days stipulated in the Agreement. Time will be assessed against the Contractor in accordance with the Agreement. If the satisfactory execution and completion of the Agreement shall require Work or materials in greater amounts or quantities than those set forth in the Contract Documents, then the Contract Time may be increased as negotiated between Contractor and Engineer and accepted by Owner as set forth in a written Modification. In general, extensions to the Contract Time will not be approved, regardless of cause of claim for extension.

No allowances will be made for delays or suspensions of the prosecution of the Work due to the fault of the Contractor. In order to secure an extension of the Contract Time by written Modification to the Contract Documents, the Contractor shall within ten (10) days from the beginning of any such Modification notify the Engineer in writing of the causes for request to adjust the Contract Time, whereupon the Engineer shall ascertain the facts and the extent of the Modification and extend the Contract Time for completing the Work in an amount equal to the additional time required due to said Modification when, in his



judgment, the findings of fact justify such an extension of time, and his finding of fact thereon shall be final and conclusive. The Contract Time may only be changed by a written Modification.

#### Failure to Complete Work on Time

10.9. In case the Contractor shall fail to fully perform and complete the Work in conformity to the provisions and conditions of the Agreement within the specified Contract Time limit for such performance and completion or within such further time as, in accordance with the provisions of the Contract Documents, shall be fixed or allowed for such performance and completion, the Contractor shall and will pay to the Owner for each and every day of the additional time in excess of the Contract Time and any granted extension thereof, the sum set forth in Section 00520 of the Agreement as liquidated damages and not as a penalty. The parties agree that Owner will suffer loss and damage; however, due to the uncertainty and difficulty of measuring actual damages for every day the Work remains uncompleted and unfinished, the parties agree that said sum is a reasonable forecast of compensatory damages. The Owner shall recover said damages by deducting the amount thereof out of any moneys which may be due or become due the Contractor, or by an action at law against the Contractor or his Surety, or by either or both of these methods. Should the entire completion and final acceptance of the Work herein embraced, together with any modifications or additions, be delayed beyond the Contract Time, it is understood and agreed that aside from any other penalty or damage, all costs of the engineering, observation and inspection on behalf of the Owner which are incurred after the Contract Time has elapsed may be charged to the Contractor and be deducted from any estimate or payment otherwise due and payable to him.

#### Adjustment for Suspended Work

10.10. In the event the Contractor is ordered by the Engineer, in writing, to suspend Work for some unforeseen cause not provided for in the Contract Documents, and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the Work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the date set out in the written order for Work to cease until the date of the order for Work to resume. Claims for such compensation shall be filed with the Engineer within ten (10) days after date of the order to resume Work or such claims will not be considered. The Contractor shall submit with his claims, substantiating papers covering the entire amount shown on the claim. After receiving relevant information from the Engineer, the Owner shall take the claim under consideration, and may make such investigations as are deemed necessary, and shall be the sole judge as to the equitability of such claim and such decision shall be final. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, delays due to failure of Surety, for suspensions made at the request of the Contractor, or for any other delay provided for in the Contract Documents.

#### Termination of Contract

10.11. The Agreement, of which these Contract Documents form a part, may be terminated by the Owner for the following reasons: (a) Failure of the Contractor to start the Work on the date given in the Notice to Proceed; (b) Substantial evidence that progress being made by the Contractor is insufficient to complete the Work within the Contract Time; (c) Deliberate

failure on the part of the Contractor to observe any requirement of the Contract Documents; (d) Failure of the Contractor to promptly make good any defects in materials or Work or any defects of any other nature, the correction of which has been directed in writing by the Engineer; (e) Substantial evidence of collusion for the purpose of illegally procuring an Agreement or perpetrating fraud on the Owner in the performance of Work under the Agreement; (f) If the Contractor is adjudged bankrupt or becomes insolvent; (g) If the Contractor shall allow any final judgment to stand against him unsatisfied for a period of ten (10) days; (h) If the Contractor makes an assignment for the benefit of creditors; (i) If a trustee or receiver is appointed for Contractor or for any of Contractor's property; (j) If Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws; (k) If Contractor repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment; (l) If Contractor repeatedly fails to make prompt payments to Subcontractors for labor, materials or equipment; (m) If Contractor disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction; (n) If Contractor disregards the authority of Engineer; or (o) If Contractor otherwise violates in any substantial way any provisions of the Contract Documents. Before the Agreement is terminated, the Contractor and his Surety will first be notified in writing by the Engineer of the conditions which make termination of the Agreement imminent. Seven (7) days after this notice is given, if a satisfactory effort has not been made by the Contractor or his Surety to correct the conditions, the Owner may declare the Agreement terminated and notify the Contractor and his Surety accordingly. Upon receipt of notice from the Owner that the Agreement has been terminated, the Contractor shall immediately discontinue all operations. The Owner may then proceed with the Work in any lawful manner that he may elect until it is finally completed. Owner may exclude Contractor from the site of the Work and take possession of the Work and of all Contractor's tools, appliances, construction equipment and machinery at the site of the Work and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), incorporate in the Work all materials and equipment stored at the site of the Work or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Amount exceeds the direct and indirect costs of completing the Work, including compensation for additional professional services, such excess shall be paid to Contractor. If such costs exceed such unpaid balance, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Engineer and incorporated in a Change Order, but in finishing the Work, Owner shall not be required to obtain the lowest figure for the Work performed.

- 10.12. Where Contractor's services have been so terminated by Owner, the termination shall not affect any rights of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- 10.13. Upon seven (7) days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Agreement. In such case, Contractor will use his best efforts to minimize additional cost being incurred under the Agreement. Contractor shall be paid for all Work executed prior to the termination date, all materials or equipment ordered prior to the date of the notice of termination which cannot be canceled or, at the option of the Owner, returned, and reasonable termination expenses.

#### Cooperation with Other Contractors

10.14. In connection with the Work under this Agreement, the right is reserved to award any work not included in the Contract Documents to another Contractor for performance during the progress of this Agreement, or to perform such work with the Owner's forces, and the Contractor for this Agreement shall cooperate and so conduct his operations as to minimize the interference therewith, as directed by the Engineer.

#### Termination of Contractor's Responsibility

10.15. This Agreement will be considered complete when all Work has been finished, the final inspection made and the Work finally accepted by the Engineer, all claims for payment of labor, materials, or services of any kind used in connection with the Work have been settled by the Contractor or his Surety and final payment has been made by Owner. The Contractor will then be released from further obligation except as set forth in the Surety Bonds. The Surety Bond executed from performance of this Agreement shall be in full effect for a period equal to the warranty correction period following the date of final payment. Neither the final payment nor any provision in the Contract Documents shall relieve the Contractor of the responsibility for negligence or inadequate Workmanship within the warranty period as described in the Supplementary Conditions. Corrections during said warranty period shall be made in accordance with the provisions of paragraph 12.5.

(END ARTICLE 10)

## ARTICLE 11 – MEASUREMENT AND PAYMENT

### Detailed Estimate

- 11.1. At least ten (10) days prior to submitting the first Application for a progress payment, Contractor shall furnish to the Owner a detailed estimate and breakdown of his Bid for any lump sum item involving more than one item. This breakdown, when reviewed and accepted by the Engineer, shall be used as the basis for making partial payments to the Contractor.

### Measurement of Quantities

- 11.2. The determination of quantities of Work acceptably completed under the terms of the Agreement, will be made by the Engineer and based on measurements taken by him or his representative. These measurements will be taken according to the United States standard measure. All surface and linear measurements will be taken horizontally unless otherwise shown on the Contract Drawings or specified. Structures shall be measured as shown on the Contract Drawings. When base course, topsoil, surface course, or any materials are measured by the cubic yard in the vehicle, such measurement shall be taken at the point of delivery. The capacity of all vehicles shall be plainly marked on said vehicle and the capacity or marking shall not be changed without permission of the Engineer. The Engineer may require all vehicles to have uniform capacity.

### Scope of Payment

- 11.3. The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, equipment, labor, tools, and incidentals necessary to complete the Work and the required bonds and insurance policies; also for loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work until the final acceptance by the Engineer, and for all risks of every description connected with the prosecution of the Work, for all expenses incurred in consequence of the suspension or discontinuance of the Work as herein specified, and for any infringement of patent, trademark, or copyright; and for completing the Work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligations to make good any defective Work or material. No moneys, payable under the Agreement, or any part thereof, except the estimate for the first month or period, shall become due and payable if the Owner so elects, until the Contractor shall satisfy said Owner that he has fully settled or paid for all materials and equipment used in or upon the Work and labor done in connection therewith, and the Owner, if he so elects, may pay any or all such bills, wholly or in part, and deduct the amount or amounts so paid from any monthly or final estimate excepting the first estimate. In the event the Surety on any Performance or Payment Bond given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has its right to do business in the State revoked as provided by law, or in any manner becomes unacceptable to Owner, the Owner may, at its election, withhold payment of any estimate filed or approved by the Engineer until the Contractor shall give a good sufficient bond in lieu of the bond so executed by such Surety.

#### Payment for Increased or Decreased Quantities

11.4. When alterations in the Contract Documents or quantities of Work not requiring Supplemental Agreements, as hereinbefore provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract Amount for the actual quantities of Work done. No allowance will be made for anticipated profits. Increased or decreased Work involving Supplemental Agreements will be paid for as stipulated in such agreements.

#### Payment for Deleted Items

11.5. As provided in paragraph 6.4, the Engineer shall have the right to cancel or alter the portions of the Agreement relating to the construction of any non-major item or items except that the Contractor shall be entitled to payment in a fair and equitable amount covering all items of cost incurred prior to the date of the cancellation or alteration. Such payment shall reflect the agreed upon unit prices or schedule of values for any work actually performed prior to the date of such cancellation or alteration. Any such cancellation or alteration shall be made by change order. No allowance will be made for anticipated profits in reimbursements to the Contractor for deleted items of Work. Acceptable materials ordered by the Contractor or delivered to the Work prior to the date of cancellation, alteration, or suspension to the Work by order of the Engineer, will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner. The Contractor shall immediately submit certified statements covering all money expended in preparation for any deleted item, and he shall be reimbursed for any money expended in preparation for any Work on any deleted item when such preparation has no value to the remaining items of the Agreement, or for a proportionate amount based on the total Contract Amount over which such preparation would ordinarily be distributed when other items are included in such preparation.

#### Extra Work

11.6. Extra Work, for which no price is provided in the Bid Proposal, shall be covered by a Supplemental Agreement or Change Order to be signed by the Owner and Contractor before such Work is commenced. Extra Work will be paid for either at a lump sum, or unit prices agreed upon, or on the basis of the Cost of the Work as set forth in paragraphs 11.7 and 11.8 plus a contractor's fee for overhead and profit as set forth in paragraph 11.9. The Contractor shall make no claim for Work done on Cost of Work basis unless performed on written order and in accordance therewith. Work performed prior to a written order by the Engineer will not be paid for.

#### Cost of the Work

11.7. The term "Cost of the Work" means the sum of all costs necessarily incurred and paid by Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Work, shall include only the following items and shall not include any of the costs itemized in paragraph 11.8.

11.7.1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Payroll costs for employees not employed full time on the Work shall

be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security, contributions, unemployment, excise and payroll taxes, Workers' or Workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing Work after regular working hours, on Sunday or legal holidays, shall be included in the above to the extent authorized by Owner.

- 11.7.2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and manufacturers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment, shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
- 11.7.3. Payments made by Contractor to the Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive Bids from Subcontractors acceptable to Contractor and shall deliver such Bids to Owner who will then determine, with the advice of Engineer, which Bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as Contractor's Cost of the Work. All subcontractors shall be subject to the other provisions of the Contract Documents insofar as applicable.
- 11.7.4. Costs of special consultants employed for services specifically related to the Work.
- 11.7.5. Supplemental costs including the following:
  - 11.7.5.1. The proportion of necessary transportation, travel and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - 11.7.5.2. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workmen, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of Contractor.
  - 11.7.5.3. Rentals of all construction equipment and machinery and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof, all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or

parts shall cease when the use thereof is no longer necessary for the Work.

- 11.7.5.4. Sales, use or similar taxes related to the Work, and for which Contractor is liable.
- 11.7.5.5. Deposits lost for causes other than Contractor's negligence, royalty payments and fees for permits and licenses.
- 11.7.5.6. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by Contractor in connection with the execution of the Work, provided they have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's Fee. If, however, any such loss or damage requires reconstruction and Contractor is placed in charge thereof, Contractor shall be paid for service a fee proportionate to that stated in paragraph 11.9.2.
- 11.7.5.7. The cost of utilities, fuel and sanitary facilities at the site.
- 11.7.5.8. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.
- 11.7.5.9. Cost of premiums for additional Bonds and Insurance required because of changes in the Work.

11.8. The terms Cost of the Work shall not include any of the following:

- 11.8.1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, lawyers, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by Contractor whether at the site of the Work or in his principal or a branch office for general administration for the Work and not specifically included in the agreed upon schedule of job classifications referred to in subparagraph 11.7.1, all of which are to be considered administrative costs covered by the Contractor's Fee.
- 11.8.2. Expenses of Contractor's principal and branch offices other than Contractor's office at the site of the Work.
- 11.8.3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the work and charges against Contractor for delinquent payments.

- 11.8.4. Cost of premiums for all Bonds and for all Insurance whether or not Contractor is required by the Contract Documents to purchase and maintain the same (except for additional Bonds and insurance required because of changes in the Work)
  - 11.8.5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.
  - 11.8.6. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.9. Contractor's Fee.
- 11.9. The Contractor's Fee allowed to Contractor for overhead and profit shall be determined as follows:
- 11.9.1. A mutually acceptable fixed fee; or if none can be agreed upon,
  - 11.9.2. A fee based on the following percentages of the various portions of the Cost of the Work:
  - 11.9.3. For costs incurred under paragraphs 11.7.1 and 11.7.2, the Contractor's Fee shall be ten percent.
  - 11.9.4. For costs incurred under paragraph 11.7.3, the Contractor's Fee shall be five percent; and if a subcontract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to the Subcontractor as a fee for overhead and profit shall be ten percent.
  - 11.9.5. No fee shall be payable on the basis of costs itemized under paragraphs 11.7.4, 11.7.5 and 11.8.
- 11.10. The amount of credit to be allowed by Contractor to Owner for any such change which results in a net decrease in cost will be the amount of the actual net decrease. When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any.

#### Substantiation of Cost of Work

- 11.11. Whenever the cost of any Work is to be determined pursuant to paragraphs 11.7 and 11.8, Contractor will submit in form acceptable to Engineer an itemized cost breakdown together with supporting data.

#### Application for Progress Payment

- 11.12. Contractor shall on a monthly basis submit to Engineer for review and approval an Application for Payment filled out and signed by Contractor covering the Work completed through the prior month interval and accompanied by such supporting documentation as is required by the Contract Documents and also as the Engineer may reasonably require. Materials purchased by the Contractor for the Work and located on the site of the Work may be included in the Contractor's invoice if they are itemized and if the Contractor provides evidence of payment for the materials; such materials are subject to the



provisions of Paragraph 11.13. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

#### Contractor's Warranty of Title

11.13. Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Work or not, will pass to Owner at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter in the General Conditions referred to as "Liens").

#### Review of Applications for Progress Payment

11.14. Engineer will, within five (5) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Pay Request to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application. Owner shall, within thirty (30) days subsequent to presentation to him of the Application for Payment with Engineer's recommendation, pay Contractor the amount recommended.

11.14.1. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's on-site observation of the Work in progress as an experienced and qualified professional and on Engineer's review of the Application for Payment and the accompanying data and schedules that the Work has progressed to the point indicated; that, to the best of Engineer's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work being functional upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents and any qualifications stated in the recommendation), and that Contractor is entitled to payment of the amount recommended. However, by recommending any such payment, Engineer will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work, or that the means, methods, techniques, sequences, and procedures of construction have been reviewed or that any examination has been made to ascertain how or for what purpose Contractor has used the monies paid or to be paid to Contractor on account of the Contract Amount, or that title to any Work, materials or equipment has passed to Owner free and clear of any Liens.

11.14.2. Engineer's recommendation of final payment will constitute an additional representation by Engineer to Owner that the conditions precedent to Contractor's being entitled to final payment as set forth in Paragraph 11.19 have been fulfilled to the best of Engineer's knowledge.

11.15. Engineer may refuse to recommend the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to Owner. He may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such extent as may be necessary in Engineer's opinion to protect Owner from loss because

- 11.15.1. The Work is defective, or completed Work has been damaged requiring correction or replacement.
- 11.15.2. Written claims have been made against Owner or Liens have been filed in connection with the Work.
- 11.15.3. The Contract Amount has been reduced because of Modifications.
- 11.15.4. Owner has been required to correct defective Work or complete the Work in accordance with paragraph 8.6.
- 11.15.5. Contractor's failure to make payment to Subcontractors, or for labor, materials or equipment.

#### Partial Payments

- 11.16. No progress payment except final payment will be made for a sum of less than one thousand dollars (\$1,000.00). The estimates will be approximate only, and all partial or monthly estimates and payments shall be subject to correction in the estimate rendered following discovery of an error in any previous estimates. Should any defective Work or material be discovered, or should a reasonable doubt arise as to the integrity of any part of the Work completed previous to the final payment, there will be deducted from the first estimate rendered after the discovery of such Work an amount equal in value to the defective or questioned work, and this Work will not be included in a subsequent estimate until the defects have been remedied or the causes for doubt removed.

#### Final Inspection

- 11.17. Upon written notice from Contractor that the Work is complete, Engineer will make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to remedy such deficiencies.

#### Final Application for Payment

- 11.18. After Contractor has completed all such corrections to the satisfaction of Engineer and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents and other documents, all as required by the Contract Documents, and after Engineer has indicated that the Work is acceptable, Contractor may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents and such other data and schedules as Engineer may reasonably require, together with complete and legally effective releases or waivers (satisfactory to Owner) of all Liens arising out of or filed in connection with the Work. In lieu thereof and as approved by Owner, Contractor may furnish receipts or releases in full; and affidavit of Contractor that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or his property might in any way be responsible, have been paid or otherwise satisfied; and consent of the Surety, if any, to final payment. If any Subcontractor, manufacturer, fabricator, supplier or distributor fails to furnish a release or receipt in full,

Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

#### Final Payment and Acceptance

11.19. If on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor has fulfilled all of his obligations under the Contract Documents, Engineer will, within five (5) days after receipt of the final Application for Payment, indicate in writing his recommendation of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that to the best of Engineer's knowledge the Work is acceptable subject to continuing obligations under the Contract Documents. Otherwise, Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. All prior partial estimates and progress payments shall be subject to correction in the final estimate and payment. If the Application and accompanying documentation are appropriate as to form and substance, and acceptable to Owner, Owner shall, within thirty (30) days after receipt thereof, cause publication to commence of Notice of Final Settlement in accordance with Owner's statutory requirements.

In the event no claims are made against Contractor in response to said publication, Owner shall pay Contractor the amount of final payment recommended by the Engineer in accordance with the Notice of Final Settlement. In the event claim(s) are made against Contractor, Owner shall withhold double the amount of any asserted claim(s) against Contractor until said claims have been resolved; however, Owner shall pay Contractor the balance of the final payment. The acceptance by the Contractor of the final payment shall operate as and shall be a release to the Owner from all claims or liability arising from the prosecution of the Work under the Contract.

#### Contractor's Continuing Obligation

11.20. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by Engineer, nor any payment by Owner to Contractor under the Contract Documents, nor any use or occupancy of the Work or any part thereof by Owner, nor any act of acceptance by Owner nor any failure to do so, nor the issuance of a notice of acceptability by Engineer pursuant to Paragraph 11.19, nor any correction of defective Work by Owner shall constitute an acceptance of Work not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents.

#### Change of Contract Amount

11.21. The Contract Amount may only be changed by written Modification. When Contractor and Owner agree upon a price for extra or changed Work by way of a written Modification, Contractor and Owner agree that the price set forth in the Modification shall include the cost of the extra or change plus any direct, indirect, and impacted costs attributable to the change or extra.

(END ARTICLE 11)

ARTICLE 12 – WARRANTY AND GUARANTEE: ACCESS TO WORK: CONTINUATION OF WORK: PARTIAL UTILIZATION

Warranty and Guarantee

- 12.1. Contractor warrants and guarantees to Owner and Engineer that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of all defects shall be given to Contractor. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in the Contract Documents.

Access to Work

- 12.2. Engineer and Engineer's representatives, other representatives of Owner, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspection and testing. Contractor shall provide proper and safe conditions for such access.

Continuing the Work

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

Partial Utilization

- 12.4. Use by Owner of completed portions of the Work may be accomplished prior to Completion of all the Work subject to the following:
- 12.4.1. Owner at any time may request Contractor in writing to permit Owner to use any part of the Work which Owner believes to be substantially complete and which may be so used without significant interference with execution of the other parts of the Work. If Contractor agrees, Contractor will certify to Owner and Engineer that said part of the Work is substantially complete. Within a reasonable time thereafter, Owner, Contractor and Engineer shall make an inspection of that part of the Work to determine its status of completion. Prior to Owner's use, Engineer will deliver to Owner and Contractor a written recommendation as to the division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance, utilities, insurance and warranty period for that part of the Work which is binding upon Owner and Contractor as to that part of the Work, unless Owner and Contractor shall have otherwise agreed in writing and have so informed Engineer, or shall object to the Engineer in writing within fifteen (15) days of receiving Engineer's recommendations. Owner shall have the right to exclude Contractor from any part of the Work which Owner uses, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list of defective or deficient items.
- 12.4.2. In lieu of the provisions of paragraph 12.4.1, Owner may take over utilization of the Work or constituting part of the Work whether or not it is substantially complete if such Work is functionally and separately useable; provided that prior to any such takeover, Owner and Contractor have agreed as to the division of

responsibilities between Owner and Contractor for security, operation, safety, maintenance, warranty period, heat, utilities and insurance with respect to such Work

- 12.4.3. No occupancy of part of the Work or taking over of operations of the Work will be accomplished prior to acknowledgment from the insurers providing the property insurance on the Work that notice of such occupancy has been received and that **said insurers, in writing, have effected the changes in coverage necessitated thereby.** The insurers providing the property insurance shall consent to such use or occupancy by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use or occupancy.

#### Warranty Period

- 12.5. After the date of final payment as set forth in paragraph 11.19, but prior to completion of the Warranty Period, if any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work, or, if it has been rejected by Owner, remove it from the Work and **replace it with non-defective Work.** If Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or the rejected Work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by Contractor. Contractor shall also pay for any damage done to other Work, other property or persons which occurred as a result of the defective Work within the Warranty Period. The duration of the Warranty Period is provided in the Supplementary Conditions.

#### Acceptance of Defective Work

- 12.6. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, also Engineer) prefers to accept it, Owner may do so. In such case, if acceptance occurs prior to Engineer's recommendation of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Amount; or, if the acceptance occurs after such recommendation, an appropriate amount shall be paid by Contractor to Owner.

(END ARTICLE 12)

## ARTICLE 13 - WORK BY OTHERS

13.1. Owner may perform additional work related to the Work by himself, or have additional work performed by entities other than the Contractor, or let other direct contracts therefore which shall contain General Conditions similar to these.

Contractor shall afford the other entities who are parties to such direct contracts (or Owner, if Owner is performing the additional work with the Owner's employees) reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate his Work with theirs.

13.2. If any part of Contractor's Work depends for proper execution or results upon the work of any such other entity (or Owner), Contractor shall inspect and promptly report to Engineer in writing any patent or apparent defects or deficiencies in such work that render it unsuitable for such proper execution and results. Contractor's failure so to report shall constitute an acceptance of the other work as fit and proper for integration with Contractor's Work, except for latent or nonapparent defects and deficiencies in the other work.

13.3. Contractor shall do all cutting, fitting and patching of his Work that may be required to make its several parts come together properly and integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected.

13.4. If the performance of additional work by other entities or Owner was not noted in the Contract Documents, written notice thereof shall be given to Contractor prior to starting any such additional work.

(END ARTICLE 13)

## ARTICLE 14 – MISCELLANEOUS

### Giving Notice

- 14.1 Whenever any provision of the Contract Documents requires the giving of written notice it shall be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### General

- 14.2. Should Owner or Contractor suffer injury or damage to his person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim shall be made in writing to the other party within a reasonable time of the first observance of such injury or damage.
- 14.3. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon Contractor and all of the rights and remedies available to Owner and Engineer thereunder, shall be in addition to, and shall not be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by law or Agreement, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph shall be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, warranties and guarantees made in the Contract Documents shall survive final payment and termination or completion of this Agreement.

### Titles and Headings

- 14.4. The titles and headings used in the Contract Documents are for guidance and convenience and are not intended to control over the specific language contained in the body of the paragraphs in the event a conflict, error or discrepancy occurs. Further, titles and headings shall not limit the scope of an article or paragraph.

(END ARTICLE 14)



**SECTION 00800 – SUPPLEMENTARY CONDITIONS**

1. Minimum Insurance Coverage and Limits

Insurance coverage is required in accordance with Article 5 of the General Conditions. Specific coverage and limits shall be as indicated below.

1.1. General Liability

1.1.1. Limits

a. General Aggregate	\$ 2,000,000
b. Products/Completed Operations Hazard Aggregate	\$ 2,000,000
c. Personal & Advertising Injury	\$ 500,000
d. Each Occurrence	\$ 1,000,000
e. Fire Damage (any one fire)	\$ 200,000
f. Medical Expense (any one person)	\$ 50,000

1.1.2. In order to ensure that there are no impaired aggregates, a per job aggregate is required.

1.1.3. All coverages shall be continuously maintained to cover all liability, claims, demands and other obligations assumed by the Contractor pursuant to this Agreement. A claims-made policy may satisfy these insurance requirements, provided that the necessary retroactive dates and extended reporting periods are procured by the Contractor to maintain such continuous coverage.

1.2. Automobile Liability

1.3.1. Comprehensive, owned, hired, and non-coverages required (combined single limit)	\$ 1,000,000
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1.3. Excess Liability (umbrella form)	
(each occurrence)	\$ 2,000,000
(aggregate)	\$ 5,000,000

1.4. Builders Risk: Equal to Contract Amount

2. The Owner and Engineer and its subcontractors and agents shall be named as additional insured and shall be indemnified, per Section 00700, Article 5.

3. Warranty Period – The duration of time after the date stated in the Certificate of Final Payment or as stated in the Certificate of Substantial Completion for which the Contractor shall warranty the Work in accordance with paragraph of the General Conditions, is two (2) years, or a longer period of time as may be prescribed by law or by the terms of any

applicable special warranty required by the Contract Documents or by any specific provision of the Contract Documents.

- 4 The following person, firm or corporation are identified as the Owner's authorized representative who is assigned to the Work or any part thereof;

Engineer.            LOMBARDO ASSOCIATES, INC.  
                            49 EDGE HILL ROAD  
                            NEWTON, MA 02467

(END OF SECTION)

**SECTION 00900 – ADDENDA AND MODIFICATIONS**

00950      Change Order to the Agreement

SECTION 00950 – CHANGE ORDER TO THE AGREEMENT

State

Order Number

County

Date

Owner: \_\_\_\_\_

Description of Work: Construction of the Little Neck, Ipswich, MA Wastewater Collection System

Contractor: \_\_\_\_\_

You are hereby requested to comply with the following changes to the Contract Documents

<u>Description of Changes</u> <u>Supplemental Plans &amp; Specs Attached</u>	<u>DECREASE TO</u> <u>Contract Amount</u>	<u>INCREASE TO</u> <u>Contract Amount</u>
	\$ _____	\$ _____
	\$ _____	\$ _____
	\$ _____	\$ _____
TOTALS	\$ _____	\$ _____
Net Change in Contract Amount	\$ _____	\$ _____

JUSTIFICATION:

The amount of the Agreement will be (decreased) (increased) by the sum of (\$ \_\_\_\_\_ ),  
\_\_\_\_\_ Dollars.

The Contract Amount including this and previous change orders will be: (\$ \_\_\_\_\_ ), \_\_\_\_\_ Dollars.

The Contract Time provided for completion will be (increased) (decreased) (unchanged) \_\_\_\_\_ days.

Contract Change Order # \_\_\_\_\_.

Page Two

This document will become a supplement to the Agreement and all provisions will apply hereto:

Requested:

OWNER: Feoffees of the Grammar School in the Town of Ipswich

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Recommended:

OWNER'S ENGINEER: Lombardo Associates, Inc.

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Accepted:

CONTRACTOR: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

## SECTION 01020 – MEASUREMENT AND PAYMENT

The following subsections describe the measurement of and payment for the work to be done under the items listed in the Bid

Each lump sum or unit price stated in the Bid shall constitute full compensation as herein specified for each item of work completed in accordance with the Contract Drawings and Specifications.

For the price submitted for each item in the Bid, the Contractor shall furnish all labor, materials, tools, and equipment, and perform all operations necessary to complete all work as indicated, specified, or directed by the Engineer, and not included for payment under any other bid item. It is hereby agreed and understood that all supervision, overhead items, protection and precautions, and all other costs incidental to the construction work are included.

Measurement for payment shall be by the Engineer except where noted elsewhere in this Specification. Measurement for payment for lump sum items shall be on the basis of percentage of work complete, and in place, including all associated clean-up.

The prices for those items that involve excavation shall include compensation for storage and/or disposal of surplus excavated material, as directed by the Engineer, and installation of all necessary sheeting and bracing not left in place.

In all items involving excavation, the price shall be based on doing the entire excavation in earth. Where rock is excavated, the price therefore shall be in addition to the cost of excavating earth, and no deduction will be made in the amount for earth excavation.

The prices for all pipe items (sewers and service connections) shall constitute full compensation for furnishing, laying, jointing, and testing of pipe; excavation, crushed stone pipe bedding and backfill; and clean-up.

In all items involving gravity sewers, the following schedule of percentage values shall be applied to the pipe item price when determining progress estimates:

- 25% for construction materials
- 25% for labor, overhead, and equipment
- 15% for mandrel testing (to be done before new sewer goes into service)
- 20% for leakage/pressure testing (to be done before new sewer goes into service)
- 15% for closed circuit internal videotaping (to be done before new sewer goes into service)

In all items involving water mains, the following schedule of percentage values shall be applied to the pipe item price when determining progress estimates:

- 30% for construction materials
- 30% for labor, overhead, and equipment
- 10% for disinfection (to be done before new water main goes into service)
- 15% for pressure testing (to be done before new water main goes into service)
- 15% for leakage testing (to be done before new water main goes into service)

The Contractor will be responsible for obtaining all permits and paying their associated application fees except for those permits, which are contained in the Appendix of these Specifications, that have already been obtained by the Owner.

The Contractor will be responsible for complying with all requirements governing the construction of the Work including, but not necessarily limited to, the requirements of the Ipswich Conservation Commission and the Commonwealth of Massachusetts Department of Environmental Protection.

The Contractor shall acquaint himself with all work associated with each payment item and shall have **no claim** for additional compensation due to his unfamiliarity with the requirements of various items.

Documentation by the Contractor and Engineer of measurements are required to substantiate contract quantities.

The Contractor's attention is directed to the fact that they shall deliver to the Town of Ipswich approximately 700 cubic yards of excess clean fill generated from the pipe laying excavation conducted during the Work. The Contractor shall deliver said excess clean fill to a location, within Ipswich town limits, to be determined by the Town. The cost of fulfilling the requirements of this paragraph shall be considered to be included in the prices stipulated for the various items of work listed in the Bid; no direct payment will be made for this work.

The Contractor's attention is directed to the fact that the Owner will provide a staging area for equipment, material or supplies at the athletic field located opposite the Little Neck Community Center building.

Privately contracted snow removal, handled by the Owner, is limited to those streets where year-round residents live. Not all streets have year-round residents. The Contractor's attention is directed to the fact that they shall be responsible for snow removal activities as necessary to perform the Work. The cost of fulfilling the requirements of this paragraph shall be considered to be included in the prices stipulated for the various items of work listed in the Bid; no direct payment will be made for this work.

### 1.0 ITEM 1 - MOBILIZATION/DEMobilIZATION

The quantity for Item 1 shall be based on the percent complete as determined by the Engineer. This item will be measured once the Contractor has substantially commenced work on the site. The lump sum price for this item shall not exceed five percent (5%) of the total amount of the bid (excluding this item). Demobilization shall constitute 25% of the lump sum price for this item, and shall be held aside until actual demobilization and clean up have been completed.

The lump sum price for Item 1 shall constitute full compensation for all costs associated with initiating the Contract and for costs that are necessary to begin the work in a substantial manner, exclusive of the cost of materials. This item shall cover all mobilization of labor, materials, tools, and equipment associated with establishing the work on-site to assure that it is proceeding in a continuous manner. This item shall also cover all costs associated with insurance, bonds, preconstruction/existing conditions survey, site preparation, staging areas, traffic management plan development and implementation, final clean-up, and demobilization at the completion of the work.

Immediately upon receipt of the Notice To Proceed, the Contractor shall videotape the entire project site including all locations where the Work is proposed. For the purposes of creating a preconstruction/existing conditions survey, the Contractor shall videotape all properties, buildings, and other structures that may be affected by the Work, paying close attention to any defects that already exist prior to any construction activities. Each structure shall be accurately located and tied into the sewer stationing shown on the drawings. The videotape shall indicate date, time, weather conditions, and all members of field crew present. The Contractor shall submit three copies of the preconstruction/existing conditions survey to the Engineer.

### 2.0 ITEM 2 - EXCAVATION BELOW NORMAL GRADE

The quantity for Item 2 shall be the actual number of cubic yards of unsuitable material excavated, measured to the depths and lengths as ordered by the Engineer, and to the width between payment limits for normal excavation as indicated.

The unit price for Item 2 shall constitute full compensation for excavation below normal depth and disposal of unsuitable material below normal grade whether by hand or machine, replacing the excavated material with the proper compacted material as specified in the Earthwork section of the Specifications. This also includes the placing and removing of any sheeting not required to be left in place.

If the bottom of the excavation is below normal grade through error by the Contractor, or if improper drainage softens the subgrade and additional excavation in the trench is required before installing the wastewater holding tanks, such removal and replacement of material will not be measured for payment.

### 3.0 ITEM 3 - ROCK EXCAVATION AND DISPOSAL

The quantity for Item 3 shall be the actual number of cubic yards of rock removed, measured in place before excavation, within the limits of normal excavation as defined in the Specifications and as shown on the drawings, unless rock excavation beyond such limits has been authorized in writing by the Engineer, in which case measurement shall be made to the authorized limits.



The unit price for Item 3 shall constitute full compensation for removal of the rock, complete, as specified or required, which shall include excavation; removal and disposal of rock; replacement backfill material; backfilling and compaction; if blasting is used, drilling and blasting, monitoring blasts; and any other incidental work related to all rock removal methods. The unit price for Item 3 applies to all construction methods, regardless of whether blasting is used.

Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the Engineer, unless in the opinion of the Engineer, satisfactory measurements can be made in some other manner.

### 3.1 METHOD FOR MEASUREMENT

Payment for rock excavation shall be computed as follows:

- a. Only boulders greater than one (1) cubic yard in volume shall be measured and paid for under this item. Measurement shall be based on the length, breadth and depth of boulders excavated within the trench limits.
- b. Ledge in pipe trenches shall be measured from its surface to a point six (6) inches below the invert of the pipe. The width of trench shall be measured as shown on the drawings. No separate payment shall be made for rock excavation where existing utilities are removed and relayed to facilitate the work within the trench limits defined hereinbefore.
- c. Ledge or boulders encountered in other excavations shall be measured from the rock surface to a point six (6) inches below the base of structure and to a width of twelve (12) inches outside the face of the structure, unless otherwise approved by the OWNER.
- d. Masonry or concrete structures encountered during the course of constructing the work, which require blasting for removal, shall be measured and paid for subject to the limits and conditions as described hereinbefore.
- e. No additional payment will be made for frost removal or for any other materials encountered in the excavations, no matter how stiff or compact of consistency, even if blasting is required for removal. Soft or disintegrated ledge which can be removed without the use of explosives or other ledge removal techniques shall not be paid for under this item.

### 4.0 ITEM 4 - BANK RUN GRAVEL

The quantity for Item 4 shall be the actual number of cubic yards, measured after compaction, of bank run gravel placed and compacted as directed or specified.

The unit price for Item 4 shall constitute full compensation for furnishing, placing, and compacting bank run gravel, complete, as directed or specified.

Bank run gravel used as ordered by the Engineer shall be paid for under this item.

Bank run gravel placed outside the limits of normal excavation, as indicated on the Details, shall be furnished, placed, and compacted at the Contractor's expense, and no measurement will be made for such gravel.

Bank run gravel used to backfill unauthorized excavations or for any drainage purpose shall not be measured for payment.

Bank run gravel used to backfill rock excavations will not be measured for payment under this item.

No payment will be made for replacing backfill material when suitable excess excavated material is available from other excavations made under this Contract.

#### 5.0 ITEM 5 - ADDITIONAL COMMON FILL

The quantity for Item 5 shall be the actual number of cubic yards, measured after compaction, of common fill placed and compacted as directed or specified.

The unit price for Item 5 shall constitute full compensation for furnishing, placing and compacting common fill, complete, as directed or specified.

Additional common fill used as ordered by the Engineer shall be paid for under this item.

Common fill placed outside the limits of normal excavation, as indicated on the Details, shall be furnished, placed, and compacted at the Contractor's expense, and no measurement will be made for such fill.

Common fill used to backfill unauthorized excavations or for any drainage purpose shall not be measured for payment.

Common fill used to backfill rock excavations will not be measured for payment under this item.

No payment will be made for replacing backfill material when suitable excess excavated material is available from other excavations made under this Contract.

#### 6.0 ITEM 6 - ADDITIONAL SCREENED GRAVEL

Additional screened gravel applies to any specified graded gravel.

The quantity for Item 6 shall be the actual number of cubic yards, measured after compaction, of screened gravel placed and compacted as directed or specified.

The unit price for Item 6 shall constitute full compensation for furnishing, placing and compacting screened gravel, complete, as directed or specified.

Additional screened gravel used as ordered by the Engineer shall be paid for under this item.

Screened gravel placed outside the limits of normal excavation, as indicated on the Details, shall be furnished, placed, and compacted at the Contractor's expense, and no measurement will be made for such gravel.

Screened gravel used to backfill unauthorized excavations or for any drainage purpose shall not be measured for payment.

Screened gravel used to backfill rock excavations will not be measured for payment under this item.

No payment will be made for replacing backfill material when suitable excess excavated material is available from other excavations made under this Contract.

#### 7.0 ITEM 7 - ADDITIONAL CRUSHED STONE

The quantity for Item 7 shall be the actual number of cubic yards, measured after compaction, of crushed stone placed and compacted as directed or specified.

The unit price for Item 7 shall constitute full compensation for furnishing, placing and compacting crushed stone, complete, as directed or specified.

Additional crushed stone used as ordered by the Engineer shall be paid for under this item.

Crushed stone placed outside the limits of normal excavation, as indicated on the Details, shall be furnished, placed, and compacted at the Contractor's expense, and no measurement will be made for such stone.

Crushed stone used to backfill unauthorized excavations or for any drainage purpose shall not be measured for payment.

Crushed stone used to backfill rock excavations will not be measured for payment under this item.

No payment will be made for replacing backfill material when suitable excess excavated material is available from other excavations made under this Contract.

#### 8.0 ITEM 8 - DEWATERING

The quantity for Item 8 shall be the actual length of dewatered trench measured on a linear foot basis along the horizontal centerline of the trench at ground level without deduction for manholes.

The unit price for Item 8 shall constitute full compensation for dewatering the trench excavation by the appropriate method, to provide a dry trench bottom for installation of the sewer, and appropriate treatment and disposal of the water generated during the dewatering operation. The unit price for this item also includes any and all costs associated with monitoring and compliance, as may be necessary to comply with applicable regulations governing dewatering activities.

#### 9.0 ITEM 9 - SHEETING LEFT IN PLACE

The quantity for Item 9 shall be the actual number of square feet of lumber or steel left in place, as approved by the Engineer. No measurement shall be made for lumber or steel used for sheeting, bracing, and cofferdamming which is left in place at the option of the Contractor, or which is removed from the excavation; understanding and agreeing that the compensation for

all such lumber or steel and for the cost of furnishing, placing, cutting, and removal thereof, is included in the prices to be paid for the items involving gravity sewer pipe or other buried utilities

The unit price for Item 9 shall constitute full compensation for all sheeting left in place as specified, including driving, cutting, bracing, including wales and braces and all other work incidental thereto. This item shall be for wood sheeting and/or steel sheeting left in place.

#### 10.0 GRAVITY SEWER PIPE FORCE MAIN AND BURIED ELECTRICAL CONDUIT

##### A. INSTALLATION OF 8" DIAMETER PVC GRAVITY SEWER PIPE

The quantity for Item 10A shall be the actual length of 8" diameter PVC gravity sewer pipe installed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe. The lengths of manhole inverts (as measured between the inside walls of the manholes) are to be deducted.

The unit price for Item 10A shall constitute full compensation for excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone bedding and backfill material, testing, installing the pipe, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item refers to PVC pipe at all depths, the expected range of which may be determined from a review of the Contract Drawings.

##### B. INSTALLATION OF 3" DIAMETER PVC FORCE MAIN

The quantity for Item 10B shall be the actual length of 3" diameter PVC force main installed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe.

The unit price for Item 10B shall constitute full compensation for excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone bedding and backfill material, testing, installing the pipe, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

##### C. INSTALLATION OF 2" DIAMETER PVC ELECTRICAL CONDUIT

The quantity for Item 10C shall be the actual length of 2" diameter PVC force main installed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe.

The unit price for Item 10C shall constitute full compensation for excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone

bedding and backfill material, testing, installing the pipe, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

## 11.0 ITEM 11 - SERVICE PIPE AND WYE CONNECTIONS

### A. INSTALLATION OF 6" DIAMETER PVC HOUSE LATERAL CONNECTIONS

The quantity for Item 11A shall be the actual length of 6" diameter PVC house lateral connection pipe installed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe to the house foundation.

The unit price for Item 11A shall constitute full compensation for excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone bedding and backfill material, testing, installing the pipe, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item refers to 6" diameter PVC house lateral connection pipe at all depths, the expected range of which may be determined from a review of the Contract Drawings.

### B. INSTALLATION OF 8" BY 6" DIAMETER PVC SERVICE WYE OR TEE

The quantity for Item 11B shall be the actual number of 8" by 6" diameter PVC service wye or tee connections installed, measured in place, after acceptance by the Engineer.

The unit price for Item 11B shall constitute full compensation for furnishing and installing 8" by 6" diameter PVC service wye or tee connections, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

### C. INSTALLATION OF 6" SEWER CHIMNEY

The quantity for Item 11C shall be the actual length of 6" sewer chimneys installed, measured in place, after acceptance by the Engineer, on a vertical foot basis. Measurement shall be made from the invert of the upper pipe to the invert of the lower pipe.

The unit price for Item 11C shall constitute full compensation for furnishing and installing the 6" sewer chimneys, complete, including, but not necessarily limited to, fittings, connections, and appurtenances necessary to connect the sewer service pipe to the new sewer, as indicated, specified, or directed by the Engineer.

## 12.0 ITEM 12 - PRECAST SEWER MANHOLES

### A. INSTALLATION OF 4' DIAMETER MANHOLES

The quantity for Item 12A shall be the actual height of 4' diameter precast concrete sewer manholes installed, measured in place, after acceptance by the

Engineer, on a vertical foot basis. Measurement shall be made from the finished invert at the manhole centerline to the elevation of the underside of the manhole frame at the manhole centerline. The unit price per vertical foot of manhole shall include payment for the manhole bases.

The unit price for Item 12A shall constitute full compensation for furnishing, installing, and testing the manhole cones, walls, and bases, and shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, antifoatation slabs (for locations listed on the drawings), crushed stone bedding and backfill material, testing, rungs, adjusting to grade, brick invert, and bitumastic coating, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

#### B. INSTALLATION OF 5' DIAMETER MANHOLES

The quantity for Item 12B shall be the actual height of 5' diameter precast concrete sewer manholes installed, measured in place, after acceptance by the Engineer, on a vertical foot basis. Measurement shall be made from the finished invert at the manhole centerline to the elevation of the underside of the manhole frame at the manhole centerline. The unit price per vertical foot of manhole shall include payment for the manhole bases.

The unit price for Item 12B shall constitute full compensation for furnishing, installing, and testing the manhole cones, walls, and bases, and shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, antifoatation slabs (for locations listed on the drawings), crushed stone bedding and backfill material, testing, rungs, adjusting to grade, brick invert, and bitumastic coating and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item refers to manholes where inside drop connections are shown on the drawings, specified, or requested by the Engineer.

#### C. MANHOLE FRAMES AND COVERS

The quantity for Item 12C shall be the actual number of manhole frame and cover sets installed.

The unit price for Item 12C shall constitute full compensation for furnishing and installing manhole frames and covers, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

#### D. INSTALLATION OF 8" INSIDE DROP CONNECTIONS

The quantity for Item 12D shall be the actual height of 8" inside drop connections installed, measured in place, after acceptance by the Engineer, on a vertical foot basis. Measurement shall be made from the invert of the upper pipe to the invert of the lower pipe.

The unit price for Item 12D shall constitute full compensation for furnishing and installing the drop inlets, complete, as indicated on the drawings and as specified. The unit price for this item shall include but not necessarily be limited to fittings, tees, and appurtenances included between the inverts of the upper and lower pipes, as indicated, specified, or directed by the Engineer.

### 13.0 ITEM 13 - PAVING

#### A. GRAVEL BASE COURSE

The quantity for Item 13A shall be the actual number of square yards measured in the field to the thickness and limits of width indicated and specified.

The unit price for Item 13A shall constitute full compensation for furnishing, placing, grading, compacting, and otherwise preparing the gravel base course for bituminous concrete binder pavement in roads and sidewalks, as indicated and specified. However, suitable gravel base material, as determined by the Engineer, taken from the excavation, as part of the contract work, shall not be included for payment under this item.

#### B. BITUMINOUS CONCRETE BINDER COURSE

The quantity for Item 13B shall be the actual number of square yards measured in field to the thickness and limits of width indicated and specified.

The unit price for Item 13B shall constitute full compensation for furnishing, placing, grading, and compacting bituminous concrete binder pavement on a prepared gravel base course, complete, as indicated and specified. The unit price for this item shall include, but not necessarily be limited to, the following: raising or resetting existing structures to meet finished grades, cutting back the edges of the existing pavement, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

#### C. BITUMINOUS CONCRETE SURFACE COURSE

The quantity for Item 13C shall be the actual number of square yards measured in the field to the thickness and limits of width indicated and specified.

The unit price for Item 13C shall constitute full compensation for furnishing, placing, grading, and compacting bituminous concrete surface pavement on a prepared bituminous concrete binder course, complete, as indicated and specified. The unit price for this item shall include, but not necessarily be limited to, the following: raising or resetting existing structures to meet finished grades, cutting back the edges of the existing pavement, cutting in key-way and new driveway aprons, providing the permanent pavement markings, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

#### D. PAVEMENT LEVELING COURSE

The quantity for Item 13D shall be the actual number of tons, certified by invoices for the material and confirmed by the Engineer, of bituminous concrete surface pavement, placed as specified and as directed by the Engineer.

The unit price for Item 13D shall constitute full compensation for furnishing, placing, grading, and compacting bituminous concrete surface pavement, complete, as specified and as directed by the Engineer. The unit price for this item shall include, but not necessarily be limited to, the following: raising or resetting existing structures to meet finished grades, and all work incidental thereto, complete, as specified and as directed by the Engineer.

No payment shall be made for the amount of leveling course required to bring the Contractor's trenches back to grade or to repair damaged binder course.

#### E. FILTER FABRIC

The quantity for Item 13E shall be the actual number of square yards of filter fabric installed, measured on the ground prior to installation so as to account for sidewall area and trench bottom roughness, as requested by the Engineer.

No payment shall be made for filter fabric installed by the Contractor that had not been requested by the Engineer.

### 14.0 ITEM 14 - EXISTING STRUCTURES/FACILITIES

#### A. REMOVAL AND RELOCATION OF EXISING CROSS-DRAINS

The quantity for Item 14A shall be the actual number of cross-drains removed and relocated, as indicated, specified, or directed by the Engineer.

The unit price for Item 14A shall constitute full compensation for excavating, removing and relocating cross-drains that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone bedding and backfill material, recoring the catch basin, sealing existing outlets of catch basin, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes furnishing, installing, and testing, precast concrete drain manholes, frames and covers, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential cross-drain conflict, and review their findings with the Engineer prior to the work.

Cross drains needing replacement shall be replaced in kind.

No payment will be made for reconstructing a cross-drain that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.



**B. REMOVAL AND RELOCATION OF EXISTING, IN-SERVICE ELECTRIC CONDUIT**

The quantity for Item 14B shall be the actual length of existing, in-service electric conduit removed and relocated, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe.

The unit price for Item 14B shall constitute full compensation for locating, excavating, removing and relocating existing, in-service electric conduit that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper bedding and backfill material, de-energizing and re-energizing all necessary electric facilities, temporary bypass, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes furnishing, installing, and testing new electric conduit, conductors, fittings, pullboxes, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential utility conflict, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential utility conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for removing and relocating existing, in-service electric conduit that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.

In addition to bituminous concrete installed as permanent binder course pavement, this item also includes bituminous concrete installed as temporary trench patch, provided that prior approval by the Engineer has been given for the manhole-to-manhole section in question.

**C. REMOVAL AND PROPER DISPOSAL OF EXISTING, OUT-OF-SERVICE ELECTRIC CONDUIT**

The quantity for Item 14C shall be the actual length of existing, out-of-service electric conduit removed and properly disposed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the exposed pipe.

The unit price for Item 14C shall constitute full compensation for locating, excavating, removing and properly disposing existing, out-of-service electric conduit that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper bedding and backfill material, de-energizing and re-energizing all necessary electric facilities, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes removing and properly disposing electric conduit, conductors, pullboxes, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential utility conflict, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential utility conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for removing and properly disposing of existing, out-of-service electric conduit that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.

#### D. REMOVAL AND RELOCATION OF EXISTING, IN-SERVICE WATER MAIN

The quantity for Item 14D shall be the actual length of existing, in-service water main removed and relocated, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe.

The unit price for Item 14D shall constitute full compensation for locating, excavating, removing and relocating existing, in-service water main that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper bedding and backfill material, system isolation and valve operation for all necessary water facilities, temporary bypass, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes furnishing, installing, and testing new water main where the relocation of the existing main is not practical due to its age, condition, or materials of construction, fittings, joint restraint, thrust blocking, valves, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential utility conflict, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential utility conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for removing and relocating existing, in-service water main that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.

#### E. REMOVAL AND PROPER DISPOSAL OF EXISTING, OUT-OF-SERVICE WATER MAIN

The quantity for Item 14E shall be the actual length of existing, out-of-service water main removed and properly disposed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the exposed pipe.

The unit price for Item 14E shall constitute full compensation for locating, excavating, removing and properly disposing existing, out-of-service water main that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper bedding and backfill material, system isolation and valve operation for all necessary water facilities, temporary bypass, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes removing and properly disposing water main, including asbestos cement main, fittings, joint restraint, thrust blocking, valves, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential utility conflict, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential utility conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for removing and properly disposing of existing, out-of-service water main that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.

F. REMOVAL AND RELOCATION OF EXISTING, IN-SERVICE CABLE/TELEPHONE CONDUIT

The quantity for Item 14F shall be the actual length of existing, in-service cable/telephone conduit removed and relocated, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new pipe.

The unit price for Item 14F shall constitute full compensation for locating, excavating, removing and relocating existing, in-service cable/telephone conduit that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper bedding and backfill material, de-energizing and re-energizing all necessary cable/telephone facilities, temporary bypass, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes furnishing, installing, and testing new cable/telephone conduit, conductors, fittings, pullboxes, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential utility conflict, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential utility conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for removing and relocating existing, in-service cable/telephone conduit that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.

**G. REMOVAL AND PROPER DISPOSAL OF EXISTING, OUT-OF-SERVICE CABLE/TELEPHONE CONDUIT**

The quantity for Item 14G shall be the actual length of existing, out-of-service cable/telephone conduit removed and properly disposed, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the exposed pipe.

The unit price for Item 14G shall constitute full compensation for locating, excavating, removing and properly disposing existing, out-of-service cable/telephone conduit that may be in conflict with the new sewer. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper bedding and backfill material, de-energizing and re-energizing all necessary cable/telephone facilities, temporary bypass, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes removing and properly disposing cable/telephone conduit, conductors, fittings, pullboxes, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential utility conflict, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential utility conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for removing and properly disposing of existing, out-of-service cable/telephone conduit that, in the opinion of the Engineer, is not in conflict with the new sewer or is capable of being supported.

**H. PROPER ABANDONMENT OF EXISTING SEPTIC TANKS/CESSPOOLS**

The quantity for Item 14H shall be the actual number of existing septic tanks/cesspools properly abandoned, measured in place, after acceptance by the Engineer.

The unit price for Item 14H shall constitute full compensation for locating, excavating, and properly abandoning existing septic tanks/cesspools left inactive following connection of the house to the new sewer system. This item shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, proper septic tank/cesspool filling and backfill material, regrading, loaming and seeding, site restoration, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes removing and properly disposing materials, debris, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

The Contractor shall evaluate each potential site conflict that would require restoration, and review their findings with the Engineer prior to the work. Test pit excavation, requested by the Engineer, to further define the extent of the potential site conflict shall be paid for under the TEST PIT EXCAVATION payment item.

No payment will be made for site restoration work that, in the opinion of the Engineer, is not in conflict with the work of this item or is capable of being supported or avoided.

#### I. CONCRETE ENCASEMENT OF EXISTING SEWER/WATER/UTILITIES.

The quantity for Item 14I shall be the actual length of existing, in-service utility pipe or conduit encased in concrete per details, measured in place, after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the utility. Where crossing utilities are encased, each utility will be measured. The unit price for Item 14I shall constitute full compensation for locating, excavating, and installing concrete, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

This item also includes furnishing, installing, forms and concrete, and all other incidental items, complete, as indicated, specified, or directed by the Engineer.

### 15.0 ITEM 15 - SUBMERSIBLE WASTEWATER PUMPING STATIONS

#### A. SUBMERSIBLE WASTEWATER PUMPING STATION #1

The quantity for Item 15A shall be based on the percent complete as determined by the Engineer. This item will be measured once the Contractor has substantially completed the work under this item.

The lump sum price for Item 15A shall constitute full compensation for furnishing and installing Pump Station #1, a duplex, submersible wastewater pumping station, complete, as shown on the drawings and as specified. The lump sum price shall include, but not necessarily be limited to, the following: installation of the precast concrete manhole (wetwell), precast concrete antifoatation slab base, precast concrete valve pit, pumps, controls, piping, fittings, valves, soil odor filter systems, and all other appurtenances, as shown on the drawings and as specified, and all other work necessary to complete the work under this item. Lump sum price shall include 2 feet of the pipe between the pump station wetwell and the FRP emergency storage tank. The lump sum price also includes pipes, fittings, and any other incidental items and work necessary to fully complete the work under this item, and connect the pumping station to the new sewer and force main adjacent to the site, as indicated on the drawings.

#### B. SUBMERSIBLE WASTEWATER PUMPING STATION #2

The quantity for Item 15B shall be based on the percent complete as determined by the Engineer. This item will be measured once the Contractor has substantially completed the work under this item.

The lump sum price for Item 15B shall constitute full compensation for furnishing and installing Pump Station #2, a duplex, submersible wastewater pumping station, complete, as shown on the drawings and as specified. The lump sum price shall include, but not necessarily be limited to, the following: installation of the precast concrete manhole (wetwell), precast concrete antiflotation slab base, precast concrete valve pit, pumps, controls, piping, fittings, valves, soil odor filter system, and all other appurtenances, as shown on the drawings and as specified, and all other work necessary to complete the work under this item. Lump sum price shall include 2 feet of the pipe between the pump station wetwell and the FRP emergency storage tank. The lump sum price also includes pipes, fittings, and any other incidental items and work necessary to fully complete the work under this item, and connect the pumping station to the new sewer and force main adjacent to the site, as indicated on the drawings.

#### C. WASTEWATER PUMPING STATIONS EMERGENCY STORAGE TANKS.

The quantity for Item 15C shall be the number of 5000 or 6000 gallon FRP storage tanks installed complete as shown on the Drawings and determined by the Engineer at pumping station #1 or #2

The lump sum price for Item 15C shall constitute full compensation for furnishing and installing each tank, complete, as shown on the drawings and as specified. The lump sum price shall include, but not necessarily be limited to, the following: excavation, shoring, installation of the FRP tank, antiflotation slab, piping, fittings, valves, backfill and restoration, and all other appurtenances, as shown on the drawings and as specified, and all other work necessary to complete the work under this item. The lump sum price shall include the pipe between the storage tank and the pump station wetwell to a point two feet off the wetwell wall.

#### 16.0 ITEM 16 - LOAMING AND SEEDING

The quantity for Item 16 shall be the actual number of square yards of loaming and seeding installed, complete, as directed or specified.

The unit price for Item 16 shall constitute full compensation for performing all work associated with restoring grassed areas disturbed by construction within the limits of the construction work, as indicated and specified.

No measurement will be made for loaming and seeding outside of the limits of construction work, as indicated and specified, nor for areas disturbed by the Contractor due to a lack of care during the execution of the Work.

#### 17.0 ITEM 17 - TEST PIT EXCAVATION

The quantity for Item 17 shall be the actual number of cubic yards excavated and backfilled, measured by the dimensions of the completed test pit, complete, as directed by the Engineer.

The unit price for Item 17 shall constitute full compensation for performing all work associated with excavating test pits, complete, including, but not necessarily be limited to, the following: earth excavation, backfill, paving, utility restoration, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

No measurement will be made for test pit excavation not approved by the Engineer.

#### 18.0 ITEM 18 - HAYBALES AND SILT FENCE

The quantity for Item 18 shall be the actual number of linear feet of haybales and silt fence combination installed, complete, as indicated, specified, or directed by the Engineer.

The unit price for Item 18 shall constitute full compensation for installing haybales and silt fence combination, complete, as indicated, specified, or directed by the Engineer. The unit price for this item also includes catch basin protection, any and all costs associated with monitoring and compliance, as may be necessary to comply with applicable regulations governing erosion control activities, and routine cleaning and maintenance of the haybales and silt fence. Silt fence shall be geotextile filter fabric as approved by the Engineer.

#### 19.0 ITEM 19 – ENGINEER'S FIELD OFFICE

The quantity for Item 19 shall be based on the percent complete as determined by the Engineer. This item will be measured, after acceptance by the Engineer, once the Contractor has substantially completed the work under this item.

The lump sum for Item 19 shall constitute full compensation for furnishing the Engineer's field office, complete, as specified.

#### 20.0 ITEM 20 – TEMPORARY 1,000 GAL. TIGHT TANKS

The quantity for Item 20 shall be based on the actual number of temporary 1,000 gal. tight tanks installed, after acceptance by the Engineer.

The unit price for Item 20 shall constitute full compensation for furnishing and installing a temporary 1,000 gal. FRP or steel watertight tank and shall include, but not necessarily be limited to, the following: excavation and disposal (except rock and below normal grade) proper disposal of damaged septic system components, clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone bedding and backfill, connecting to existing sewer, testing, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer.

No payment shall be made under this item for tight tanks installed to replace septic tanks, damaged prior to tie-in, due to the Contractor's negligence.

#### 21.0 ITEM 21 – TRENCH DAMS

The quantity for Item 21 shall be based upon the actual number of trench dams installed, after acceptance by the Engineer.

The unit price for Item 21 shall constitute full compensation for installing trench dams in sewer trenches, and other buried utility line trenches, as indicated, specified, or directed by the

Engineer. The unit price includes proper installation and compaction of dams through the entire cross-section of the trench, extending from the bottom of the trench to the start of common fill above crushed stone, and across the full width of the trench excavation.

(END OF SECTION)



## SECTION 01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

### 1.0 GENERAL

- A. The Contractor shall provide all construction facilities and temporary controls necessary for the proper completion of the work, as necessary and as specified.

### 2.0 ENGINEER'S FIELD OFFICE

- A. Before starting work at the site, the Contractor shall provide and equip a suitable office for the exclusive use of the Engineer, and the Contractor shall maintain this office thereafter until the completion of the work to be done under this contract. This office shall be a separate building located, as directed, where it will not interfere with the progress of the work. An approved, suitably constructed and equipped trailer of adequate size and design for the purpose may be furnished as the Engineer's field office. The office, furniture, equipment, supplies, and services necessary shall be satisfactory to the Engineer.
- B. The office shall be of suitable height and of ample size to accommodate the furniture and equipment listed below, without crowding (at least 150 sq. ft. of floor area). It shall be weather-tight; the walls and roof shall be insulated with at least 1/2-in. insulating board suitably ventilated; and the floor shall be tight and of double-thick construction. The office shall have screened windows that can be both opened and locked shut and the door shall have a cylinder lock with two keys. There also shall be a screen door. Mesh security screen shall be welded in place over all windows. The office shall have a partitioned-off conference room with conference table.
- C. The Contractor also shall provide acceptable toilet and lavatory facilities for the exclusive use of the Engineer.
- D. The Contractor shall furnish the following furniture, equipment, supplies, and services:
1. Plan table or sloping plan shelves, about 3 ft. by 5 ft., with reasonably smooth top, and suitable swivel stools.
  2. Four chairs.
  3. Shelves as directed (minimum 20 S.F.).
  4. Electric power, wiring, lights and outlets as directed. The Contractor shall pay all charges for the energy used.
  5. Broom and dustpan.

6. Two desks for general office use, each about 3 ft. by 5 ft., with three desk chairs of the armchair swivel type
  7. Telephone, answering and FAX machine and internet/cable connection installed in the job office for the exclusive use of the Engineer at the start of work and shall pay all charges associated with its use for Project purposes.
  8. One four-drawer, legal size, metal filing cabinets with lock.
  9. Printing desk calculator.
  10. Five (5) pound dry type fire extinguisher.
  11. Photocopying machine installed with paper supply in the job office for the exclusive use of the Engineer at the start of work.
  12. Janitor service and sanitary facilities.
  13. Supply of drinking water in a suitable cooler or other approved container.
  14. Refrigerator.
  15. Paper cups, paper towels, liquid soap, and toilet paper; each with suitable dispenser or holder.
  16. Thermostatically controlled heating unit or system of adequate capacity to maintain a minimum temperature of not less than 68 deg. F. under all cold weather conditions. The Contractor shall provide all fuel used and service necessary.
  17. Thermostatically controlled, refrigerant type, air conditioner of adequate capacity to maintain a maximum temperature of not more than 72 deg. F. under all hot weather conditions. The Contractor shall provide all service necessary and provide all power used.
- E. The Contractor shall provide office space and facilities until the office, furnishings, and equipment described above are ready for use, but by so doing he shall not be relieved of his obligation to provide and equip the specified Engineer's office as promptly as possible.
- F. Unless otherwise directed by the Engineer, after the date of completion of the Work as stated in the final estimate, the Contractor shall remove the office and all such temporary facilities from the site, the same to become his property, and leave the premises in a condition acceptable to the Engineer.
- G. The Contractor shall supply all fuels for heating and pay all utility bills.

3. CONTRACTOR'S FIELD OFFICE

A. The Contractor shall maintain a field office at the job site in a location directed by the Engineer. The field office shall be kept neat and clean at all times, and shall contain, as a minimum, the following:

1. Telephone - operational at the start of construction.
2. Complete set of Contract Drawings & Specifications.
3. Two sets of Drawings and Specifications indicating all adjustments or changes made during construction.
4. Correspondence, change order and field order files.
5. Complete file of approved shop setting and erection drawings.
6. Log of all material and equipment delivered, and certificates.
7. Log and copies of all equipment tests.
8. Copies of all requisitions for payment.
9. All labor and Wage Notices required by Law.

B. The Contractor or his authorized representative shall be present in the field office at all times while work is in progress. Instructions received there from the Engineer shall be considered as delivered to the Contractor.

C. In addition to the stationary telephone described above, the Contractor shall maintain the following:

1. A portable cellular telephone with belt mounted carrying case. Telephone is to remain "on" at all times to allow the Engineer the ability to contact the Contractor during normal working hours, as necessary.
2. Cellular telephone service with unlimited calling capability to the Massachusetts 617, 781, and 978 area codes. Service shall include an automated answering system. The Contractor shall pay all bills charged against the Contractor's telephone, including activation fees, cancellation fees, and all monthly charges throughout the construction period.

4. TEMPORARY TELEPHONE

A. Install in the Engineer's field office a private telephone for the Engineer's exclusive use. Telephone shall be provided with an automatic message system.

The Contractor shall pay all bills charged against the Engineer's telephone, including installation charge and all monthly charges throughout the construction period.

- B Before starting work on the project, the Contractor shall furnish the following for use by the Resident Engineer representing the Owner:
1. A portable cellular telephone with belt mounted carrying case.
  2. Cellular telephone service with unlimited calling capability to the **Massachusetts 617, 781, and 978 area codes**. Service shall include an **automated answering system**. The Contractor shall pay all bills charged against the Resident Engineer's telephone, including activation fees, cancellation fees, and all monthly charges throughout the construction period.

5. SANITARY REGULATIONS

- A. Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. Such conveniences shall be made available when the first employees arrive on the site of the Work. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the perpetration of nuisances within, or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

6. PROJECT SIGN

- A. NOT USED.

7. PROVISIONS FOR CONTROL OF EROSION

- A. The Contractor shall comply with all conditions required by the order issued by the Conservation Commission.
- B. The Contractor shall take sufficient precautions during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens and calcium chloride into the supplies and surface waters of the Commonwealth. Special precautions shall be taken in the use of construction equipment to prevent operations that promote erosion.
- C. Disposal of drainage shall be in an area approved by the Owner. The Contractor shall prevent the flow or seepage of drainage back into the drainage area. Drainage shall not be disposed of until silt and other sedimentary materials have

been removed. Particular care shall be taken to prevent the discharge of unsuitable drainage to a water supply or surface water body.

D. As a minimum, the following shall apply:

1. In cross-country areas brush and stumps shall not be removed until more than one week prior to the start of work in that area. The existing ground surface shall be disturbed as little as possible until no more than one week prior to the start of work.
2. Stacked bales of hay shall be provided at points where drainage from the work site leaves the site, to reduce the sediment content of the water. Sufficient bales of hay shall be provided such that all flow will filter through the hay. Other methods that reduce the sediment content to an equal or greater degree may be used as approved by the Engineer.
3. Drainage leaving the site shall flow to watercourses in such a manner as to prevent erosion.
4. Loaming and seeding or mulching of cross-country areas shall take place as soon after completion of work in that area as practicable. This shall be considered part of the cleanup work, and full payment for the work will not be made until it has been completed.

E. Measures for control of erosion must be adequate to assure that turbidity in the receiving water will not be increased more than 10 standard turbidity units (s.t.u.), or as otherwise required by the State or other controlling body, in waters used for public water supply or fish unless limits have been established for the particular water. In surface water used for other purposes, the turbidity must not exceed 25 s.t.u. unless otherwise permitted.

F. In cross-country areas when excavating in wetland or river flood-plain, where no temporary diversion structure is required, the excavated material shall be placed on the uphill side of the trench so that the trench serves as a barrier between the excavated material and the wetland or flood plain.

## 8. DUST CONTROL

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and applying water to streets, as necessary so as to minimize the creation and dispersion of dust.
- B. At no time shall calcium chloride or other chemicals be used for dust control on this project.

## 9. WEATHER PROTECTION AND HEATING DURING CONSTRUCTION

- A. It is the intent of these standards to require the general contractor to provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March in compliance with Chapter 497 of the Massachusetts General Laws of 1970. These standards are not to be construed as requiring enclosures or heat for operations that are economically infeasible to protect in the judgment of the Owner. Included in this category, without limitation, are such items as Site work, Excavation, Pile Driving, Steel Erection, Erection of Certain Exterior Wall Panels, Roofing, and similar operations.
- B. "Weather Protection" shall mean the temporary protection of that work adversely affected by moisture, wind and cold by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Owner and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 40 deg. F. at the working surface. This provision does not supersede any specific requirements for methods of construction and/or curing of materials.
- C. The Contractor may with the approval of the Owner elect to utilize the permanent heating systems for temporary heat after the building is enclosed and after it has been tested and is ready to operate. However, it shall be his responsibility to have all portions of the permanent heating system, that are used for heating during construction, thoroughly cleaned and restored to first-class condition, to the satisfaction of the Owner.
- D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices.
- E. The Contractor shall furnish and install Fahrenheit thermometers at places designated by the Owner in order to determine if specified temperatures are maintained.

(END OF SECTION)

## SECTION 02010 - SUBSURFACE INVESTIGATION

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. This section describes the subsurface soil and groundwater investigations at the site, and use of data resulting from that investigation.

#### 1.2 Soils Investigation Report

##### A. General:

1. Subsurface investigations performed for the Owner are provided as an appendix to the Division II Specifications for the information of the Contractor.
2. Data on indicated subsurface conditions contained in the geotechnical information are not intended as representations or warrants of continuity of such conditions between explorations. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn from the data by the Contractor. Data are made available for the convenience of the Contractor. Neither the Owner nor the Engineer assumes responsibility for accuracy of the data other than at the particular locations and at the time the explorations were made.
3. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

##### B. Use of Data:

1. The boring data enclosed is available for bidders' information, but is not a warranty of subsurface conditions.
2. Bidders should visit the site and acquaint themselves with existing conditions.
3. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Engineer.

#### 1.3 Quality Assurance

- A. The Contractor shall re-adjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Engineers.

(END OF SECTION)

## SECTION 02070 - SITE DEMOLITION & UTILITIES ABANDONEMENT

### 1.0 GENERAL

#### 1.1 Special Provisions

- A. All demolition work shall conform to the requirements of the Massachusetts Department of Public Safety.
- B. The Contractor shall examine all Drawings and all other sections of the Specifications for requirements therein affecting the work of this trade.

#### 1.2 Scope of Work

- A. The work of this Section consists of Demolition and related items, as indicated on the Drawings, and/or as specified herein.
  - 1. Demolition of existing bituminous paving and concrete walkways and paving.
  - 2. Removal of concrete walls and steps.
  - 3. Removal and stacking of existing granite curbing and granite pieces.
  - 4. Removal and/or capping of all utilities to be abandoned.
  - 5. Removal of existing storm drainage structures piping.
  - 6. Removal of light poles and bases.
  - 7. Removal from the site and legal disposal of all materials resulting from the demolition operations except those specified to be preserved, stockpiled, and re-used as specified herein or in other Sections of the Specifications.

#### 1.3 Related Work Under Other Sections.

- A. The following items of related work are specified and included under other Sections of the Specifications.
  - 1. Section 02100 - Site Preparation
  - 2. Section 02200 - Earthwork
  - 3. Section 02500 - Bituminous Pavement
  - 4. Section 02600 - Site and Utilities

#### 1.4 Coordination



- A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of the work of the Contract.

## 2.0 PRODUCTS

None used this Section.

## 3.0 EXECUTION

### 3.1 Workmanship

- A. Before beginning Demolition work, the Contractor shall:
  - 1. Disconnect or arrange for the disconnection of all utility service lines to the structures to be demolished.
  - 2. Notify the proper local authorities and utility companies, in writing, before work commences.
  - 3. Remove all utility and service lines in accordance with the authorities and/or companies having jurisdiction over such work.
  - 4. Report the location of all caps and plugs to the Engineer.
- B. The Contractor shall take all possible precautions to avoid damaging those materials which are to be salvaged, stockpiled, or re-used on the site.
- C. The Contractor's demolition work shall be carried out in a careful and orderly manner. Provide adequate protection to persons and property inside and outside of the site.
- D. The Contractor shall not commence work until trees and other items to be saved have been protected as specified in other Sections of the Specifications and Drawings.
- E. The Contractor shall burn no material or debris on the site.

### 3.2 Removal and Abandonment

- A. The Contractor shall remove and legally dispose of, at no cost to the Owner, all materials and debris resulting from the Demolition work, other than those to be salvaged, stockpiled, and re-used on the site. Leave the site in safe and clean condition.
- B. The following procedure shall be used to abandon all septic tanks and cesspools:
  - 1. The septic tank or cesspool shall be pumped of its entire contents by a licensed septage hauler; and the bottom of the tank or cesspool shall be opened or ruptured after being pumped of its contents so as to prevent retainage of water and the tank shall be completely filled with clean sand.

### 3.3 Examination of Site and Documents

- A. The Contractor shall visit the site and examine the existing conditions thoroughly to acquaint himself with the specific obstacles and advantages related to Demolition work. He shall thoroughly examine the documents to determine the exact extent of Demolition work required, as well as inspect the site to determine conditions and items to be demolished

(END OF SECTION)

## SECTION 02100 - SITE PREPARATION

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The Contractor shall provide all equipment and materials, and do all work necessary to maintain the erosion and sediment control program. The erosion and sediment control provisions detailed on the contract Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to effect the erosion and siltation control principles specified herein, or as directed by the Engineer.
- B. The work shall include, but not be limited to, the following: clearing, grubbing, cutting and disposing of vegetation, trees and debris from within the project area (including the stripping of topsoil).
- C. Furnish and set all lines and grades required for construction operations and be solely responsible for the accuracy of lines and grades features of the work.
- D. Site clearing, grubbing and erosion control methods shall comply with the Town of Ipswich requirements.
- E. Provide Erosion and Sedimentation Control features including: slope protection, placement of haybales, and siltation fences, temporary drainage swales, filtration and check dams, inlet baskets, and temporary seeding.

#### 1.2 Related Work Specified Elsewhere

- A. Earthwork is specified in Section 02200.
- B. Site Grading is specified in Section 02210.

### 2.0 PRODUCTS

#### 2.1 Fence

- A. Snow fence plastic sheet grid at least 48-inches high orange in color.
- B. Filter fabric shall be one of the following, or approved equal:

Product	Manufacturer
Trevira Spunbond Fabric Type 1120	Hoechst Fibers Industries Spartanburg, SC 29304
Supac N 5 NP UV	Phillips Fibers Corporation Greenville, SC 29602

- C. Silt Fence shall be supported by posts, driven a minimum of 1 ft. into the ground. Posts shall be spaced 7 ft. o.c. maximum.
- D. Fencing other than that specified above shall be subject to review and acceptance by the Engineer.

## 2.2 Hay Bales

- A. Hay bales for construction of erosion control devices shall be new, firm, wire or nylon-bound livestock feed-grade.

## 2.3 Crushed Stone

- A. Crushed stone for hay bale check dams shall conform to Massachusetts Department of Public Works (MDPW) Specification Section M2.01.0, "Crushed Stone" for Stone Size M2.01.2.

## 3.0 EXECUTION

### 3.1 General

- A. The Contractor shall be solely responsible for locating all underground utilities and notifying the appropriate utility owners and Dig Safe prior to the commencement of work. Locations of existing utilities on the site plan are not warranted to show all existing utilities under or above ground. Existing utilities indicated on the site plan are shown only for the convenience of the Contractor. It shall be expressly understood that the Owner will not in any way be held responsible for conclusions or interpretations drawn therefrom by the Contractor. The Contractor shall therefore be held solely liable for any damage that occurs on or off site in this respect.

### 3.2 Protection of Existing Trees and Vegetation

- A. The Contractor shall protect existing trees, groups of trees, and other vegetation designated by the Engineer or shown on the Contract Drawings to remain in place against unnecessary cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
- B. The Contractor shall repair or replace trees and vegetation damaged by construction operations and outside the limits of construction activities, in a manner acceptable to the Engineer. Tree damage shall be repaired by a qualified tree surgeon.

### 3.3 Site Clearing

- A. General:

1. Prior to starting site clearing operations, the Contractor shall stake out all limits of all areas to be cleared and grubbed, and limits of cut and fill at edges of these areas, if limits do not coincide.
2. Promptly, upon completion of layout work and before any clearing is done, the Contractor shall arrange a conference on the site with the Engineer to verify clearing limits. The Contractor shall not do any clearing without a clear understanding of existing conditions to be preserved. Adjustments to clearing lines shall be made at this time to save trees or other items on the edges of clearing lines. If necessary, minor grading adjustments shall be made to save these trees.
3. The Contractor shall remove shrubs, grass, weeds and other vegetation, improvements or obstructions that interfere with the installation of new construction. Also remove such items elsewhere on the site or premises as specifically indicated by the Engineer. Removal includes new and old stumps and their roots and any existing above-ground improvements.
4. Clearing operations shall be conducted to prevent falling trees from damaging standing trees or adjacent structures.
5. Topsoil is defined as friable clay loam surface soil reasonably free of subsoil, clay, lumps, stones, objectionable material, and other objects over two (2) inches in diameter.
6. Normal depth of topsoil is defined as the depth at which clay, stones, sand, gravel objects over two (2) inches in diameter and objectionable material are encountered.

B. Stripping:

1. Prior to beginning earthwork excavation within the project site, the Contractor shall strip all topsoil to its normal depth.
2. The Contractor shall strip topsoil to whatever depths encountered, and in such manner so as to prevent intermingling with the underlying subsoil or other objectionable materials.
3. Where trees are indicated to be left standing, the Contractor shall stop topsoil stripping a sufficient distance from these trees to prevent damage to the main root system.
4. The Contractor shall:
  - a. Stockpile topsoil so it will not interfere with construction operations or local access or where otherwise directed.
  - b. Construct storage piles to freely drain surface water.
  - c. Cover storage piles if required to prevent windblown dust and erosion.

5. Any stockpile soil shall be prevented from eroding into wetland resource area and/or buffer zones by the use of staked hay bales. Throughout construction the hay bales shall be maintained in a functioning condition and shall not be removed until all disturbed areas have been adequately vegetated.
6. If the stockpiled soil is to remain for a duration longer than 30 days, the stockpile shall be seeded. This may be accomplished by use of an approved spraying machine.
7. The Contractor shall dispose of excess topsoil and waste material as herein specified.

#### 3.4 Clearing and Grubbing

- A. Clear the project site (as directed by the Engineer) of shrubs and other vegetation except for those indicated to be left standing.
- B. Completely remove stumps, roots, organic materials and other debris in all excavation, embankment, and slope areas in which earthwork and grading operations will occur, except as presented in paragraph 3.03, Site Clearing.
- C. Fill depressions caused by clearing and grubbing operations with suitable backfill material unless further excavation or earthwork is indicated.

#### 3.5 Disposal of Materials

- A. All roots, stumps, brush, foliage, vegetation, and other materials and work from clearing and grubbing operations shall become the property of the Contractor and shall be removed by him from the project site. All materials removed from the project site shall be legally disposed of by the Contractor. No on-site disposal will be permitted.
- B. Burning of combustible cleared and grubbed materials and debris will not be permitted on the Owner's property.

#### 3.6 Dust and Erosion Control

- A. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and also to control surface water throughout the operation so that it does not run onto paved ways without being filtered. In addition, the Contractor shall control all dust created by construction operations and movement of construction vehicles, both on the site and on paved ways. Provide additional crushed stone where necessary to provide traps or filters for runoff water carrying sediment. Provide temporary swales and interceptor ditches to control surface runoff water where necessary.

- B. The Contractor shall employ dust control measures approved by the Engineer; the use of calcium chloride or other similar material for dust control is strictly prohibited.

(END OF SECTION)

## SECTION 02140 - DEWATERING AND DRAINAGE

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The Contractor shall prevent surface water and subsurface or groundwater from flowing into excavations or earthwork areas which would cause flooding of the project site and surrounding area, or softening or loosening of the soil at excavation or earthwork subgrade.
- B. The Contractor shall provide adequate and satisfactory dewatering and drainage of excavations and furnish all materials and equipment and do all incidental work required in conjunction with the furnishing, installing, and maintaining of same to permit proper and timely completion of all work required. The Contractor may choose any satisfactory method he wishes subject to the acceptance of the Engineer and permitting agencies for handling groundwater or surface water encountered in the work, provided they perform the dewatering required, and shall assume all responsibility for the adequacy of the methods, materials, and equipment employed. The Contractor shall bear the full cost of providing the dewatering at all times of the year, throughout the construction period, and no additional payment shall be made for this work. The Contractor shall take all precautions necessary to prevent loosening or softening up of the subgrade. In this regard, the Contractor shall at all times be prepared to alter his construction method or sequence. Dewatering and control of water shall be conducted as necessary to prevent seepage, groundwater flow or surface infiltration and runoff from it in any way undermining or otherwise damaging adjacent structures and utilities.
- C. Pumping equipment and devices to properly remove and dispose of all water entering the trenches and excavation for structures shall be provided. The grade shall be maintained dry until the structures (paved area, pipe, wetland crossing, drainage structure, embankments, etc.) to be built thereon are completed. All dewatering required by pumping and drainage shall be performed without damage to the excavation, pipe trench, pavements, pipes, electrical conduits, other utilities and any other work or property. Existing or new sanitary sewers shall not be used to dispose of drainage.
- D. The Contractor's method of dewatering shall maintain the bottom of the excavation dry at all times.
- E. In areas adjacent to water courses, the Contractor shall provide the degree of protection against flooding of the excavation that he deems suitable. Should flooding occur, the Contractor shall restore and repair all work as required. No additional payment will be made for this work.

#### 1.2 Design Criteria

- A. The Contractor is responsible for the adequacy of the dewatering systems and to design the dewatering systems so they will:



1. Effectively reduce the hydrostatic pressure and lower the groundwater levels to a minimum of 2 feet below the bottom of excavation;
  2. Develop a substantially dry and stable subgrade for the prosecution of subsequent operations;
  3. Not result in damage to adjacent properties, buildings, structures, utilities and other work; and
  4. Assure that after 12 hours of initial pumping, no soil particles will be present in the discharge.
- B. The Contractor shall locate dewatering facilities where they will not interfere with utilities and construction work to be done by others.
- C. The Contractor shall modify dewatering procedures which threaten to cause damage to new or existing facilities, so as to prevent further damage. The Contractor is responsible for determining the modifications to be made. Those modifications shall be at no additional expenses to the Owner.

### 1.3 Submittals

- A. Prior to installation of the dewatering system, the Contractor shall submit working drawings and design data showing the following, for review by the Engineer:
1. The proposed type of dewatering system;
  2. Arrangement, location and depths of system components;
  3. Complete description of equipment and instrumentation to be used, with installation, operation and maintenance procedures;
  4. Types and sizes of filters;
  5. Design calculations demonstrating adequacy of the proposed system and equipment; and
  6. Methods of disposal of pumped water.
- B. Submit records as required by Paragraph 3.2 of this Section.

### 1.4 Job Conditions

- A. Surface Drainage: Intercept and divert precipitation, and surface water, away from excavations through the use of dikes, curb walls, ditches, pipes, sumps or other approved means.
- B. Drainage of Excavated Areas: The Contractor shall:
1. Provide and maintain ditches of adequate size to collect surface and seepage water which may enter the excavations.

2. Divert the water into sumps and drain or pump into drainage channels or storm drains. When water is to be diverted into a storm drain, the Contractor shall provide settling basins or other accepted apparatus as required to reduce the amount of fine particles which may be carried into the drain. If a storm drain becomes blocked due to dewatering operation it shall be cleaned by the Contractor at his own expense.

## 2.0 PRODUCTS

None this Section.

## 3.0 EXECUTION

### 3.1 Dewatering

- A. The Contractor shall accomplish dewatering in accordance with accepted working drawings. Keep the Engineer advised of any changes made to accommodate field conditions and, on completion of the dewatering system installation, revise and resubmit working drawings, as necessary to show the installed configuration.
- B. The Contractor shall organize dewatering operations to lower the groundwater level in excavations as required for prosecution of work, and to provide a stable, dry subgrade for the prosecution of subsequent operations.
- C. The Contractor shall maintain the water level at such lower elevations to ensure that no danger to structures can occur because of buildup of excessive hydrostatic pressure, and in any event maintain the water level a minimum of two feet below the subgrade, or bottom of trench unless otherwise permitted by the Engineer.

### 3.2 Records

- A. The Contractor shall:
  - 1. Observe and record the average flow rate and time of operation of each pump used in the dewatering system. Where necessary provide appropriate devices, such as flow meters, for observing the flow rates. Submit the data, in tabular form acceptable to the Engineer, during the period that the dewatering system is in operation.
  - 2. Observe and record the elevation of the groundwater on a form acceptable to the Engineer during the period that the dewatering system is in operation. Submit observation records within 24 hours of reading, on a regular basis.
  - 3. During the initial period of the dewatering, the Contractor shall make required observations on a daily basis. If, after a period, dewatering operations have stabilized, reduce observations to longer intervals as accepted by the Engineer.

(END OF SECTION)

## SECTION 02200 - EARTHWORK

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The Contractor shall perform the following items required to complete the work of this Section 02200, as shown on the Drawings and specified herein:
1. Furnish all labor, materials, equipment and transportation required to complete Excavation and Backfill work indicated on the drawings and as specified under this Section.
  2. Without limiting the generality thereof, excavation and backfill shall include excavating and backfilling for demolition, construction of roadways, walks, retaining walls, lawn and all other areas to receive proposed surface finishes, fencing, utilities and all foundation footings. Excavation shall also include unclassified material, such as bituminous pavements, cobblestones, concrete, metal or wood posts, bollards, signs, footings and miscellaneous debris of every nature throughout the site not included under Section 02070, Demolition.
  3. Provide from off-site locations or from suitable on-site excavation all graded fill materials necessary to fulfill the requirements under this Section.
  4. The excavation for test pits to locate existing utilities.
  5. Furnish all labor, materials, equipment and transportation to remove and dispose of all unsuitable or surplus materials encountered in the construction.
  6. Perform all compaction of fill materials as hereinafter specified.
  7. Establish and properly prepare subgrades for all proposed work and surface finishes.
  8. Furnish all labor, materials, equipment and transportation required to complete the loam borrow work as specified under that item.
  9. Perform all operations and provide such equipment as necessary to maintain excavated areas free from water from any source.
  10. Furnish, install, and maintain sheeting, shoring and bracing, as necessary, to protect excavations against cave-in and to protect existing adjacent structures against damage due to the earthwork performed under this Contract.
  11. Obtain all required permits, licenses, and approvals of appropriate municipal and utility authorities, prior to commencing the work of this Section, and pay all costs therefore.

1.2 Related Work Specified Elsewhere

- A. Site Demolition is specified in Section 02070.
- B. Site Preparation is specified in Section 02100.
- C. Site Grading is specified in Section 02210.
- D. Topsoiling, Fine Grading and Seeding is specified in Section 02920.
- E. Dewatering and Drainage is specified in Section 02140.

1.3 Referenced Standards

- A. American Society for Testing and Materials (ASTM):  
D1557 Moisture-Density Relations of Soil and Soil Aggregate  
Mixtures Using 10-lb. (4.54-kg) Rammer and 18-inch  
(457-mm) Drop.
- B. Commonwealth of Massachusetts Department of Public Works (MDPW):  
Specifications: Standard Specifications for Highways and Bridges

1.4 Quality Assurance

- A. The Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and methods needed for proper performance of the work in this Section.
- B. The Contractor shall use equipment in size, capacity, and number to accomplish the work of this Section in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, the Contractor shall comply with the directions of the Engineer.
- D. The Contractor shall be responsible for notifying the Owner and forty-eight (48) hours in advance of construction in order to have the Engineer on-site.

1.5 Quality Control

- A. The Owner will retain a Geotechnical Consultant to perform on-site observation and testing during the following phases of the construction operations. The services of the Geotechnical Consultant may include, but not be limited to the following:
  - 1. Observation during excavation and dewatering of building areas, parking areas, and controlled fill areas.

2. Observation during placement and compaction of fills within the building area, parking areas, and other controlled fill areas as appropriate.
  3. Laboratory testing and analysis of fill and bedding materials specified, as required
  4. Observation of construction and performance of water content, gradation, and compaction tests at a frequency and at locations determined by the Geotechnical Consultant. The results of these tests will be submitted to the Engineer, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the Geotechnical Consultant will advise the Engineer in writing with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.
- B. The Geotechnical Consultant's presence does not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Geotechnical Consultant, nor any observations and testing performed by him, nor any notice of failure to give notice shall excuse the Contractor from defects discovered in his work.
- C. The Owner reserves the right to modify or waive Geotechnical Consultant services.

#### 1.6 Samples and Testing

- A. All fill materials and their placement shall be subject to quality control testing. A qualified laboratory will be selected and paid by the Owner to perform tests on materials. Test results and laboratory recommendations will be available to the Contractor.
- B. The Contractor shall provide samples of each fill material from the proposed source of supply. Allow sufficient time for testing and evaluation of results before material is needed. Submit samples from alternate sources if required.
- C. The Engineer will be the sole and final judge of the suitability of all materials.
- D. The laboratory will determine maximum dry density and optimum water content in accordance with ASTM D 1557, Method D, and the in-place density in accordance with ASTM D 1556.
- E. Tests of the material as delivered may be made from time to time. Materials in question may not be used, pending test results. Tests of compacted materials will be made regularly. Rejected materials shall be removed from the site.
- F. The Contractor shall cooperate with laboratory in obtaining field samples of in-place materials after compaction. Furnish incidental field labor in connection with these tests.

- G. When initial tests indicate non-compliance with the specification, subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency, and the costs thereof will be deducted by the Owner from the Contract Amount.

#### 1.7 Disturbance of Excavated and Filled Areas During Construction

- A. The Contractor shall take the necessary steps to avoid disturbance of subgrade and underlying natural soils/compacted fill during excavation and filling operations. Methods of excavation and filling operations shall be revised as necessary to avoid disturbance of subgrade and underlying soils/fill, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering, and other acceptable control measures. Disturbance shall be constructed to include deteriorating of fill (after placement and satisfactory compaction) due to the Contractor's operations, such as moving equipment, hauling trucks, etc. The Contractor shall cooperate with the Engineer or Geotechnical Consultant to modify his operations as necessary to minimize disturbance and protect bearing soils, based on the Engineer's or Geotechnical Consultant's recommendations.
- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with compacted Gravel Fill or Crushed Stone. Fill that cannot be compacted within 48 hours because of its saturated condition shall be removed and replaced with compacted Gravel Fill or Crushed Stone. Costs of removal of disturbed material and re-compaction with Gravel Fill or Crushed Stone shall be borne by the Contractor.

#### 1.8 Coordination

- A. Prior to start of earthwork the Contractor shall arrange an on-site meeting with the Engineer and Geotechnical Consultant for the purpose of establishing the Contractor's schedule of operations and scheduling inspection procedures and requirements.
- B. As construction proceeds, the Contractor shall be responsible for notifying the Engineer prior to start of earthwork operations requiring inspection and/or testing.
- C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

## 2.0 PRODUCTS

### 2.1 Common Fill

A. Unless further specified, common and embankment fill material used on the project shall meet the following general criteria:

1. Materials shall be free from organic matter, weak or compressible materials, frozen materials, deleterious substances, and rocks or lumps over eight (8) inches in greatest dimension, with not more than 15% of these rocks or lumps larger than one and one-half (1-1/2) inches in their greatest dimension. The fill material shall be well graded within the following limits.

Sieve Size	Percent Passing
Tubular 8-inch	100
No. 430	90
No. 405	60
No. 2000	20

- B. Common fill shall be used, compacted as specified, for general grading; as backfill in areas outside the building limits and where otherwise indicated on the drawings and specifications.
- C. Common fill may be used in lieu of structural fill or gravel base provided that the material conforms to the gradation requirements specified for each.
- D. Fill material is subject to the acceptance of the Engineer, and is that material removed from on-site excavations or imported from off-site borrow areas, predominantly granular, non-expansive soils free from roots and other deleterious matter.
- E. Fill material shall have no stones larger than six (6) inches maximum dimension when used in the upper two (2) feet of fill or embankment.
- F. Fill material shall be free of stones larger than two (2) inches maximum dimension when used in trenches or when backfilling within two (2) feet of a structure.
- G. Fill material shall be of such nature and character that it can be compacted to the specified densities in a reasonable length of time.

## 2.2 Structural Fill

- A. Structural fill shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Structural fill shall conform to the following gradation requirements:



Sieve Size	Percent Finer By Weight
6-inch	100
No. 4	30-95
No. 40	10-70
No. 200	0-15

- B. Structural fill may be used under structural slabs, foundations, footings, walls and in other soil bearing situations, and where otherwise indicated on the Drawings and Specifications. As discussed previously, it may be possible to use the on-site materials as structural fill within the excavations if it conforms to the gradation requirement given above.

### 2.3 Gravel

- A. Gravel shall be used as a backfill material in all trench excavations, rock excavations, miscellaneous trench excavations and any other location where specified herein, as called for in the appropriate pipe specifications, as shown on the Plans or ordered by the Engineer.

Weight slips may be requested by the Engineer to verify the source of the Gravel. Such slips shall bear the name of the supplier, date purchased and the weight of the gravel. Such slips shall not be used as a method of measuring the gravel for payment.

- B. Gravel shall consist of inert material that is hard, durable stone and coarse sand free from loam and clay surface coatings, be well graded and contain no stone having any dimension greater than three (3) inches.

Gravel shall conform to the following requirements:

Passing 3 inch sieve	100%
Passing 1 ½ inch sieve	70 – 100%
Passing ¾ inch sieve	50 – 85%
Passing No. 4 sieve	30 – 60%
Passing No. 200 sieve	0 – 10%

- C. New bank run or processed gravel is acceptable but must meet the above requirements and be processed by mechanical means. All processed gravel shall come from an approved stockpile. The equipment producing the processed gravel shall be of adequate size and with sufficient adjustments to

produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes

2.4 Dense Graded Crushed Stone

- A. Dense graded crushed stone for use under pavement shall meet Massachusetts Department of Public Works Material Standard M2.01.7 for dense graded crushed stone for sub-base.

2.5 Crushed Stone

- A. Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone shall be uniformly blended and shall conform to the Standard Material Specification M2.01.1 to 2.01.6.

Sieve Size	Percent Passing By Weight		
	¾ Inch Stone	½ Inch Stone	3/8 Inch Stone Peastone
1-inch	100	---	---
¾ inch	90	100	---
5/8 inch	---	100	---
½ inch	10-50	85-100	100
3/8 inch	0-20	15-45	85-150
No. 4	0-5	0-15	0-15
No. 8	---	0-5	0

A.

Crushed stone may be used where specified as bedding under pipelines or as a working mat.

2.6 Blasted Rock Fill

- A. Blasted Rock Fill shall be broadly graded blasted rock with a maximum size of 12-inches and twenty-five percent (25%) smaller than 6-inches and ten percent (10%) finer than 3/4-inch. Occasional boulders up to 18-inches will be permitted near the base of the fill.

1. General site rock fill (outside the building area) may be placed up to within 36-inches of finish grade in parking pavement areas, to within two feet of finish grade in lawn areas and to within 18-inches of inverts of utility lines.

First lift over the top of Rock Fill shall be a choke stone layer 18-inches thick. Compaction shall be by minimum of four coverages of a self-propelled vibratory drum roller in each direction (i.e., north-south and east-west). The minimum weight of the drum shall be 10,000 lb.

2.7 Choke Stone

- A. Choke stone shall have a maximum rock size of 9-inches and shall have fifty percent (50%) finer than 1-1/2 inches and twenty-five percent (25%) finer than 3/4 inches.

2.8 Riprap

- A. Stone riprap for revetment and slope protection at locations shown on the plans shall conform with Massachusetts Department of Public Works Material Standard M2.02.0.
- B. Riprap shall be sound, durable rock which is angular in shape. Rounded stones, boulders, sandstone or similar soft stone or relatively thin slabs will not be acceptable. Each stone shall weigh not less than 50 pounds and at least 75% of the volume shall consist of stones weighing not less than 500 pounds each. The remainder of the stones shall be so graded that when placed with the larger stones the entire wall will be compact.

2.9 Dumped Riprap

- A. Stone for dumped riprap for slope protection at locations shown on the plans shall conform with the Massachusetts Department of Public Works Material Standard M2.02.2.
- B. Stone used for dumped riprap shall be hard, durable, angular in shape, resistant to weathering and shall meet the gradation requirement specified. Neither breadth nor thickness of a single stone should be less than one-third its length. Rounded stone or boulders will not be accepted unless authorized by special provisions.

Stone shall be free from overburden, spoil, shale, and organic material and shall meet the following gradation requirement specified:

Size of Stone	Maximum Percent of Total Weight Smaller Than Given Size
400 lb.	100
300 lb.	80
200 lb.	50
*25 lb.	10

- \* No more than 5% by weight shall pass a 2 inch sieve.

Each load of riprap shall be reasonably well graded from the smallest to the maximum size specified. Stones smaller than the specified 10 percent size and spalls will not be permitted in an amount exceeding 10 percent by weight of each load.

Control of gradation will be by visual inspection. The Contractor shall provide at the locations specified a mass of rock of at least five tons meeting the gradation specified. The sample at the construction site may be a part of the finished riprap covering. At the quarry, an additional sample shall be provided. These samples shall be used as a frequent reference for judging the gradation of the riprap supplied. Any difference of opinion between the Engineer and Contractor shall be resolved by dumping and checking the gradation of two random truck loads of stone. Mechanical equipment, a sorting site and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost to the Owner.

#### 2.10 Riprap For Pipe Ends

- A. Riprap for pipe ends/energy dissipaters shall be stone conforming to Material Standard M2.02.3 and as shown on the Contract Drawings. Stone for pipe ends shall be sound, durable rock which is angular in shape. Rounded stones, boulders, sandstone, and similar stone or relatively thin slabs will not be acceptable. Each stone shall weigh not less than 50 pounds nor more than 125 pounds, and at least 75% of the volume shall consist of stones weighing not less than 75 pounds each. The remainder of the stones shall be so graded that when placed with the larger stones, the entire mass will be compact.

#### 2.11 Gravel Filter Layer

- A. Gravel filter layer material for pipe ends/energy dissipaters shall be crushed rock or crushed gravel, conforming to ASTM D448, Size Number 67 gradation, as follows:

Sieve Size	Percent Passing by Weight
1 inch	100
¾ inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

2.12 Filter Fabric

- A. Filter Fabric shall be Mirafi 140N manufactured by Mirafi, Inc., Charlotte, NC 28224, or approved equal.

2.13 Sand Borrow

- A. Sand for use as backfill in water and drain pipe trenches as shown on the Drawings shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials. The allowable amount of material passing a No. 200 sieve as determined by AASHTO T 11 shall not exceed ten percent (10%) by weight. The maximum particle size for Sand Borrow shall be 3/8 inch.
- B. Two weeks prior to ordering sand borrow, the Contractor shall submit to the Engineer a certified laboratory test result indicating that the sand borrow meets the requirements above. No sand shall be delivered to the site until the test results are approved by the Engineer. Field samples may be periodically tested for compliance with laboratory results.

2.14 Loam Borrow

- A. The Contractor shall notify the Engineer in writing at least one week in advance of the time he intends furnishing Loam Borrow, stating the location and amount of such deposit, the name and address of the supplier and also shall be furnish such facilities, transportation and assistance as the Engineer may require for collecting and forwarding samples.
- B. Samples for testing will be taken in the field upon notification of source and no topsoil may be placed without proper authorization by the Engineer.
- C. Samples shall be tested by a qualified soils lab approved by the Engineer.
- D. Testing must confirm that the loam contains not less than 5% nor more than 20% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 221 degrees F ( $\pm 5$ ) and certified test results shall be sent to the Engineer by the laboratory for approval. Loam ph shall range from 5.5 to 7.0 and shall conform to the following sieve analysis:

Sieve Analysis (By Wash Test ASTM Designation C-117)	Percent Passing
Passing 1-inch sieve	100%
Passing No. 4 sieve	90-100%
Passing No. 100 sieve	30-60%
Passing No. 200 sieve	10-30%

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

#### 2.15 Topsoil and Plantable Soil Borrow

- A. Topsoil and Plantable Soil Borrow shall consist of fertile, friable, natural topsoil, reasonably free of stumps, roots, stiff clay, stones larger than 25 millimeter diameter, noxious weeds, sticks, brush or other litter.
- B. Prior to stripping the topsoil from the construction project, it shall have been demonstrated by the occurrence upon it of healthy crops, grass or other vegetative growth, that is reasonably well drained and capable of supporting plant growth. Material classified as Topsoil can only be obtained within project lines.

#### 2.16 Clay for Trench Dams

- A. Clay for Trench Dams shall be bentonite.

### 3.0 EXECUTION

#### 3.1 Existing Conditions

##### A. Site Information:

1. Information on the Drawings, Reference Drawings, and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.
2. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have personally examine them during the bidding period, as no additional compensation will be made for errors and inaccuracies that may be found therein.

##### B. Existing Utilities:

1. See Section 02100, Site Preparation, Paragraph 3.1.

#### 3.2 Disposal and Stockpiling

- A. Disposal: All excavated materials which in the opinion of the Engineer or as specified elsewhere herein are not suitable for fill or backfill and all surplus

excavated materials shall be removed from the site and disposed of at no additional cost to the official.

- B. Stockpiling: Store where convenient on site, and so as not to interfere with the general progress of the work, all excavated material suitable and required for re-use. Storage areas outside the limits of work will not be permitted unless so authorized by the Engineer.

### 3.3 Sheeting and Bracing

- A. The Contractor shall furnish, place, remove or leave in place all sheeting and bracing required to support the sides of all trenches or other excavations for this project.
- B. The Contractor shall be solely responsible for the safety of the workmen and the adjacent facilities from danger of caving and sliding and all work to be done shall be in strict accordance with the Department of Labor, Occupational Safety and Health Administration regulations and suggested practices for construction excavations and/or other applicable codes and regulations. Special precautions shall be taken to guard against any damage to or settlement of pavements, building, walls, pipes, ducts or other structures and facilities which are adjacent to the work.
- C. The cost of providing and removing, or leaving in place, sheeting, shoring and bracing shall be included in the cost of the various items of work under this contract and no additional compensation will be allowed therefore. Any sheeting which the Contractor chooses to leave in place shall be cut off at least two feet below the finish grade.
- D. The Contractor shall remove sheeting and shoring, etc., as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides, all at no additional cost to the Owner.

### 3.4 Excavation - General Criteria

- A. Excavated materials unsuitable for reuse and materials designated as excess and not required on the project shall be disposed of off the project site; shall be the sole responsibility of the Contractor; shall be in accordance with the regulations and requirements of all municipalities or agencies having jurisdiction over the disposal sites and the routes between the project and the disposal sites.
- B. If any part of the excavation is carried, through error, beyond the depth and dimensions indicated on the Drawings or specified herein, the Contractor shall, at his own expense, and at the direction of the Engineer, furnish, place and compact gravel borrow, all as specified herein.
- C. Unsuitable material below specified subgrades under the wetland crossing, trenches, etc. shall be removed until suitable soil material (as previously defined) as directed by the Engineer is encountered. Crushed stone shall be

placed and compacted as specified to bring the excavation to specified subgrades.

- D. Ledge shall be removed to six (6) inches below subgrade or to the depth indicated on the Drawings.

### 3.5 Excavation Classifications

#### A. Unclassified Excavation:

1. Unclassified excavation shall include the removal of earth, bituminous pavements, concrete pavements (reinforced or not reinforced), cobblestone pavement, bricks, muck, rock (except Ledge Excavation) sidewalks, excavation to roadway and sidewalk subgrade, railroad ties and ballast, if required, gate boxes to be abandoned; and, when no longer required and/or when condition of items to be removed are unsuitable for reuse or stacking as determined by the Engineer (and not paid for under other items of work), the work under this item shall also include, as incidental to the general work, the removal and disposal or stacking of traffic sign posts, concrete wheel stops, concrete median barriers, granite curb, bollards and other appurtenances.
2. Edges of excavations made in existing pavements shall be squared by sawcutting with power driven tools to provide a neat clean edge for joining new pavement as shown on the plans. Pavement areas which have been broken or undermined shall be neatly edged with minimum disturbance to remaining pavement.

#### B. Rock, Ledge, and Boulder Excavation:

1. Consists of the removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling, continuous use of a ripper or other special equipment, except such materials that are classified as earth excavation.
2. Materials classified as rock, ledge and boulder are two (2) cubic yards or more in volume, solid rock, and rock-hard aggregate deposits that cannot be broken or moved with a two (2) cubic yard backhoe.
3. Old foundation walls, concrete slabs, equipment footings, and other manmade obstructions are not to be considered as ledge, rock or boulder.

#### C. Excavation Below Grade:

1. If the Contractor does not dewater properly or otherwise neglects to conduct the excavation work properly so that the surface of the subgrade is in proper condition when he is ready for construction, the Contractor shall remove the unsuitable material and replace it with crushed stone at his own expense so that the condition of the subgrade meets with the specified requirements before any work is placed thereon.



2. In areas where, in the opinion of the Engineer, the material in its undisturbed natural condition at the grade of the excavation as indicated on the Drawings for Trench Bottom is unsuitable for structure and pavement subgrade, or embankment construction, it shall be removed to such depth and width as he may direct and be replaced with crushed stone or other material as directed by the Engineer. Compensation for excavation below the grade of the excavation as ordered by the Engineer shall be based on the Contractor's Bid Price and the Contract Documents.

D. Unauthorized excavation:

1. Consists of removal of materials beyond indicated depth or elevations without the specific direction of the Engineer. Replace unauthorized excavation by backfilling and compacting as specified for authorized excavations of the same classification, unless otherwise directed by the Engineer. No additional compensation will be made to the Contractor for backfill material used to replace the material removed by the unauthorized excavation.

### 3.6 Rock Excavation

A. Definitions and Classifications: The following classifications of excavation will be made only when rock excavation is encountered:

1. Rock excavation consists of removal and disposal of materials encountered that cannot be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler type tractor rated between 210- and 240-net flywheel horsepower, operating in low gear. This classification does not include materials that can be removed by means other than drilling and wedging but which, for reasons of economy in excavating, the Contractor prefers to remove by drilling and wedging. Typical of materials classified as rock excavation are as follows:
  - a. Rock or stone in original ledge.
  - b. Boulders on-site, outside trench limits exceeding 3 cubic yards in volume.
  - c. Boulders within trench limits exceeding 1 cubic yard in volume.
2. Intermittent drilling and ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
3. Presplitting is required where the design slope of a cut is one vertical on one horizontal or steeper and the vertical height of the design rock slope exceeds five (5) feet. Ripping will not be allowed within ten (10) feet of a slope that requires presplitting. All rock slopes shall be thoroughly scaled to

the satisfaction of the Engineer before fragmenting the next lift. In no case shall the subgrade be trimmed prior to the completion of the scaling operation at any location.

4. Finished rock slopes shall be stable and free from possible public safety hazards of falling rock or rock slides. If after proper scaling such hazards still exist, a determination of the cause will be made by a geologic study. If it is determined that the hazards are a result of poor workmanship or improper methods employed by the Contractor, he shall provide approved remedial treatment at no expense to the Owner. Such treatment may include, but is not necessary limited to, laying back the slope, rock bolting, or shotcreting.

### 3.7 Trench Excavation

- A. Trench excavation shall include the removal and satisfactory disposal of all materials encountered in the construction of drainage, water, sewer, electric, telephone, gas and other necessary utilities. Trench excavation for pipe laying in roadway cuts shall include only that portion of the trench which is below the roadway excavation except where the Engineer orders in writing, that the trench excavation and all its backfill shall be completed before the roadway excavation is begun.
- B. Definitions:
  1. "Trench" shall be defined as an excavation in which the bottom width does not exceed 7 feet and the width does not exceed twice the depth, or where footings are excavated by backhoe. Refer to Drawings for any special trenching conditions.
  2. The words "invert" or "invert elevation" as used herein shall mean the elevation at the inside bottom of pipe or channel.
  3. The words "bottom of the pipe" as used herein shall mean the elevation at the base of the pipe at its outer surface.
- C. Trench excavation shall be of sufficient width and depth at all points to allow pipes to be laid, and appurtenant work to be built in a workmanlike manner, and when needed, to allow for sheeting and shoring, pumping and draining, and/or for removing and replacing any materials unsuitable for foundations.
- D. Trenches shall be excavated to the minimum limits shown on the Drawings.
- E. Trenches shall not be unnecessarily wide, so as to increase excessively the load on the pipe resulting from backfill.
- F. If, at or below the elevation of the bottom of the pipe or related appurtenance, the material is muck, peat, peaty sand or other material not suitable to support the pipe or related appurtenances, the Contractor shall notify Engineer

immediately and do no further trench excavation in this area until Engineer's instructions are received.

### 3.8 Backfill and Fill

#### A. Ground Surface Preparation:

1. Vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials shall be removed from ground surface prior to placement of fills. The Contractor shall plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.

#### B. Subgrade Preparation:

1. After the subgrade has been shaped to line, grade, and cross-section, it shall be thoroughly compacted. This operation shall include any required reshaping and wetting to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material from excavation or borrow. The resulting area, and all other low sections, holes, or depressions shall be brought to the required grade with approved material and the entire subgrade shaped to line, grade and cross section and thoroughly compacted.

#### C. Frost Protection:

1. Frozen material shall not be placed as fill or backfill. No fill shall be placed over frozen ground containing more than 1 inch of frost.

#### D. Backfill Material Selection:

1. Unless otherwise specified or directed, material used for filling and backfilling shall meet the requirements specified under Materials Subsection 2.00. If material removed from the excavations does not meet the requirements specified for common fill, new material which does meet this criteria shall be used for backfilling utility trenches. All backfill placed within the building limits shall be sand and gravel fill unless otherwise specified.
2. In areas where the bottom of the excavation is in fine sand and silt and is below the groundwater table, the first lift of backfill shall be 12-inches of compacted sand and gravel to provide a working mat and drainage layer.

### 3.9 Trench Backfill

- A. The trenches shall be backfilled as soon as practicable with suitable approved material. All trench backfilling shall be done with special care, in the following manner and as the Engineer may direct from time to time.

- B. Selected backfill material shall be as shown on the drawings, deposited into the trench uniformly on both sides of the pipe, for the entire width of the trench, to the depths shown on the drawings. Backfill and compaction near the pipe zone shall be done with such care as to achieve 90% compaction, prevent dislodging of the pipe from its intended location or bedding conditions, and provide uniform support around the pipe free from voids.
- C. The balance of backfill shall be spread in layers not exceeding 12-inches in loose depth. Each layer shall be dampened, thoroughly compacted by tamping or other approved method and shall meet the requirements specified for common fill.
- D. All trench backfilling shall be done with special care and must be carefully placed so as not to disturb the work at any time; if necessary, a timber grillage or other suitable method shall be used to break the fall of material. The moisture content of the backfill material shall be such that proper compaction will be obtained. Puddling of backfill with water will generally not be permitted except as specified below. Backfill within areas of pavement construction shall be made to grades required to establish the proper pavement base courses.
- E. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density at least equal to that of the surrounding undisturbed earth, and in such a manner as to permit the rolling and compaction of the filled trench or excavation with the adjoining earth to provide the required bearing value, so that paving of the excavated and disturbed areas, where required, can proceed immediately after backfilling is completed.
- F. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.
- G. During filling and backfilling operations, pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the inspection of the pipelines shows poor alignment, displaced pipe or any other defects shall be remedied in a manner satisfactory to the Engineer at no additional cost to the Owner.

### 3.10 Bentonite Clay Trench Dams

- A. Trench dams shall be constructed on all utility main lines where grades exceed ten percent (10%) or where indicated on the construction drawings. Trench dam spacing shall be as shown on the Drawings, but, at a minimum, 5' upstream of manholes with incoming lines exceeding 10% slope, and at intervals no greater than 75'. Bentonite clay trench dams shall be installed in 6-inch lifts, compacted to 95% Modified Proctor Density, at the locations shown on the drawings or as directed by the Engineer.

### 3.11 Backfilling Against Structures

- A. Backfilling against masonry or concrete shall only be done when approved. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed, special leakage tests of the structures shall be made by the Contractor, as required by the Engineer, at the Contractor's expense.

After the satisfactory completion of leakage tests and the satisfactory completion of any other required work in connection with the structures, the backfilling around the structures shall proceed using suitable and approved excavation material. The best of the backfill material shall be used for backfilling within 2 feet of the structure. Just prior to placing backfill, the areas shall be cleaned of all excess construction material and debris and the bottom of excavations shall be in a thoroughly compacted condition.

- B. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures. During backfilling operations, care shall be exercised that the equipment used will not overload the structures in passing over and compacting these fills. Except as otherwise specified or directed, backfill shall be placed in layers not more than 12-inches in loose depth and each layer of backfill shall be compacted thoroughly and evenly using approved types of mechanical equipment. Each pass of the equipment shall cover the entire area of each layer of backfill.
- C. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be made good by the Contractor at no additional expense to the Owner.
- D. After backfilling trenches and excavations, the Contractor shall maintain the surfaces of backfill areas in good condition so as to present a smooth surface at all times level with adjacent surfaces. Any subsequent settling over backfilled areas shall be repaired by the Contractor immediately, in a manner satisfactory to the Engineer, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to the Owner.
- E. The finished subgrade of the filled excavations upon which pavements are to be constructed, shall not be disturbed by traffic of other operations and shall be maintained in a satisfactory condition until the finished courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.
- F. Uniformly smooth grading of all areas to be graded, as indicated and as directed, including excavated sections and all areas disturbed as a result of the Contractor's operations, shall be accomplished. The finished surfaces shall be reasonably smooth, compacted and free from surface irregularities.

### 3.12 Compaction

#### A. Compaction Requirements:

1. The degree of compaction is expressed as a percentage of the maximum dry density at optimum moisture content as determined by ASTM Test D1557, Method C. The compaction requirements are as follows:

**ASTM Density**

Area	Degree of Compaction
Below footings	95%
Below slabs	95%
Pavement base course	95%
Pavement subbase	95%
General fill below pavement subbase	90%
Trench backfill	90%
Lawn areas	90%

Properly compacted direct roading density motor will be decided on by the Engineer for measuring compaction density.

#### B. Moisture Control:

1. Fill that is too wet for proper compaction shall be harrowed, or otherwise dried to a proper moisture content to allow compaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill.
2. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.
3. In no case shall fill be placed over material that is frozen. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

### 3.13 Embankment Construction

A. General Requirements:

1. All suitable material removed from the excavations, as determined by the Engineer, shall be used as directed in the formation of fill sections, embankments, subgrade, etc.
2. The Engineer may determine that excavated material from certain strata is unsuitable for use under paved areas, but that such material may be deposited in berms or embankment areas outside the paved.

B. Borrow Material:

Should there be a deficiency of proper fill material from within the graded area on the site, the Contractor shall supply all such borrow material from other areas approved in writing by the Engineer.

C. Compaction of Embankment Foundation:

Prior to placing compacted fills the Contractor shall proof roll the approval compaction equipment to be used for fill placement. Where materials of low density are indicated by rutting or weaving under the compactor, the Contractor may be required to make up to three (3) additional complete coverages of the area with the compactor as determined by the Engineer. The cost of all proof rolling shall be included in the Contract Sum. If materials of low density are encountered that cannot be compacted to the extent necessary to support the proposed embankment fills as determined by the Engineer, the Contractor shall remove those materials and replace them with compacted fill. The cost of excavation and replacement of such unsuitable material shall be paid for at the price set in the Proposal. Extra payment will be made for material removed below normal grade only when ordered in writing to be removed.

Alternately, an initial layer of fill may be allowed to form a working platform. The need, manner of construction, and thickness of such a layer shall be subject to approval of the Engineer and the layer will be permitted only where the lack of support is, as determined by the Engineer, not due to deficient ditching, grading or drainage practices, or where the embankment could be constructed in the approved manner by the use of different equipment or procedures. Thicknesses of up to three (3) feet may be permitted for such a layer.

D. Placing Fill:

1. Fill sections and embankments shall be constructed of earth, rock, or a mixture of earth and rock deposited in successive lifts. Except as hereinafter permitted, the loose thickness of each lift shall not be more than twelve (12) inches before compaction.
2. Embankments shall not be constructed more than 10 feet in height without placement of rip-rap on the exposed slope. Placement of rip-rap shall be

coordinated with the construction of the embankment (See Rip-rap Bank Detail Drawing)

3. Rock fill may be used in deep fill areas.
4. No rock in excess of six (6) inches in its largest dimension shall be incorporated in the top two (2) foot layer of embankment immediately below the subgrade.
5. During fill and embankment construction operations earth moving equipment shall be routed as evenly as possible over the entire width of the work.
6. At the close of each day's work the working surface shall be crowned, shaped, and rolled with smooth steel or pneumatic tired rollers to ensure proper drainage.

E. Moisture:

1. If in the opinion of the Engineer fill the material becomes too wet for the required compaction, prior to commencing or continuing compaction operations the fill shall be dried by a method approved by the Engineer.
2. If in the opinion of the Engineer the fill material becomes too dry for the required compaction, the fill shall be moistened prior to commencing or continuing compaction operations.

F. Protection of Fill:

1. Protection of all compacted fill shall be the responsibility of the Contractor. Newly graded areas shall be protected from the actions of the elements and traffic. Any settlement or washing that occurs prior to acceptance of the work shall be repaired and grades shall be re-established to the required elevations and slopes. Damage to any compacted lift (including those lifts previously tested and approved by the Engineer) occurring at any time during the course of construction which is caused by equipment, moisture entering the embankment, or from any other cause whatsoever shall be fully repaired by the Contractor prior to placement of any overlying materials at his own expense, to the complete satisfaction of the Engineer.
2. In the event of any prior to the commencement of heavy rains, the Contractor shall suspend fill operations immediately and shall take all necessary steps to keep the site as well drained as possible. Fill operations shall not be resumed until the moisture content of the fill is such as to permit compliance with the Specifications.
3. All corrective work or operations necessary to maintain proper moisture control of the fill material shall be at the expense of the Contractor.



- G. Upon completion of the work, ground surface shall be left in a firm, unyielding, true, uniform condition, free of ruts.

(END OF SECTION)

## SECTION 02210 - SITE GRADING

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. Furnish all labor, materials and equipment to grade the site to the elevations as shown on the plans or as directed by the Engineer. All work shall be in accordance with the specifications and in close conformity with the lines, grades of the plans or established by the Engineer.
- B. The work shall include but not be limited to the following:
  - 1. The shaping, trimming, compacting, and finishing of all subgrade areas for roadway, parking and sidewalk areas prior to the placement of subbase material.
  - 2. The grading and finishing of all unpaved shoulders and slope areas and the preparation of all areas for topsoil, loam, riprap or slope paving.
  - 3. The protection of existing or new utilities in or immediately adjacent to the project site.
- C. The Contractor shall refer to Section 02100, Part 3.01 of these specifications for his responsibility with respect to existing utilities.
- D. The Contractor shall furnish and set all lines and grades required for construction operations and be solely responsible for the accuracy of lines and grades of all features of the work.
- E. The Contractor shall hire a Registered Professional Land Surveyor Civil Engineer to establish permanent benchmarks to which access can be had during the progress of the work. The Contractor shall maintain all established bounds and benchmarks and replace as directed any which may be disturbed or destroyed.

#### 1.2 Related Work Specified Elsewhere

- A. Site Preparation is specified in Section 02100.
- B. Earthwork is specified in Section 02200.
- C. Dewatering is specified in Section 02140.
- D. Pavements is specified in Section 02500.

#### 1.3 Quality Assurance

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of the Section.

## 2.0 PRODUCTS

None used this Section.

## 3.0 EXECUTION

### 3.1 General

- A. The Contractor shall uniformly grade areas within the limits of site grading under this Section. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

### 3.2 Grassed Areas

- A. Areas to receive topsoil shall be finished to within not more than 0.10 feet above or below the required subgrade elevations, compacted as specified, and free from irregular surface changes.

### 3.3 Excavation and Fill Areas

- A. The Contractor shall shape the surface of the excavation and fill areas to line, grade and cross-section as shown on the Drawing, with the finish surface not more than 0.10 feet above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction.

### 3.4 Fine Grading and Compacting - Subgrade Areas

- A. Before surfacing or subbase material is spread, the subgrade shall be shaped to a true surface conforming to the proposed cross sections shown on the Drawings and compacted. All depressions and high spots shall be filled with suitable material or removed and such areas again compacted until the surface is smooth and satisfactorily compacted. A tolerance of 1/2 inch above or below the finished subgrade will be allowed provided that this 1/2 inch above or below grade is not maintained for a distance longer than 50 feet. Any portion of the subgrade which is not accessible to a roller shall be thoroughly compacted with mechanical tampers or by other adequate methods approved as satisfactory by the Engineer.
- B. Prior to starting work, the Contractor shall obtain approval for the compaction equipment to be used. Unless otherwise directed by the Engineer, each layer of material shall be thoroughly compacted with power rollers or tamping rollers.

Other equipment of equivalent compactive capacity may be used subject to trial on the project and approved by the Engineer. Compacting equipment will not be used for any other purpose during compaction operations. The use of tractors, trucks, scrapers or other equipment designed primarily for purposes other than compaction and being used for purposes other than solely compaction will not be considered as compaction equipment, but traffic of such vehicles shall be distributed over this fill in such a manner as to take advantage of the additional compaction afforded thereby.

3.5 Grade Control

- A. During construction, the Contractor shall maintain the lines and grades including crown and cross-slope of the gravel subbase course.

3.6 Maintenance

A. Protection of Graded Areas:

1. Newly graded areas shall be protected from traffic and erosion and keep free of trash and debris resulting from the Contractor's operations.
2. The Contractor shall repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Reconditioning Compacted Areas:

1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, the Contractor shall scarify the surface, reshape, and compact to the required density prior to further construction.

3.7 Disposal of Excess and Waste Materials

- A. The Contractor shall remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, from the Owner's property and legally dispose of it at no additional cost to the Owner as previously specified.

(END OF SECTION)

## SECTION 02370 – EROSION AND SEDIMENT CONTROL

### 1.0 GENERAL

#### 1.1 Scope

- A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, installation equipment, and incidentals required to install and maintain all temporary erosion and sediment control measures and structures including, but not limited to silt fence, straw bales, check dams, sediment traps, and dewatering pumping throughout the duration of the project and removal of temporary measures and structures, and restoration of areas where designated.

#### 1.2 Related Sections

- A. Trenching, backfilling and compaction are specified in section 02200.
- B. Dewatering and drainage are specified in section 02140.
- C. Site demolition is specified in section 02070.
- D. Site preparation is specified in section 02100.
- E. Site grading is specified in section 02210.
- F. Topsoiling, fine grading and seeding is specified in section 02920.

#### 1.3 References

- A. Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas. Prepared for the Massachusetts Executive Office of Environmental Affairs, US Environmental Protection Agency (EPA) Region 1 and Natural Resources Conservation Service (NRCS). 1997.
- B. Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges.
- C. Massachusetts Nonpoint Source Management Manual or "Megamanual". Massachusetts Department of Environmental Protection. May 1994.

#### 1.4 Compliance With Regulations

- A. It is the sole responsibility of the Contractor to be completely familiar with and to follow all local, state, and federal permits and regulations pertaining to the work required in this Section, including any conditions specified in the Order of Conditions for the project, per the Ipswich Conservation Commission.

- 1.5 Health And Safety
- A. The Contractor shall follow all procedures set forth in their Construction Health and Safety Plan.
- 1.6 Construction Quality Assurance
- A. Construction of the erosion and sediment control components of the project shall be monitored by the Contractor daily and periodically checked by the Client or its representative. Inspections performed by the Client or its representative in no manner relieve the Contractor of the responsibility to construct all work to conform to the Drawings and Specifications.
- B. If inspections indicate Work does not meet specified requirements, the Contractor shall remove Work, replace and retest at no additional cost to the Client.
- 1.7 Existing Conditions
- A. The Contractor shall comply with applicable regulations in locating and providing clearance for all underground and above ground utilities prior to beginning construction activities. The Contractor shall immediately notify the Client and the Town of Ipswich if other utility lines or structures not shown on the Drawings are encountered.
- B. Repair of damage and all restitution for liabilities resulting from damage to existing facilities due to activities by the Contractor shall be at the Contractor's expense.
- 1.8 Good Housekeeping Practices
- A. The Contractor shall implement procedures necessary to maintain a clean and orderly construction site, and prevent environmental, health and safety impacts due to construction and site management practices. Good housekeeping measures shall include the following:
1. Perform regular operation and maintenance of machinery and processes.
  2. Control fugitive sediment and dust emissions during and after construction (i.e. from on-site storage of excavated soil), as well as off-site migration of litter and debris. Remove sediment tracked onto the pavement daily, or more frequently based on site conditions, to ensure track out onto roadways is minimized.
  3. Maintain appropriate on-site storage of all chemicals, soil and other materials. Cover materials as necessary to protect against rainfall and prevent runoff pollution.
  4. Maintain strict inventory controls.
  5. Maintain routine and regular clean-up schedules.

6. Maintain well organized work areas, signage.
7. Provide training as appropriate for all employees at the project site on proper erosion and sediment control practices and any specified conditions per the Ipswich Conservation Commission.

#### 1.9 Scheduling Sequence

- A. Preparation of the construction site and installation of erosion control measures shall be performed according to a planned schedule so as to maximize their effectiveness. Trenching and preparation for piping should only be dug for a section that can be completed in one day. At the end of each work day, the trench should be backfilled, compacted, and the final 6 inches should be covered with crushed stone. Placement of rock check dams shall be installed per the plans.
- B. Prior to commencement of construction activities, the following actions shall be taken:
  1. Install silt fence at the limit of the disturbed area, as appropriate.
  2. Install temporary inlet filters at all adjacent and down-gradient storm water inlets, catch basins and manholes that may be impacted.
  3. Install all temporary and permanent erosion and sediment control measures in accordance with the approved plan.
  4. Install an anti-tracking pad at the site access points. The pad should be underlain with fabric and provide the specified depth of aggregate, per approved plans.
- C. Maintain specified good housekeeping practices throughout construction.
- D. Upon completion of construction, the following actions shall be taken:
  1. Finish grade, redistribute topsoil, and seed or mulch all disturbed areas. Maintain silt fences and storm inlet filters.
  2. Complete permanent soil erosion control measures for all slopes, channels, ditches, or any disturbed land area.
  3. Remove any accumulated sediment and remove all temporary erosion and sediment control measures, once vegetation has been established.

## 2.0 PRODUCTS

### 2.1 Silt Fence

- A. Silt fence shall meet the requirements of the NPS Megamanual and shall be as shown on the Drawings.

### 2.2 Straw Bales

- A. Straw bales shall be fresh agricultural straw as shown on the Drawings and shall meet the requirements of the NPS Megamanual.

### 2.3 Trenched Soil

- A. The Contractor shall stockpile the trenched soil on the road near the excavation. At the end of each day, soil shall be filled and compacted into open trenches and excess shall be trucked offsite. If soil stockpiles are needed for more than one day, stockpiles shall be covered and a silt fence shall be erected around the perimeter.

### 2.4 Fertilizer, Seed, And Mulch

- A. For disturbed areas adjacent to the trenching, the following re-seeding criteria shall apply:
  - 1. The fertilizer shall be low-phosphorus.
  - 2. The seed mix shall comply with MHD Section M6.03.
  - 3. The mulch shall comply with MHD Section M6.04.

### 2.5 Water Bars, Check Structures And Stop Ditches

- A. Rock check dams shall be placed every 50 feet on slopes greater than 3:1 and more frequently if deemed necessary. Check dams are necessary to maintain from the time the trench has exposed soil until the trench is completed with asphalt. Check dams shall be placed at a distance and height to allow small pools to form behind them, reducing flow velocity and promoting sediment trapping. Check dams shall be designed according to the Drawings and follow the specifications:
  - 1. Gravel-filled Bags: Bags shall be of burlap material. The opening shall be folded over and secured. Gravel-filled bags shall be wide enough to prevent flows from bypassing to the side of the check dam.
  - 2. Surface Fill Material: The surface of the filled trench shall be of crushed rock ( $D_{50} = 6$  inches) per the Drawings (Trench Detail), and shall be clean and free from clay balls, organic matter, and other deleterious materials.



3. Installation: Check dams shall be installed along a level contour, tightly abutting and stacking bags using a pyramid approach overlapping joints of lower rows. Gravel bags shall not be stacked any higher than 0.5 feet.

4. Maintenance:

- a. Inspect check dams after each significant rainfall event. Repair damage as needed or as required.
- b. Remove sediment manually when depth reaches one-third of the check dam height.
- c. Remove accumulated sediment prior to permanent seeding or soil stabilization.
- d. Remove check dam and accumulated sediment when check dams are no longer needed.

2.6 Erosion Control Mat

A. Where erosion occurs, erosion control mats (SI Geosolutions Landlok® BonTerra® CS2 or equivalent) shall be installed.

2.7 Trench Dewatering

- A. Pumping/Dewatering of water from the trenches shall be performed as needed by the Contractor using a submersible pump surrounded by gravel around the pump intake to prevent pumping of sediments downstream.
- B. Filter bags shall be used for all discharges. The location of the discharge must be approved by the Client or representative.
- C. The Contractor shall, to the extent practicable, prevent water from flowing into excavations and from flooding any portion of the disturbed areas. The Contractor shall provide and maintain sumps, pumps, and dewatering system components to convey water out of and/or away from the work areas.

### 3.0 EXECUTION

#### 3.1 Familiarization

- A. Prior to implementing any of the work described in this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this Section.
- B. Prior to implementing any of the work in this Section, the Contractor shall carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of this Section may properly commence without adverse impact.

#### 3.2 Installation

- A. The standard details, such as silt fence and hay bales, and requirements representing the minimum erosion and sediment control standards that shall be met by the Contractor during construction are provided on the Drawings and in this Section. Regardless of any minimum standards, the Contractor is solely responsible for selecting, implementing, and maintaining proper and fully adequate erosion and sediment controls at all times.
- B. The Contractor shall prevent sediment laden water from being discharged into resource areas.
- C. The Contractor shall provide materials for any trench shoring and bracing to comply with all OSHA, other Federal, and State regulations and local codes.

#### 3.3 Protection And Inspection Of Work

- A. The Contractor shall use all means necessary to protect all prior work, including materials and completed work of other Sections.
- B. The Contractor shall inspect erosion and sediment controls after rainfall events greater than 0.5 Inches.
- C. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary, at no additional cost to the Client.

[END OF SECTION]

## SECTION 02500 - BITUMINOUS CONCRETE PAVING

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. Furnish all labor, equipment, and materials and perform all work to complete the work of this section as indicated within. Such work includes but is not limited to bituminous concrete paving for roads, access drives and parking areas.
  - 1. Filter Fabric
  - 2. Gravel Base Course
  - 3. Dense Graded Crushed Stone
  - 4. Bituminous Prime Coat on Tack Coat
  - 5. Bituminous Concrete Paving
- B. The Contractor shall coordinate with all other trades especially grading, electrical, plumbing and pipeline contractors and shall prevent covering up unfinished or uninspected work and loss of time or labor by mis-scheduling. Any rework shall be done at no cost to the Owner.

#### 1.2 Referenced Standards

- A. The Commonwealth of Massachusetts, Department of Public Works "Standard Specifications for Highways and Bridges" 1973 Edition, and latest amendments, hereinafter referred to as the Standard Specifications, form a part of these Specifications to the extent of the references thereof.
- B. American Society for Testing and Materials Standard D1557, Moisture-Density Relations of Soils, using 10 pound (4.5-kg) Rammer and 18 inch (457-mm) Drop.
- C. American Association of State Highway and Transportation Officials Standard M82, Cut-Back Asphalt (Medium Curing Type).

#### 1.3 Related Work Specified Elsewhere

- A. Site preparation is specified in Section 02100.
- B. Earthwork is specified in Section 02200.
- C. Site grading is specified in Section 02210.

#### 1.4 Paving Restrictions

- A. Bituminous paving shall not be placed when the ambient temperature is below 40 degrees F., when there is frost in the base, or at any time when weather conditions are unsuitable for the type of material being placed.
- B. Bituminous paving shall not be applied until the Engineer inspects and accepts the finished gravel base.
- C. Construction methods, transportation and delivery of mixtures, spreading, finishing, compaction, joints, etc., shall conform to Section 460 of the Massachusetts Department of Public Works Standard Specifications for Highways and Bridges unless otherwise specified herein.

#### 1.5 Testing

- A. During the placing and rolling operation, repeated checks shall be made to ascertain the correct rate of application to provide the required compacted thickness. When required, test holes shall be cut, one for each 1,000 square yards of pavement, and the thickness checked. If any test hole shows a deficiency of more than one quarter (1/4) inch, six additional holes shall be cut, three (3) each on lines at right angle to each other. Holes shall be spaced three feet from the original hole and three (3) feet apart. The thickness of all seven shall be averaged.
- B. If the average thickness is deficient from the specified thickness by one quarter (1/4) inch or more, the extent of the deficient area shall be established by similar procedures and the deficient area shall be corrected at the Contractor's expense.
- C. Upon completion of testing, the Contractor shall properly fill all test holes by compacting a fine aggregate bituminous concrete for the full depth of the core. The finished surface shall be smooth.

### 2.0 PRODUCTS

#### 2.1 Filter Fabric

- A. Filters fabric shall be woven polypropylene and meet or exceed the following standards:
  - 1. Weight = 4 ounces per square yard
  - 2. Grab Strength = 200 pounds
  - 3. Elongation = 30 percent (maximum)
  - 4. Burst Strength = 400 psi
  - 5. Puncture Strength = 85 pounds
  - 6. Thickness = 23 mils.

7. Water Flow Rate = 35 gallons per minute per square foot
8. Equivalent Opening Size (EOS) = No. 20 to No. 45 U.S. Standard Sieve

## 2.2 Gravel Base

- A. Gravel base material shall be gravel borrow material as specified in Section 02200 and shall conform to Material Standard M1.03.0, Type B.

## 2.3 Dense Graded Crushed Stone

- A. Dense graded crushed stone shall meet the requirements of Massachusetts Department of Public Works Material Standard M2.01.7.

## 2.4 Bitumen Prime Coat

- A. Bitumen for prime coat shall be RS-1, RC-70, or RC-250 as directed by the Engineer and shall be applied at a rate of 0.05 gallons per square yard.

## 2.5 Bituminous Concrete Pavement

- A. Bituminous concrete shall be composed of mineral aggregate, mineral filler and bituminous material and shall conform in all respects to Class I, Bituminous Concrete Pavement, Type I-1, as specified in Sections 420, 460, 701 and M3 of the Standard Specifications.

## 3.0 EXECUTION

### 3.1 Construction Details - General

- A. The Contractor shall install all pavements as specified in the locations, to the grade shown on the Drawings, and/or as directed by the Engineer. Materials, methods of construction, and type of pavement courses shall be constructed in accordance with relevant provisions of Section 460 of the Standard Specifications and as shown on the Drawings.
- B. The Contractor shall be responsible for laying out and installing all pavements to the proper cross sections and in accordance with the lines and grades as specified herein, on the Drawings, and/or in accordance with the Engineer's directions. Pavements which are not constructed to the proper section, grade and alignment shall be corrected by repair or replacement by the Contractor in accordance with the Engineer's directions and at no additional cost to the Owner. Where pavement is being replaced over new trenches or other excavations, the original existing grades, thicknesses, limits and slopes shall be restored. Replacement pavement shall be extended a minimum of one foot in all directions beyond the limits of any excavation.
- C. The paving plant used by the Contractor for the preparation of the bituminous concrete shall be acceptable to the Engineer who shall have the right to inspect the plant and the making of the material.

- D. Complete job mix formula listing quantities and pertinent ingredient properties shall be submitted to and approved by the Engineer.
- E. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing bituminous pavement shall be used. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the pavement.
- F. After the pavement has been properly spread, initial and final compaction shall be obtained by the use of steel wheel power rollers having a weight of at least 10 tons.

### 3.2 Filter Fabric

- A. The filter fabric shall be placed under all "roadway pavement" as shown on the Drawings, and under other areas of pavement as directed by the Engineer. Sharp objects shall be removed from the area before placing fabric to avoid fabric punctures. The fabric shall not be laid in a stretched condition, but laid loosely and overlapped by a minimum of three feet. Gravel material shall be backfilled onto the fabric, taking care not to drive equipment directly on the fabric. Filter fabric damaged or displaced before or during placement of backfill shall be replaced or repaired at no additional expense to the Owner.
- B. Filter fabric will only be requested in areas of the project where, in the opinion of the Engineer, the possibility exists that there may be migration of soil fines, as a result of groundwater movement, that could potentially undermine the new pavement.

### 3.3 Gravel Base Course

- A. Gravel base course shall be placed and compacted on approved subgrade to the depth indicated on the drawings. The gravel base shall be compacted to not less than 95 percent of maximum dry density as determined by ASTM D1557. The gravel shall be spread and compacted in layers not exceeding 6 inches in compacted thickness. The surface of the gravel base shall be shaped to the cross section of the pavement.
- B. The Dense Graded Crushed Stone shall be spread in layers from self spreading vehicles equipped with automated grade controlled equipment. Power graders or conventional self spreading vehicles may be used only with prior written approval of the Engineer. The Dense Graded Crushed Stone shall be placed to the tolerance as stipulated. Suitable watering devices shall be available at the source of supply and on the project for use as directed by the Engineer to prevent segregation in transit and during spreading and to obtain proper density and stability of the mixture. The specific density of the Dense Graded Crushed Stone shall be maintained by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests either using the sand/volume method or the nuclear device.

### 3.4 Preparation of Subgrade

- A. General Requirements: Prior to the start of paving operations the subgrade surface shall be prepared by filling in wheel ruts, erosions, and all other ground disturbances regardless of cause. The ground surface shall be fine graded so that after compaction, the subgrade surface will be at the proper level to receive the pavement.
- B. Fine Grading: Fine grading of the subgrade shall be done in sections, working the equipment perpendicular to the contours and constructing the respective valleys and ridges in accordance with the Drawings. Particular care should be exercised with the grades of the valleys which lead to the catch basins. Fine grading of the roadways shall be done parallel to the centerline, observing the profiles and cross-sections shown on the Drawings. Fine grading shall not be done when the ground is excessively wet or frozen.
- C. Compaction: Fine grading of the subgrade shall be accompanied by proper compaction to the extent that the upper twelve (12) inches of subgrade shall have a density of not less than 95% modified Proctor density as determined by ASTM D1557.
- D. Proof-rolling: Immediately prior to the start of paving operations the Contractor shall proof-roll the subgrade in the presence of the Engineer. If in their opinion the subgrade is not suitable for support of the pavement structure, measures shall be taken by the Contractor to correct the subgrade deficiencies to the satisfaction of the Engineer at no cost to the Owner.
- E. Subgrade Approval: The Engineer must approve the subgrade prior to placement of the initial pavement course. Installation of all or any portion of the pavement without subgrade approval by the Engineer is done at the Contractor's risk.
- F. Protection of Approved Subgrade: Approval of the subgrade by the Engineer shall not relieve the Contractor of his responsibility to protect the subgrade from damage caused from excessive moisture, rutting from trucks, heavy equipment, or any other cause. Any damage occurring to the subgrade either before or during the paving operations shall be corrected to the satisfaction of the Engineer at the Contractor's expense.
- G. Longterm Protection of Approved Subgrade During Adverse/Cold Weather Conditions: Installation of temporary bituminous concrete trench patch shall only be performed if approved by the Engineer for each manhole-to-manhole section. In lieu of installing temporary bituminous concrete trench patch, the Contractor shall install additional gravel and/or crushed stone, compacted to grade, to provide longterm protection of the approved subgrade until such time as weather conditions permit the installation of permanent bituminous concrete pavements. As this additional material will be suitable for bedding or backfill of the house lateral connections, no payment will be made for this material either as subgrade protection or bedding/backfill material

### 3.5 Preparation For Pavement Installation

- A. Utility Structure and Appurtenances: After the subgrade and/or existing pavement surfaces have been prepared as specified herein, the Contractor shall check all frames, covers, grates, water valve boxes, and all miscellaneous casting that are located in the proposed pavement area to insure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates shall be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All corrective work deemed necessary by the Engineer shall be done at the Contractor's expense.
- B. Vertical Surfaces in Contact with Bituminous Mixtures: All vertical surfaces of curbs, structures, gutters and existing pavement in contact with new bituminous mixtures shall be painted with a uniform coating of an approved bituminous emulsion or priming material. Extreme care shall be exercised in the application of this material to prevent splattering or staining of surfaces that are to be exposed after the work. Any work stained as a result of the Contractor's operation shall be repaired and/or replaced to the satisfaction of the Owner's Agent at the contractor's expense.

### 3.6 Permanent Base Course

- A. Bituminous concrete binder shall be installed to the thickness shown on the drawings. Bituminous concrete shall be of the type and class as shown on the drawings, laid in a single course, in accordance with the Massachusetts Highway Department Standard Specifications for Highways and Bridges.
- B. All thicknesses are measured after rolling. The bituminous concrete shall be an approved hot mixture, evenly spread and rolled, with a power roller so as to conform to adjacent surfaces with the application of the final top course.
- C. Prior to application of the final wearing course, the entire surface and edges shall be cleared of dirt and debris using power sweepers and then tack coated with cut-back asphalt.

### 3.7 Permanent Pavement

- A. Bituminous concrete surface course shall be installed, as a full-width overlay of the existing pavement, to the thickness shown on the drawings. Bituminous concrete shall be of the type and class as shown on the drawings, laid in a single course, in accordance with the Massachusetts Highway Department Standard Specifications for Highways and Bridges.
- B. The wearing course shall be keyed to the existing pavement at the ends of pavement repair sections, including damaged driveways.
- C. Any cracks remaining at the junction of old and new pavements shall be sealed with an asphalt emulsion and sanded before acceptance of the work.



### 3.8 Bitumen Prime Coat

- A. If, through the direct fault of the Contractor by the scheduling of his performance operations, the surface of the base course, binder course or other bituminous concrete pavements is, in the judgment of the Engineer, unsatisfactory for the placement of surface course, (use of roadway for construction purposes, or otherwise), it shall be treated with a prime coat as directed by the Engineer and the entire cost for such treatment shall be entirely borne by the Contractor.
- B. When and if the surface of the base course or binder course is in a condition which, in the Engineer's judgment, is unsatisfactory for the direct placement of surface course due to the construction scheduling required by the this Contract, it shall be treated with a prime coat.
- C. Paint edges of the existing pavement "to remain" with prime coat material before placing bituminous concrete mixture adjacent thereto.
- D. The contract surfaces of manholes or other appurtenant structures in the pavement shall be painted thoroughly with a thin uniform coating of bitumen before any mixture is placed against them.

### 3.9 Leveling Course

- A. Leveling course shall be of the same material as the surface course. Leveling course shall be used at the direction of the Engineer to bring areas where the base course has settled to the required grade.

### 3.10 Meeting Existing Pavements

- A. Where new pavements are to meet existing pavements the Contractor shall saw cut the existing pavements so that there will be a vertical butting surface between the old and new pavements. Saw cutting of existing pavements shall be along neat, straight and even lines, and shall be done in such a manner so as not to damage the adjacent pavement which is to remain.
- B. The Contractor shall saw cut, by approved method, for the full depth of the pavement prior to placement of any new pavement. The existing bituminous surface shall be trimmed to a neat true line with straight vertical edges free from irregularities for a minimum depth of 1 1/2 inches, and the trimmed edges shall be treated with a light coating of asphaltic cement or asphaltic emulsion immediately prior to the installation of the new abutting bituminous concrete surface course to provide a bond between the old and new pavement. The new pavement surface shall be finished flush with the adjacent pavement.
- C. All vertical surfaces of curbs, structures, gutters and existing pavement in contact with new bituminous mixtures shall be painted with a uniform coating of an approved bituminous emulsion or priming material. Extreme care shall be exercised in the application of this material to prevent splattering or staining of surfaces that are to be exposed after the work is completed. Surfaces that are

stained as a result of the Contractor's operation shall be repaired and/or replaced to the satisfaction of the Owner's Agent at the Contractor's expense.

3.10 Inspection and Guarantee

- A. Three (3) days after rolling, the finished pavement shall be tested. Any section that shows ponding, indentation, rutting or picking up shall be resurfaced at the Contractor's expense.
- B. The Contractor shall guarantee all pavement installations, including materials and workmanship, for a period of one (1) year from the date of acceptance (as specified in writing by the Owner). The Contractor shall make interim repairs as necessary to maintain all paved areas in good, usable condition. The Contractor shall receive no additional compensation for pavement maintenance and restoration.

(END OF SECTION)

## SECTION 02600 - SITE UTILITIES

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. Provide all labor, materials, services, equipment, layout, and transportation necessary to install, complete, and ready for continuous operation all utility systems indicated on the Contract Drawings, as specified herein, or both, including but not limited to the following items:

1. Storm drain system as shown on plans.
2. Sanitary sewer system as shown on plans.
3. Water system including valves and appurtenances.
4. Gas, electric and telephone utility ducts in the locations shown on the plans.

#### 1.2 Referenced Standards

- A. The Commonwealth of Massachusetts, Department of Public Works "Standard Specifications for Highways and Bridges" 1973 Edition, and latest amendments, hereinafter referred to as the Standard Specifications, form a part of these Specifications to the extent of the references thereof.
- B. American Society for Testing and Materials Standard D1557, Moisture-Density Relations of Soils, using 10 pound (4.5-kg) Rammer and 18-inch (457-mm) Drop.
- C. American Association of State Highway and Transportation Officials.
- D. American Concrete Pipe Association (ACPA).

#### 1.3 Related Work Specified Elsewhere

- A. Precast concrete manholes, frames, grates, and covers are specified in Section 02601.
- B. Ductile Iron Pipe as specified in 02616.
- C. Polyvinyl Chloride Pipe as specified in 02622.
- D. Valves and appurtenances as specified in 02640.
- E. Trench backfilling and compaction is specified in Section 02200, Earthwork, and Section 02600 Part 3.1.

1.4 Permits, Laws, Ordinances and Codes

- A. The Contractor shall obtain and pay for all permits, inspections, licenses and certificates required for work specified under this Section and as shown on the Drawings.
- B. The Contractor shall comply with laws, ordinances, rules, and regulations of all local, state, and federal authorities having jurisdiction.

1.5 Gas, Electric and Telephone Installation

- A. The Contractor shall cooperate with the utility companies to ensure a timely installation of these utilities.
- B. It shall be the Contractor's responsibility to ensure the gas, electric, and telephone utilities have been installed in the locations shown on the plans prior to any paving operations.
- C. Should the utility company not be able to install their respective utility line, it will be the Contractor's responsibility to obtain and supervise utility company approved gas, electric, or telephone installation subcontractors to complete this work.

1.6 Record Drawings

- A. The Contractor shall keep on the job at all times, one (1) complete and separate set of prints of the site utility work. Wherever work is installed otherwise than as shown on the Contract Drawings such changes shall be noted.
- B. Daily progress shall be indicated on these prints by coloring in the various pipes, apparatus and associated appurtenances as they are erected.
- C. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.
- D. At the conclusion of the work, the Contractor shall prepare Record Drawings in accordance with the requirements of the General Conditions.

1.7 Guarantee

- A. All materials, items of equipment, and workmanship furnished under this Section shall carry a 2-year guarantee against defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship, or design which may develop shall be made good forthwith, by and at the expense of the Contractor, including all damage done to areas, materials, and other systems resulting from this failure.

- B. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected parts shall be replaced by the Contractor.

#### 1.8 Workmanship

- A. The entire work provided in this Specification shall be constructed and finished in every respect in a workmanlike manner. The Contractor shall completely coordinate with all other utilities as necessary to complete the system in accordance with the best trade practice and to the satisfaction of the Engineer and any and all authorities having jurisdiction.
- B. The Contractor shall keep all Subcontractors fully informed as to the elevation, size, and position of all utilities required and give full information to all Subcontractors sufficiently in advance of the work so that all utilities may be coordinated in advance of their installation.
- C. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same.

#### 1.9 Protection

- A. The Contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted and:
  - 1. Carefully store materials and equipment which are not immediately installed after delivery to site.
  - 2. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.
- B. The Contractor shall protect work and material of other trades from damage that might be caused by his work or workmen and make good any damage thus caused.

### 2.0 PRODUCTS

#### 2.1 Materials

- A. PVC for Sanitary Sewers: As specified in Section 02622.
- B. Ductile Iron Pipe and Fittings: As specified in Section 02616.
- C. Valve and Appurtenances: As specified in Section 02640.
- D. Sewer Manholes, Frames and Covers: As specified in Section 02601.

### 3.0 EXECUTION

#### 3.1 Installation of Pipeline

- A. This work shall include the furnishing and installation of all labor, materials, and equipment necessary for the complete installation of the pipelines in accordance with local and state requirements.
- B. When laying is not in progress, including lunch time, the open end of the pipe shall be closed by a watertight plug.
- C. **Excavation:** The trench for the pipe shall be excavated to the required line and grade and shall be of sufficient width to permit thorough tamping of the fill material under the haunches and around the pipe. Soft or unsuitable material encountered below the normal bedding line of the pipe shall be removed as directed, replaced with screened gravel, and thoroughly compacted. The bottom of the trench shall be shaped to conform to the curvature of the pipe. This bed shall also be excavated to accommodate the bells of pipes. If any cross pipes, conduits, drains, or other unforeseen obstacles are encountered in the excavation, the grade of the bottom of the trench may be raised or lowered during the excavation operation as directed by the Engineer. Use concrete or other approved support under existing pipes passing through the excavation where said pipe would normally be supported by backfilled earth. Wooden supports or blocking will not be allowed.
- D. **Bedding Pipe:** The pipe shall be laid true to the specified lines and grades. The bell end shall be toward rising grade and each section of pipe shall have a firm bearing throughout its length.
- E. **Gravel Bedding:** Gravel bedding, screened gravel bedding or sand bedding will be required below all pipe unless otherwise shown on Drawings or specified herein. Screened gravel bedding is required under utility structures where shown on the Drawings. Gravel bedding, screened gravel bedding, sand bedding or crushed stone shall be placed to the full width of the trench and under utility structure foundations as indicated on the Drawings. After a pipe is bedded, the trench shall be filled to the centerline of the pipe with gravel fill, screened gravel or sand bedding except at the joint. After the joint is inspected, that portion shall be filled in with gravel, screened gravel or sand bedding. Material under and around the pipe shall be carefully and thoroughly tamped.
- F. From the centerline of the pipe to a point 12 inches above the top of the pipe the backfill shall be gravel fill, screened gravel or sand placed by hand and hand tamped. Above this point, backfill shall be material as specified in Section 02200, Earthwork. This backfill shall be placed in layers eight inches deep and each layer shall be compacted with mechanical tampers to not less than 95% of maximum density at optimum moisture content of the material. This backfill shall be carried up to the bottom of materials specified to be placed for surfacing or topsoiling and seeding requirements.
- G. Additional installation, bedding, and backfilling requirements are found in the various pipe material sections.

### 3.2 Installation of Manholes and Concrete Structures

- A. Manholes and other concrete structures shall be built to the lines, grades, dimensions, and design shown on the plans with all necessary frames, gratings, covers, etc.
- B. Where masonry work is required to adjust catch basin and manhole finish elevation the brick shall be wetted as necessary before laying. Mortar shall be composed by volume of one part Portland Cement and two parts of sand with sufficient water to form a workable mixture.
- C. Frame castings shall be set in full mortar beds true to the lines and grades as directed.
- D. Placement of approved precast manholes and other concrete structures shall be in accordance with the manufacturer's instructions and as shown on the drawings.

### 3.3 Cleaning and Testing

- A. Furnish all labor, material, instruments, supplies, and services and bear all costs for the accomplishment of the tests herein specified. Correct all defects appearing under test and repeat the test until no defects are disclosed.
- B. Perform all tests other than herein specified which may be required by any and all authorities or agencies to whose requirements this work is to conform. Forty-eight (48) hour notice must be given to all authorities.
- C. No backfilling of any utility shall take place until the test has been conducted and accepted by the Engineer.
- D. At the conclusion of the work, the Contractor shall thoroughly clean the pipelines by flushing with water or other means to remove dirt, stones, and other material. Prior to acceptance, all pipe lines shall be inspected for cleanliness and to be sure no sand bags, broken pipe, or other obstructions exist.
- E. The testing of manholes if specified in Section 02601, ductile iron pipe in Section 02616 and sewers in Section 02622.
- F. If leakage exceeds the specified amount, the Contractor shall at his own expense make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit, and the tests shall be repeated until the leakage requirement is met.
- G. Any defects found in the system shall be made good at the expense of the Contractor so as to conform strictly to the Specifications and to the satisfaction of the Owner's Agent. All repairs shown necessary by the tests

are to be made, broken or cracked pipe replaced, all deposits removed, pipelines left true to line and grade, entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance is made by the Owner.

(END OF SECTION)



## SECTION 02601 - PRECAST CONCRETE MANHOLES, PUMP CHAMBERS & CONCRETE STRUCTURES

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The work under this section includes furnishing all labor, materials, equipment, and incidentals required and installing and testing concrete manholes complete with all brickwork and cast iron frames and covers and other concrete structures as shown on the Contract Drawings and/or specified herein.
- B. Manholes shall be constructed of 48- inch and 60-inch diameter precast concrete barrel sections unless otherwise noted on the plans. Bases shall be precast.
- C. All manholes shall be 48-inch diameter except for manholes where inside drop connections are shown on the drawings. Where inside drop connections are shown, manholes shall be 60-inch diameter.
- D. Pump chambers shall be constructed of 72-inch diameter precast concrete manholes.
- E. Brickwork shall include (but is not limited to) formed inverts in manholes, adjusting grade for manhole frames, and covers and temporary brick plus.

#### 1.2 Related Work Specified Elsewhere

- A. Concrete is specified in Section 03300.
- B. Earthwork (excavation and backfill) is specified in Section 02200.

#### 1.3 Shop Drawings

- A. Submit to the Engineer for approval, as provided in the General Conditions, complete sets of shop drawings for all items to be furnished under this Section. No materials shall be fabricated or shipped prior to approval of the shop drawings by the Engineer. Shop drawings for the precast concrete sections shall show at least the details of construction, reinforcing, and joints. Shop drawings for frames and covers shall show at least dimensions and materials.

### 2.0 PRODUCTS

#### 2.1 Manholes

- A. General

1. The Contractor shall furnish materials and construct manholes as indicated on the Contract Drawings, referenced on Standard Drawings, and as specified. Shop Drawings to indicate the applicable standards, materials, dimensions, and other details of the manholes proposed for the work are required. All manholes constructed under the Contract shall conform to the specifications and accepted drawings.
2. Precast concrete manhole barrels and cones shall be precast concrete sections. Bases may be either precast or poured concrete. Invert channels may be formed in concrete in the case of storm drains. Precast manholes shall have an adjustment ring at the top of the cone to permit the frame and cover to meet the finished surface. This shall consist of courses of brick or reinforced grading rings not to exceed 11-inches.
3. Brick manholes shall be constructed at locations indicated on the Drawings with brick walls, poured concrete bases and brick inverts as detailed on the Drawings.
4. Manhole pipe entrances shall be sealed with premolded gaskets.
5. Inverts shall conform accurately to the size of the adjoining pipes. Side inverts and main inverts where the direction changes, shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerline of adjoining pipelines.

## 2.2 Precast Barrels and Bases

- A. Precast concrete barrel sections and precast manhole basis shall conform to ASTM Designation C478.77 and meet the following requirements:
  1. The wall thickness shall not be less than five (5) inches for forty-eight (48) inch diameter barrel sections.
  2. Sections shall have tongue and groove joints.
  3. Manhole top sections shall be eccentric.
  4. Type II cement shall be used except as otherwise approved.
  5. Jointing shall be accomplished by bitumastic sealant, butyl rubber gasket, or rubber "O" ring gasket. The round rubber "O" ring gaskets shall conform to ASTM C443.77. The completed joint shall withstand an internal water pressure in excess of 15 psi without showing any leakage or displacement of the jointing material. The Contractor's supplier shall test the effectiveness of the joints against leakage. Such tests shall be made by an internal pressure against the joint of at least 15 psi. A complete set of records of the test shall be submitted to the Engineer.
  6. All sections shall be cured by an approved ASTM method and shall not be shipped nor subjected to loading until the concrete compressive

strength has attained 3,000 psi and not before five (5) days after fabrication and/or repair, whichever is longer. Precast barrel sections, eccentric or concentric top sections, top slabs, and bases shall be designed for a minimum of H-20 loading plus the weight of the soil above.

7. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each precast section.
8. Precast concrete bases shall conform to all the requirements of the Specification on manhole barrel sections ASTM C478.77, and shall be installed as shown on the Drawings.
9. The thickness of the bottom slab of the precast bases shall not be less than the manhole barrel sections or top slab, whichever is greater.
10. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs, made specifically for this purpose, or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.
11. The exterior surfaces of precast manholes shall be given two heavy coats of bituminous waterproofing material. The material shall be No. 46-449 Heavy Duty Black made by Tnemec Company, Inc., North Kansas City, MO; no. 35-J-10 Hi Build Bituminous Coating made by Mobil Chemical Company, Edison, NJ; Bitumastic Super Service Black made by Koppers Company, Inc., Pittsburgh, PA; or acceptable equivalent products. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.
12. Joints for pipe into precast manhole bases shall be the following:
  - a. Sewer Application: Use premolded elastomeric-sealed joints for pipe into precast manhole bases. Premolded elastomeric-sealed joints shall be Lock Joint Flexible Manhole Sleeve made by National Pollution Control Systems, Inc., Nashua, NH; Press Wedge II made by Press-Seal Gasket Corporation, Fort Wayne, IN; A-Lok Manhole Pipe Seal made by A-Lok Corporation, Trenton, NJ; or an acceptable equivalent product.

## 2.3 Manhole Steps

- A. Steps for manholes shall be either the drop-front extruded aluminum type with 12-inch wide stepping surface or a raised edge-front steel reinforced polypropylene plastic type with at least a 10-3/4 inch wide stepping surface. Placement into precast walls shall be by a proven method as recommended

by the supplier of the precast manhole sections. Steps to be placed in mortar joints of brick manhole walls shall be suitable for this type of installation. Details of the steps and method of placement shall be submitted for approval

- B. Aluminum steps shall be as made by the Aluminum Company of America, Allegheny Foundry Company, New Jersey Aluminum Company, or an acceptable equivalent product. The steps shall have an anchoring lip if cast into the wall or serrated legs if driven into the green concrete or polypropylene inserts after castings. Those parts of aluminum steps which will be in contact with the concrete shall be thoroughly cleaned and given a protective coating of an acceptable heavy-bodied bituminous material.
- C. Plastic steps shall be made by M.A. Industries, Inc. or acceptable equivalent product. The legs shall be placed into the wet concrete wall during manufacture or if designed for press fit installation shall be driven into a wall opening according to the manufacturer's specifications. Steps shall not be mortared into place after the concrete has set.

2.4 Not used

2.5 Miscellaneous Brickwork

- A. Cement shall be domestic Portland cement conforming to ASTM Designation C150, Type II.
- B. Lime for mortar shall be hydrated, conforming to ASTM Designation C207-79, Type S.
- C. Sand shall be clean, hard, sharp, durable particles, preferably siliceous, containing not more than five (5) percent in volume of loam, mica, clay or other deleterious substances, and free from injurious amounts of organic matter. The sand shall be graded from fine to coarse so that when tested dry, it will conform to the limits of ASTM Specification for Aggregate for Masonry Mortar, C144.
- D. Mortar shall conform to ASTM C270, Type S, consisting of one part Portland cement, 1/4 part lime and two parts sand by volume. Mortar shall be mixed in the exact proportions specified. In general, mortar for Grade SS brick shall be mixed in the proportions of 1:1/2:4-1/2. Approximate measurement of quantities will not be permitted. Anti-freeze mixtures shall not be permitted in the mortar.
- E. Water shall be free from injurious amounts of oils, acids, alkalis, or organic matter, and shall be clean and fresh.
- F. Brick shall be sound, hard, and uniformly burned bricks, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Bricks shall comply with ASTM Standard Specifications for Sewer and Manhole Brick (Made from clay or shale), Designation C32-73. Grade SS

shall be used for paved inverts and shelves, and Grade MS shall be used for walls.

## 2.6 Frames, Covers and Gratings

- A. Castings shall be of good quality, strong, tough, even-grained, smooth cast iron, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field by the Engineer. All finished surfaces shall be machined to a true plane surface and shall be true and seat at all points without rocking. Allowances shall be made in the patterns so that the thickness specified or shown shall not be reduced in obtaining finished surfaces. Castings shall not be acceptable if the actual weight is less than ninety-five (95) percent of the theoretical weight computed from the dimensions as shown. The Contractor shall furnish invoices to the Owner showing true weights certified by the supplier.
- B. Cast iron shall conform to ASTM A48-76 Class 30.
- C. Before shipment from the foundry, castings shall be given a coat of coal tar pitch varnish which shall present a coating which is smooth and tough but not brittle.
- D. The types of castings to be used for the various structures shall be as indicated on the Contract Drawings and the following:
  - 1. Round sewer manhole frames and covers shall be cast iron manufactured to the dimensions shown by LeBaron Model 246 with the word "SEWER" centered on the cover in 3-inch high letters. The frames shall provide a 24-inch diameter clear opening.
  - 2. Install watertight bolted and gasketed covers at all sewer manholes and pump station wetwells where the rim elevation of same is less than or equal to 15.0' M.S.L.
- E. Manhole frames and covers that are not required to be watertight shall be provided and installed with inflow and odor control inserts. Inserts shall be high density polyethylene or equal and as shown in USA Blue Book Catalog 119 page 177 or equal. Inserts shall be provided with pressure relief/drain valves to discharge to the manhole.

## 3.0 EXECUTION

### 3.1 Installation of Manholes

- A. Work under this item shall include all necessary excavation, materials, backfill and tamping to construct proposed catch basins and manholes at the locations indicated on the Contract Drawings in accordance with these Specifications.

- B. Manhole bases shall be placed on a six (6) inch bed of crushed stone as specified in Section 02601. The tops of the bases shall be shaped to mate with the precast barrel sections.
- C. Precast concrete barrel sections shall be set so as to be vertical and with sections in true alignment with a one-quarter (1/4) inch maximum tolerance to be allowed. The precast sections shall be installed in a manner that will result in a watertight joint. The outside and inside joint shall be filled with non-shrink mortar and finished flush with the adjoining surfaces before or after testing as specified below.
- D. Two damp-proof coatings shall be applied to the outside of all concrete structures.
- E. Backfilling shall not take place until the mortar in joints has set for at least 24 hours.
- F. Holes in the concrete barrel sections required for handling or other purposes shall be plugged with a non-shrinking grout or non-shrinking grout in combination with concrete plugs, and finished flush on the inside.
- G. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.
- H. All work shall be protected against flooding and flotation.
- I. The areas disturbed in constructing the manholes shall be graded, and all site work necessary to achieve a finished surface as indicated on the Contract Drawings shall be performed. Where topsoiling and seeding are required, it shall be completed in accordance with these Specifications.
- J. Where directed, the casting shall be temporarily set at such grades as to provide drainage during the construction.
- K. Manhole pipe connections for precast manhole bases may be accomplished by any method described below. The Contractor shall make sure that the outside diameter of the pipe is compatible with the following pipe connection:
  - 1. "KOR-N-SEAL" joint which has a neoprene boot cast into the manhole wall. It shall be installed as recommended by the manufacturer. The stainless steel clamp shall be protected from corrossions with a bitumastic coating.

### 3.2 Installation of Brickwork

- A. Mortar shall be mixed only in such quantity as may be required for immediate use, and shall be used before the initial set has taken place. Mortar shall not be retained for more than one and one-half (1 1/2) hours and shall be

constantly worked over with hoe or shovel until used. Prepared mortar shall not be allowed to stand in beds during the noon hour or overnight.

- B. Brick masonry shall be protected from too rapid drying by approved means and shall be protected from weather and frost, as required.
- C. Bricks shall be cleaned and thoroughly wetted shortly before they are put into the work, and each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling. Joints between bricks shall not exceed one-half (1/2) inch and shall be pointed. Bricks forming the shaped inverts in manholes shall be laid on edge as shown on the details.
- D. Manhole inverts shall be constructed to conform to the sizes of flow through sewers, and shall correspond in shape to the lower half of the pipe. At changes in directions, the inverts shall be laid out in curves of the longest possible radii tangent to the centerline of the sewer pipes. Shelves shall be constructed to the elevation of the highest pipe crown unless shown on the Drawings to be different and sloped to drain toward the flowing-through channel.

### 3.3 Installation of Frames, Covers and Grates

- A. Frames, covers and grates shall be set firm and true to grade, and mortar shall be placed from the top of the manhole on drainage shelves up over the base flange to the top of the frame to form a collar around the frame. Where necessary to adjust for grade, the top section of the manhole shall be extended with brick masonry as specified herein.
- B. All manhole frames and grates are to be set to the grade of the permanent pavement.
- C. Fastening to wood plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.

### 3.4 Leakage Tests

- A. Leakage tests shall be made and observed by the Engineer on each manhole. The test shall be by infiltration and/or exfiltration as described below. The Contractor shall submit a report to the Engineer detailing the test and test results.
- B. After the manhole has been assembled in place, all lifting holes and those exterior joints within six (6) feet of the ground surface shall be filled and pointed with an approved non-shrinking mortar. The tests shall be made prior to placing the shelf and invert and before filling and pointing the horizontal joints below the six (6) foot depth line. The Contractor shall furnish and put in place all temporary plugs and all equipment required to measure leakage rates. The Contractor shall furnish all water for testing purposes. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

C. Infiltration Test

1. If the groundwater table is above the highest joint in the manhole, an infiltration test may be made as accepted by the Engineer. If the manhole is judged by the Engineer as watertight, the manhole will be accepted and testing considered complete. If the Engineer is not satisfied that the manhole is watertight, the exfiltration test shall be performed.

D. Exfiltration Test

1. An exfiltration test shall be made if the groundwater level is not up to the highest joint or the manhole has failed the infiltration test specified above.
2. If the groundwater table has risen above the bottom of the manhole it shall be lowered for the duration of the test. The manhole shall then be filled with water to the top of the cone section. If observation indicates no visible leakage, that is, no water visibly moving down the surface to the manhole, the manhole may be considered to be satisfactorily watertight. If the test as described above is unsatisfactory as determined by the Engineer, the test shall be continued. A period of time may be permitted, if the Contractor so wishes, to allow for absorption. At the end of this period the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least eight (8) hours begun. At the end of this period, the manhole shall be refilled to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one (1) gallon per vertical foot for a 24-hour period. If the test fails this requirement, but the leakage does not exceed three (3) gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer to bring the leakage within the allowable rate of one (1) gallon per foot per day. Leakage due to a defective section or joint or exceeding the three (3) gallon per vertical foot per day, shall be the cause for the rejection of the manhole. It shall be the Contractor's responsibility to disassemble, reconstruct or replace it. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.
3. No adjustment in the leakage allowance will be made for unknown causes such as leakage plugs, absorptions, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.

(END OF SECTION)



## SECTION 02616 - DUCTILE IRON PIPE AND FITTINGS

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The work covered under this Section of the Specifications includes furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with the furnishing, installing and testing of pipe, pipe fittings and specials, polyethylene film wrap, jointing materials, and accessories of various ductile iron, sizes, classes, joints and types, and appurtenant work, at the locations and to the lines and grades indicated, complete in place, in accordance with the Drawings and Specifications.
- B. Furnish all labor, materials, equipment and incidentals required to test and chlorinate water mains and appurtenances.

#### 1.2 Related Work Specified Elsewhere

- A. Earthwork (trench excavation, backfill and compaction) is specified in Section 02200.
- B. Valves and appurtenances are specified in Section 02640.
- C. Site Utilities are specified in Section 02600.

#### 1.3 Approval of Materials

- A. Within ten (10) days after execution of the Contract, the Contractor shall submit to the Engineer the following information:
  - 1. Name of suppliers.
  - 2. Expected date of delivery of materials to the job site.
  - 3. Time schedule for the completion of the various portions of the job.
- B. Shop Drawings: The Contractor shall submit for approval Shop Drawings or descriptive literature, or both, showing pipe dimensions, joint and other details for each type and class of pipe to be furnished for the project. All pipe furnished under the Contract shall be manufactured only in accordance with the Specifications and the approved Drawings.

#### 1.4 Inspection

- A. The supplier is responsible for the performance of all inspection requirements as specified in ANSI A21.51 for pipe and ANSI A21.10 for fittings.

- B. Inspection of the pipe will be made by the Engineer or other representative of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.5 Reference Standards

- A. References herein to any technical society, organization, group or body are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable:

ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
Fed. Spec.	Federal Specifications

2.0 PRODUCTS

2.1 General

- A. Contract Drawings and Specifications are intended to supplement and explain each other. Materials not specifically mentioned in the Specifications shall be as indicated on the Contract Drawings. Where conflicts occur between the Contract Drawings and/or Specifications, or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Contractor's bid. Where no specific kind of quality of material is given, a first-class standard article shall be furnished.
- B. The Contract Drawings are diagrammatic only and are intended to indicate the extent but not all details of the piping which shall be supplied. All offsets and materials are not shown, however, the Contractor shall furnish these items as if called for or shown.

2.2 Ductile Iron Pipe

- A. Ductile iron pipe shall be designed in accordance with ANSI A21.50/AWWA C150 and manufactured in accordance with ANSI A21.51/AWWA C151.
- B. Ductile iron pipe shall be thickness Class 52 for diameters 16 inches or less.

- C. Pipes shall be cement-mortar lined in accordance with ANSI A21.4/AWWA C104.
- D. Ductile iron pipe shall be Class 52 and furnished in nominal 18-foot lengths, with Tyton or Mechanical Joints as manufactured by U.S. Pipe and Foundry Company, Atlantic States Cast Iron Pipe Company, Clow Corporation, or equal with gaskets conforming to ANSI A21.11, "Rubber Gasket Joints".
- E. The ductile iron pipe shall be double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil thick. The cement lining shall conform to ANSI A21.4. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

### 2.3 Fittings

- A. Fittings shall be either plain mechanical joint or restrained mechanical joint fittings with body thickness and radii of curvature conforming to ANSI A21.10, and joints in accordance with ANSI A21.11. The mechanical joint fittings shall be Class 250 cast iron for sizes to twelve (12) inch and shall be Class 150 cast iron for sizes larger than twelve (12) inches. The restraining at the joints shall be accomplished with cast iron retainer glands or tie rods.
- B. All bolts and nuts shall be Cor-Ten.
- C. Type of ends at the fittings in relating to valves and the connection piping shall be determined by the Contractor in accordance with the requirements of Drawings and Specifications prior to ordering the fittings.

### 2.4 Sleeve Couplings

- A. Sleeve couplings and accessories shall be pressure rated at least equal to that of the pipe. Couplings shall be cast iron and shall be Dresser Style 53 or 153, Rockwell Style 431, Baker Series 228 or acceptable equivalent product. The couplings shall be provided with "Cor-Ten" bolts and nuts or approved equal.
- B. After assembly, all exterior surfaces including the bolts and nuts shall be thoroughly coated with two coats of a heavy-duty protective coating. The interior of the coupling shall be coated with the minimum dry-film thickness of 8 mil. of a two-component, polymerized epoxy. Surfaces to receive epoxy coating shall be prepared in accordance with Steel Structure Painting Council Specifications SP-10. All surfaces to receive epoxy coating shall be preheated. Electrical continuity (copperstrip conductors) shall be provided across all joints in accordance with the manufacturers recommendations. Copper strips shall be cadwelded on each side of the joint.

### 2.5 Joints

- A. At the Contractor's option, joints shall be either push-on or mechanical joints conforming to ANSI A21.11/AWWA C111. Push-on and mechanical joints

shall be provided with sufficient quantities of accessories conforming to ANSI A21.11/AWWA C111.

- B. All mechanical joints shall be provided with lead-tipped or copper-armored gaskets to provide electrical conductivity. All joints shall be provided with a strip connector to insure electrical continuity across the joint.
- C. Push-on Joints shall be made by first inserting the gasket into the groove of the bell and applying a thin film of non-toxic gasket lubricant uniformly over the inner surface. The chamfered end of the plain pipe shall be inserted into the gasket and forced past it until it seats against the bottom of the socket.
- D. Mechanical Joints shall be made by first cleaning the surfaces against which the gaskets will come in contact with a wire brush. The gasket, bell, and spigot shall be lubricated by washing with soapy water just prior to assembling the joint. After the nuts have been made up finger tight, the bottom nut, then top and then diametrically opposite nuts shall be progressively tightened. The tightening process should be repeated until the nuts are within the following range of torques:

Paper Size In Inches	Bolt Diameter In Inches	Torque Feet - Pounds	Wrench Length In Inches
3	5/8	40-60	8
4-24	3/4	60-90	10
30-36	1	70-100	12
42-48	1-1/4	90-120	14

If a regular socket wrench is used with average pull, the torque is subject to testing with a torque wrench. If effective sealing is not attained, the joint shall be disassembled, cleaned and reassembled. Bolts shall not be over stressed to tighten a leaking joint.

## 2.6 Lining and Coating

- A. All pipe and fittings shall have a cement mortar lining and bituminous seal coat on the inside in accordance with ANSI A21.4, except that cement mortar lining shall be one-eighth (1/8) inch thickness for pipe and fittings, fourteen (14) inch to twenty (20) inch diameter with a plus tolerance of one-eighth (1/8) inch.

## 3.0 CONSTRUCTION METHODS

### 3.1 General

- A. All ductile iron pipes shall be installed as shown on the Contract Drawings with a minimum depth to cover the pipe of five feet six inches. Backfill

materials shall be as shown on the Contract Drawings and as specified in Section 02200, Earthwork.

### 3.2 Handling Ductile Iron Pipe and Fittings

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipes, linings, or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective.
- B. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor at his own expense. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until used in the completed work, and when laid shall conform to the lines and grades required.

### 3.3 Laying Ductile Iron Pipe and Fittings

- A. Ductile iron pipe and fittings shall be installed in accordance with the requirements of AWWA Standard Specification C600, except as otherwise provided herein. The pipe shall be bedded in screened gravel to mid-diameter of pipe. Blocking will not be permitted.
- B. All pipe shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.

Fittings, in addition to those shown on the Contract Drawings, shall be provided if required in crossing utilities which may be encountered upon opening the trench.

- C. When cutting of pipe is required, the cutting shall be done by machine leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.
- D. The Contractor shall construct at least one impervious dam of clay or concrete in the pipe bedding material every three hundred (300) feet to interrupt the unnatural flow of groundwater after construction is complete. The height of the impervious dam shall extend from the bottom of the gravel bedding to the top of the pipe.

### 3.4 Jointing Ductile Iron Pipe (Push-One Type)

- A. Push-on joints shall be made in strict accordance with the manufacturer's instructions. A rubber gasket shall be inserted in the groove of the bell end of the pipe and the joint surface cleaned and lubricated using the pipe manufacturers suggested methods and materials. The plain end of the pipe to be laid shall then be inserted in alignment with the bell of the pipe to which

### 3.0 EXECUTION

#### 3.1 Installing Polyvinyl Chloride Pipe

- A. Pipe and fittings shall be installed in accordance with ASTM D2321 (Bedding Classifications) except that crushed stone shall be placed to one foot above the top of the pipe. As soon as the excavation is completed to the grade of the bottom of the trenches, the Contractor shall immediately place a bed of crushed stone. The pipe shall then be laid accurately to line and grade. Bell holes shall be excavated so that only the barrel of the pipe shall bear upon the gravel over the trench bottom.

Blocking under the pipe will not be permitted.

Crushed stone shall be placed to mid-diameter and thoroughly compacted to give firm support of the pipe. The spigot shall be pushed home into the adjacent bell to form a closed joint.

The interior of each pipe shall be inspected while being joined to see that the alignment is preserved. The pipe having been joined, crushed stone will be placed to one foot over the top of the pipe.

Complete backfilling as specified in Section 02200.

- B. Installing and joining instructions of the pipe manufacturer shall be followed explicitly. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.
- C. All pipe shall be sound and clean before installation. When installation is not in progress, including lunch time, the open ends of the pipe shall be closed by watertight plug or other approved means.
- D. PVC pipe shall be connected to concrete structures by one of the methods described in Section 02601.
- E. The Contractor shall construct at least one impervious dam of clay or concrete in the pipe bedding material every three hundred (300) feet to interrupt the unnatural flow of groundwater after construction is completed. The height of the impervious dam shall extend from the bottom of the gravel bedding to the top of the pipe.

#### 3.2 Restrained Joint Assemblies for Force Main

- A. Pipe with restrained joints shall be installed at locations shown below. Bends, reducers, tees, valves, dead ends, and hydrants are among the places where thrust forces create unbalanced forces in the piping and where the pipe and fittings shall be restrained. All valves and fitting shall be restrained. The minimum number of pipe joints to be restrained on either side of the fitting shall be as shown on the table below.

Fittings	Number of Joints Restrain on Either Side of Fitting
90 degree bend	2
45 degree bend	1
22 ½ degree bend	1
Tee Branch	2
Tee Run	2

- B. No restraining is required in the direction of the existing pipe if only a short length of it is exposed in the trench for making a connection.
- C. Concrete thrust blocks, shall be used instead of restrained joints only at locations where no sufficient length of pipe is available for restraining.
- D. Restrained joint assemblies for push-on pipe and fittings shall be made in strict accordance with the manufacturer's recommendation.

### 3.3 Cleaning and Repair

- A. The Contractor shall, on completion, clean the entire sanitary sewer system of all debris and obstructions. This shall include (but not be limited to) removal of all formwork from structures, concrete and mortar droppings, construction debris, and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sanitary sewers or streams; all debris shall be removed from the system.
- B. After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be promptly made by the Contractor.
- C. All cleaning and repair work as specified herein shall be done at the Contractor's expense and to the complete satisfaction of the Engineer.

### 3.4 Testing

- A. Test pipe for joint tightness by either low pressure air testing or by hydraulic testing.

### 3.5 Low Pressure Air Testing (Gravity Sewer Pipe)

- A. After completing backfill of a section of pipe, the Contractor shall conduct a Line Acceptance Test using low pressure air. The Test shall be performed

using the equipment listed below according to the specified procedures and under the supervision of the inspecting engineer.

1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.
2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
3. All air used shall pass through a single control panel.
4. Three individual hoses shall be used for the following connections:
  - a. From control panel to pneumatic plugs for inflation;
  - b. From control panel to sealed line for introducing the low pressure air;
  - c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

B. The following testing procedures shall be explicitly followed:

1. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
2. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of the line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe) shall not be less the time shown for the given diameters in the following table:

Pipe Diameter In Inches	Minutes
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4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

3. In areas where groundwater is known to exist, the Contractor shall install a one-half (1/2) inch diameter capped pipe nipple, approximately ten (10) inches long, through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple to clear it then attaching a clear plastic tube to the nipple. The tube shall then be held vertically and a measurement of the height is taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is eleven and one-half [11 1/2] feet, then the added pressure will be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same.)

B. If the installation fails to meet this requirement, the Contractor shall, at his own expense, determine the source of leakage. He shall then repair or replace all defective materials and/or workmanship.

### 3.6 Pipe Deflection Testing for PVC Piping

A. Six months following completion of the backfill over the PVC pipe installation, the pipeline shall be tested for deflection using a "go/no-go" deflection mandrel. The "go/no-go" gauge shall be passed through all sections of the pipeline.

B. Pipe deflections shall be measured and converted to percent deflection. Deflections shall be recorded, with a copy of results submitted to Engineer.

Test results shall be mailed or delivered to Engineer not later than the day following the day on which test was made.

C. Sections of pipe with deflection greater than 7.5% shall be replaced.

3.7 Testing Force Main Sewer

- A. After the pipes of the force main sewer have been laid, secured in place and joined as hereinbefore specified, the force main sewers shall be tested for strength and leakage. The tests shall be made when approved by the Engineer.
- B. The Contractor shall furnish all apparatus material and labor and the necessary water for making the test.
- C. Before testing pipe lines having flexible joints, the Contractor must make certain that the pipe lines are securely held to prevent movement.
- D. The ends of the sections of force main to be tested shall be tightly closed by blank flanges or otherwise for the duration of each test.
- E. Strength shall be tested at a pressure of 50 psi above normal operating pressure. The pressure for strength test shall be maintained for at least ten minutes by pumping additional water into the pipeline.
- F. Leakage shall be tested at the normal operating pressure. The test for leakage shall be for at least one hour and may be required to last for two hours. The additional water needed to maintain the required pressure shall be measured accurately in a manner approved by the Engineer.

1. The rate of leakage for force main sewers shall be determined by the formula:

$$L = ND \times \text{square root of } P/7400$$

Where:

L = Allowable Leakage (gal/hr)

N = Number of Joints in Tested Line

D = Nominal Diameter of Pipe (inches)

P = Average Test Pressure

(END OF SECTION)

## SECTION 02640 - VALVES AND APPURTENANCES

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The work covered under this Section of the Specifications includes the furnishing of all labor, equipment, appurtenances and materials, and in performing all operations in connection with the furnishing, installing and testing of the valves and appurtenances, at the location indicated and/or as directed, complete in place in accordance with the Contract Drawings and Specifications.

#### 1.2 Shop Drawings

- B. The Contractor shall submit for approval Shop Drawings or descriptive literature or both for each type of valve furnished in compliance with the provisions of the General Conditions.

#### 1.3 Related Work Not Included

- A. Restrained joints are included under Section 02616.

### 2.0 PRODUCTS

#### 2.1 Gate Valves

- A. Gate valves shall meet or exceed the requirements of AWWA C500. Valves shall be rated a minimum 300 psi hydrostatic test pressure. Valves shall be of the iron body, bronze mounted, double disc, parallel seat, non-rising stem type fitted with "O-Ring" seals.
- B. Gate valves shall be designed for buried service and as manufactured by American Darling Valve, U.S. Pipe Corporation, Mueller Company or approved equal.
- C. All operating nuts shall be 2-inches square at the base, tapering to 1-15/16-inches square at the top.
- D. All gate valves, shall open to the left (counter-clockwise).
- E. All valves shall have mechanical joint ends, complete with all accessories. Bolts shall be CorTen or approved equal.
- F. The interior of all valve bodies and other ferrous metal parts that will come in contact with sewage or water shall be epoxy coated conforming to AWWA C550.

G. All bonnet bolts, seal plate bolts, stuffing box bolts, and other bolts in contact with soil (except for MJ bolts) shall be 18-8 Type 304 stainless steel or Everdur bronze.

H. The Engineer or Owner shall be provided with two valve keys with handles long enough to extend 3-feet above finished grade for each size and type of valve.

2.2 Not used

2.3 Not used

2.4 Not used

2.5 Valve Boxes

A. Each gate valve shall be provided with a valve box and cover. Valve boxes shall be of the adjustable, telescoping, heavy-pattern type with the lower part of cast iron and the upper part of steel or cast iron. They shall be designed to prevent the direct transmission of traffic loads to the pipe or valve. The upper portion shall be provided with a flange having sufficient bearing area to prevent undue settlement. The lower section shall be designed to enclose the operator and stuffing box of the valve and rest on the bonnet. The inside diameter of boxes for valves shall be at least 4-1/2 inches and provisions shall be made for adjustment through at least 6-inch vertical without reduction of lap between sections to less than 4-inches.

B. Covers shall have the word "caps" cast in the top with the direction of opening indicated by an arrow.

### 3.0 EXECUTION

3.1 Gate Valves

A. Gate valves and boxes shall be set with the operating stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping screened gravel under and at the sides of the valve.

3.2 Not used

3.3 Valve Boxes

A. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform to the finished surface of roadway or other surface at the completion of the contract. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

(END OF SECTION)

## SECTION 02690: SINGLE WALLED FRP TANKS FOR NONPOTABLE WATER USE

### 1.0 GENERAL

#### 1.1 Scope Of Work

- A. The Contractor shall furnish and install fiber reinforced plastic tanks of the capacity, dimensions and layout as shown on the design drawings. The Contractor shall furnish and install watertight seals, access risers, access covers, and all other necessary appurtenances conforming to the Contract Documents. Delivery and preparation of the components, excavation, dewatering, tank installation, installation of piping, watertightness and installation of all appurtenances shall be the responsibility of the Contractor.

#### 1.2 Materials

- A. Acceptable Manufacturers: Xerxes Corporation, Minneapolis, Minnesota
- B. Manufacturing Standards:
  1. Manufacturer shall be able to provide documentation that the tank shell has been built to the applicable requirements of Underwriters Laboratories Standard UL 1316.
  2. Tank manufacturer shall be in the business of manufacturing tanks to UL 1316 standards.
- C. Materials:
  1. Tank shall be manufactured of 100% resin and glass-fiber reinforcement, with no sand fillers and no exposed glass fibers. The raw materials used in this resin are listed as acceptable in FDA regulation Title 21CFR 177.2420 for repeated use in contact with food.

#### 1.3 Submittals

- A. Comply with pertinent provisions of the General Conditions.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  1. Materials list of items proposed to be provided under this section;
  2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
  3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

## 2.0 PRODUCTS

### 2.1 Single-Wall Fiberglass Underground Tanks

#### A. Product-Storage Requirements:

1. Tank shall be vented to atmospheric pressure, as the tank is not designed as a pressure vessel.
2. Tank shall be designed for maximum product-storage temperature of 150° F.

#### B. Loading Conditions: Tank shall meet the following design criteria:

1. Internal Load: Tank shall withstand a 5-psig air-pressure test with 5:1 safety factor. Installer shall test each tank for leakage prior to installation. Maximum test pressure is 5 psig (3 psig for a 12-foot tank).
2. Vacuum Test: To verify structural integrity, each tank up through 10-foot diameter shall be vacuum tested by the manufacturer at the factory to 11.5 inches of mercury.
3. Surface Loads: Tank shall withstand surface H-20 axle loads when properly installed according to manufacturer's current installation instructions.
4. External Hydrostatic Pressure and Burial Depth: Tank shall be capable of being buried in ground with up to 13 feet of overburden, the hole fully flooded and a safety factor of 5:1 against general buckling.
5. Tank shall support accessory equipment-such as internal pump platforms, submersible pumps and ladders-as shown on tank drawings and when installed according to tank manufacturer's recommendations.

### 2.2 Accessories

#### A. Anchor Straps:

1. Straps shall be FRP anchor straps as supplied by tank manufacturer.
2. Number and location of straps shall be shown on tank drawings and as required by the manufacturer to prevent movement of the tank when completely empty and fully submerged without overburden.

#### B. Manways:

1. All tanks for potable water use shall require at least one manway.
2. All manways are to be flanged and 22-inch-i.d., complete with UL-listed gaskets, bolts and covers.

3. Location(s) shall be shown on tank drawings.
4. Manway extensions shall be FRP.

C. Fittings:

1. All standard threaded fittings shall be constructed of carbon steel.
2. All standard threaded fittings shall be half-couplings, and of 2-inch, 4-inch or 6-inch diameter. Reducers are to be used for smaller sizes where shown and provided by contractor.
3. All NPT fittings shall withstand a minimum of 150 foot-pounds of torque and 1,000 foot-pounds of bending, both with a 2:1 safety factor.

3.0: Execution

A. Testing and Installation:

1. Tank shall be tested and installed according Xerxes Installation Manual and Operating Guidelines for Single Walled Fiberglass Underground Wastewater Tanks, latest edition.
2. Vacuum testing shall be performed following tank installation, in accordance with ASTM C 1227. The empty tank shall be sealed, and a vacuum shall be applied to 2 in. of mercury. The vacuum test shall include the riser sections and all penetrations. The tank shall be approved if 90% of the vacuum is held for a minimum of 2 minutes.

(END OF SECTION)

## SECTION 02795 – GRASS PAVERS

### 1.0 GENERAL

#### 1.1 General Provisions

- A. The Conditions of the Contract and all Sections of Division 1 are hereby made a part of this Section.

#### 1.2 Scope of Work

##### A. Work Included:

1. Provide and install sandy gravel subbase.
2. Provide Grasspave2 Paving System products including Grasspave2 units, Hydrogrow soil polymer, and installation per the manufacturer's instructions furnished under this section.
3. Provide and install loam/sand mix under and filling the Grasspave2 units.
4. Provide and install seed in accordance with section 02920.

#### 1.3 Related Work Specified Elsewhere:

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

1. Excavation and subgrade preparation is specified in Section 02200.
2. Site preparation is specified in Section 02100.
3. Site Grading is specified in Section 02210.

#### 1.4 Quality Assurance

- A. Installation shall be performed only by skilled workpeople with satisfactory record of performance on landscaping or paving projects of comparable size and quality.

#### 1.5 Submittals

- A. Submit manufacturer's product data and installation instructions.



- B. Submit a 10" x 10" section of Grasspave2 material for review. Reviewed and accepted samples will be returned to the contractor.
- C. Submit material certificates for base course and sand fill materials.

#### 1.6 Delivery, Storage, and Handling

- A. Protect Grasspave2 units from damage during delivery and store under tarp to protect from sunlight, when time from delivery to installation exceeds one week. Keep Hydrogrow in a dark and dry location.

#### 1.7 Project Conditions

- A. Review installation procedures and coordinate Grasspave2 work with other work affected. Generally, Grasspave2 is installed at the same time as project grass installation, nearly the last site construction activity.
- B. All hard surface paving adjacent to Grasspave2 areas, including concrete walks and asphalt paving must be completed prior to installation of Grasspave2.
- C. Gradients for grass porous paving surfaces can vary from flat to 20%, depending upon vehicle types to use the surface. Please note that firelanes, or other emergency vehicles, will generally require a gradient that is less than 6%. If there are any questions regarding existing gradients on this project, please contact the Project Designer, or Invisible Structures, Inc.
- D. Cold weather:
  - 1. Do not use frozen materials or materials mixed or coated with ice or frost. Be careful in handling rolls of Grasspave2 in temperatures below 50 degrees F, as product connectors become stiff and can separate, and the individual units will retain the roll curl until warmed to room temperature (aided by placement in sun for 15 to 20 minutes). If cold weather is anticipated, Grasspave2 can be shipped in flat sheets that measure 1-meter (40") square.
  - 2. Do not build on frozen work or wet, saturated or muddy subgrade.
- E. Protect partially completed paving against damage from other construction traffic when work is in progress, and until grass root system has matured (about 3 to 4 weeks). Any barricades constructed must still be accessible by emergency and fire equipment during and after installation.
- F. Protect adjacent work from damage during Grasspave2 installation.

## 2.0 PRODUCTS

### 2.01 Grass Pavers

- A. Grass Pavers shall be Grasspave2 by Invisible Structures, Inc., 1597 Cole Blvd., Suite 310, Golden, Colorado 80401. Call from USA and Canada 800-233-1510 toll free, International 303-233-8383, Fax 303-233-8282.
- B. Local Sales Representative:  
(Contact Manufacturer)
- C. Grasspave2 Grass Paving Units: Lightweight injection-molded plastic units 0.5x0.5x0.025 m (20"x20"x1" high, 2.7 ft<sup>2</sup> each) with hollow rings rising from a strong open grid allowing maximum grass root penetration and development. The plastic shall be 100% post-consumer recycled plastic resins, predominately HDPE, with minimum 3% carbon black concentrate added for UV protection.

Loading capability is equal to 402 kg/cm<sup>2</sup> (5700 psi) when filled with sand, over an appropriate depth of roadbase. Standard color is black. Unit weight = 510 g (18 oz.), volume = 8% solid. Units may also be shipped in pre-assembled into rolls that vary from 10 square meters (108 sf) to 125 square meters (1345 sf).

- 2.02 Sandy gravel shall be material from local sources commonly used for road base construction, passing the following sieve analysis.

<u>Passing</u>	<u>Sieve Size</u>
100	3/4"
85	3/8"
60	#4
30	#40
< 3	#200

- A. Sources of the material can include either "pit run" or "crusher run." Crusher run material will generally require sharp sand to be added to mixture (33% by volume) to ensure long term porosity. If there is difficulty in finding local sources to meet this sieve analysis, an alternative mixture can be created by mixing 2/3 crushed drainage rock (0.75" dia) with 1/3 concrete or river sand.
- B. Selected materials should be nearly neutral in pH (range from 6.5 to 7.2) to provide adequate root zone development for turf.

2.03 Sand and Loam Mix

- A. Loam shall be as specified in Section 02920
- B. Sand shall be clean sharp sand (washed concrete sand)
- C. Mixture proportions shall conform to detail drawing

2.04 Hydrogrow Mix:

- A. Hydrogrow Mix shall be a mixture made from several commercial products including: 1) cross-linked polyacrylimide (<0.1%) polymer, which is non-toxic and neutral in pH, and will absorb 150 to 350 times its weight in water from most tap sources; 2) ZeoPro zeolite mineral, amended with small amounts of starter fertilizers, from Zeoponix, Inc.; 3) Isolite porous ceramic, designed to hold large amounts of water without physical degradation or change of size of particle, from Sumitomo Group; 4) and agglomerated Humate, a natural source of nutrients and micronutrients, from Tri-C Enterprises.
- B. Hydrogrow Mix is available free of charge from the manufacturer, Invisible Structures, Inc, with the purchase of Grasspave2 units.

2.05 Seed shall conform to Section 02920

2.06 Mulch shall be of wood or paper cellulose types of commercial mulch materials often used in conjunction with hydroseeding operations. Mulches of straw, pine needles, etc. will not be acceptable because of their low moisture holding capacity.

3.0 EXECUTION

3.01 Inspection

- A. Examine subgrade and base course installed conditions. Do not start Grasspave2 installation until unsatisfactory conditions are corrected. Check for improperly compacted trenches, debris, and improper gradients.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Project Manager for resolution.

3.02 Preparation

- A. (Ensure that subbase materials are structurally adequate to receive designed base course, wearing course, and designed loads. Generally, excavation into undisturbed normal strength soils will require no additional

modification. Fill soils and otherwise structurally weak soils may require modifications, such as geotextiles, geogrids, and/or compaction (not to exceed 90%). Ensure that grading and soil porosity of the subbase will provide adequate subsurface drainage.)

- B. Place base course material over prepared subbase to grades shown on plans, in lifts not to exceed 150 mm (6"), compacting each lift separately to 95% Modified Proctor.
- C. Place loam/sand mix layer compacting to 95% Modified Proctor. Leave minimum 25 mm (1") to 35 mm (1.5") for Grasspave2 unit and loam/sand fill to Final Grade.
- C. Spread all Hydrogrow mix provided (spreader rate = 2.25 kg per 100 m<sup>2</sup> (5 lbs per 1000 ft<sup>2</sup>) evenly over the surface of the loam/sand mix layer with a hand-held, or wheeled, rotary spreader. The Hydrogrow mix should be placed immediately before installing the Grasspave2 units to assure that the polymer does not become wet and expanded when installing the units.

### 3.03 Installation of Grasspave2 Units

- A. Install the Grasspave2 units by placing units with rings facing up, and using pegs and holes provided to maintain proper spacing and interlock the units. Units can be easily shaped with pruning shears or knife. Units placed on curves and slopes shall be anchored to the base course, using 16d Common nails with fender washer, as required to secure units in place. Tops of rings shall be between 6 mm to 13 mm (0.25" to 0.5") below the surface of adjacent hard-surface pavements.
- B. Install loam/sand mix in rings as they are laid in sections by "backdumping" directly from a dump truck, or from buckets mounted on tractors, which then exit the site by driving over rings already filled. The loam/sand mix is then spread laterally from the pile using flat bottomed shovels and/or wide "asphalt rakes" to fill the rings. A stiff bristled broom should be used for final "finishing" of the loam/sand mix. The mix must be "compacted" with the finish grade no less than the top of rings and no more than 6 mm (0.25") above top of rings.

### 3.04 Installation of Grass

- A. Install grass seed as specified in 02920 and mulch over loam/sand-filled rings with specified mulch. Coverage must be uniform and complete. Following germination of the seed, areas lacking germination larger than 20 cm x 20 cm (8" x 8") must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf plants.

### 3.05 Protection

- A. Seeded areas must be protected from any traffic, other than emergency vehicles, for a period of 4 to 6 weeks, or until the grass is mature to handle traffic.

### 3.06 Cleaning

- A. Remove and replace segments of Grasspave2 units where three or more adjacent rings are broken or damaged, reinstalling as specified, so no evidence of replacement is apparent.
- B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

(END OF SECTION)

If you have any questions regarding this specification, please call Invisible Structures, Inc. 1-800-233-1510, overseas call 303-233-8383.

## SECTION 02920 - TOPSOILING, FINE GRADING, AND SEEDING

### 1.0 GENERAL

#### 1.1 REFERENCES

- A. The GENERAL DOCUMENTS, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

#### 1.2 SCOPE

- A. The work of this Section consists of all seeding work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
  - 1. Fine grading and loaming
  - 2. Seeding
  - 3. Maintenance and protection

#### 1.3 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
  - 1. Earthwork and Excavation is specified in Section 02200.
  - 2. Site preparation is specified in Section 02100.
  - 3. Site Grading is specified in Section 02210.
  - 5. Grass Pavers are specified in Section 02795.
  - 6. Planting is specified in Section 02950.

#### 1.4 DEFINITIONS

- A. The following related items are included herein and shall mean:
1. AOAC: Association of Official Agricultural Chemists

#### 1.5 SAMPLES AND SUBMITTALS

- A. At least thirty (30) days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with requirements of these specifications. Do not order materials until Landscape Architect's approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples.
1. Loam Borrow: The Contractor shall provide a one (1) cubic foot representative sample from each proposed source for testing, analysis, and approval. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Landscape Architect and pay all costs. Testing reports shall include the following tests and recommendations.
    - a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. A hydrometer shall be used to determine percent of clay and silt.
    - b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230° F, plus or minus 9°.
    - c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH).
    - d. Tests, as specified, for gradation, organics, soil chemistry and pH shall be performed by a public extension service or a private testing laboratory approved by the Landscape Architect.
    - e. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for fertilizing and liming applications to support successful turf growth.

- f. All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists.
2. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
3. Fertilizer: Submit four (4) certificates of analysis for lawn fertilizer.
4. Erosion Control Matting: Submit one (1) sample.
5. Maintenance Instructions: At the time of Acceptance, the Contractor shall submit complete maintenance instructions for lawn care for the Owner's use. The instructions shall be reviewed for approval by the Landscape Architect as a precondition for Acceptance.
6. Peat: Submit a one (1) cubic foot sample and supplier's certification of contents.
7. All additives needed to amend a specific soil in order to meet these specifications.

## 1.6 EXAMINATION OF CONDITIONS

- A. All areas to be fine graded and seeded shall be inspected by the Contractor before starting work. Any defects such as incorrect grading, etc., shall be reported to the Landscape Architect prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be fine graded and seeded, and he shall assume full responsibility for the work of this Section.
- B. Locate exposed utilities (i.e., pipes, valves, cleanouts, manholes) in the areas of work before beginning topsoiling and seeding surface preparation. Provide adequate means of protection during these other operations under this Section. SECTION 02920.

## 2.0 PRODUCTS



2.1 LOAM

A. Loam shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one inch (1"), lumps, plants and their roots, debris and other extraneous matter as determined by the Landscape Architect.

B. Loam shall have the following mechanical analysis:

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

C. Loam shall have an acidity range of pH 6.0 to pH 6.5 and shall contain not less than 4% or more than 8% organic matter, as certified by required tests.

D. The topsoil stripped and stockpiled on the site may be used provided that, after testing and addition of necessary additives, it meets the above specification. The Contractor shall provide additional loam as required to complete the required work.

E. All loam proposed for use shall be tested for conformance to the specifications.

2.2 SOIL ADDITIVES

A. Commercial fertilizer, peat, humus or other additives shall be used to counteract soil deficiencies as recommended by the soil test analysis, and as specified seeding supplements.

B. Commercial fertilizer shall be a product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers which shall bear the manufacturer's certificate of compliance covering analysis which shall be furnished to the Landscape Architect. At least 50% by weight of the nitrogen content shall be derived from organic materials. Fertilizer shall contain not less than the percentages of weight of ingredients as follows or as recommended by the soil analysis:

Nitrogen	Phosphorus	Potash
10%	6%	4%

- C. Humus shall be manufactured compost. It shall be free from hard lumps and in a shredded or granular form. The acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 65%. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.
- D. Compost shall be a stable humus-like material produced from the aerobic decomposition of organic residues. The residues, if biosolids, shall consist of compost meeting MA-DEP Type 1 requirement or approved equal. The residues shall be dark brown or black in color, with no visible free water or dust and no unpleasant odor, meeting the following criteria certified by the producer.
1. carbon-nitrogen ratio minimum 10:1 maximum 25:1
  2. stability CO<sub>2</sub> evolution test <10 mg CO<sub>2</sub> - C/g BVS/day or  
Dewar self-heating test <10 degrees C above room temp. or  
Woods End Laboratory's Compost Test Kit
  3. organic content 40 percent minimum dry weight (Loss on Ignition; minus  
#10 Sieve, 430 degrees C)
  4. particle size 90 percent passing 0.5 inch (13 mm) screen,  
100 percent passing one-inch (25 mm) screen
  5. inorganic debris 1 percent maximum (dry weight)
  6. pH minimum 5.5 - maximum 8.0
  7. Soluble Salts >2 and <4.0 mmhos/cm (ds/m)
  8. Density 850-1,050 lb./cy (505 kg – 642 kg/m<sup>3</sup>)

- D. Peat moss shall be composed of the partly decomposed stems and leaves of any of several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing of A.O.A.C., latest edition. Its water absorbing ability shall be a minimum of 1,100% by weight on an oven-dry basis.
- E. Sand shall consist of hard, durable grains of quartz or other rock, clean and free from foreign matter or chemical contamination.
- F. Ground limestone for adjustment of loam pH shall contain not less than eighty five percent (85%) of total carbonates and shall be ground to such fineness that forty percent (40%) will pass through 100 mesh sieve and ninety five (95%) will pass through a 20 mesh sieve. Contractor shall be aware of loam pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations. Ground limestone shall not be applied at a rate greater than two hundred pounds (200 lbs.)/one thousand (1,000) square feet incorporated into the soil, or fifty pounds (50 lbs.) of limestone/one thousand (1,000) square feet, surface application, per season.
- G. Sulphur shall be commercial or flour sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- H. Superphosphate: Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.

2.3 SEED

- A. Lawn Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. Chewings fescue, hard fescue, tall fescue and rygrass shall contain *Acromonium* endophytes. Seed containing endophyte must be kept cool and dry at all times; do not stockpile in the sun.

3. Seed Mixture Composition

Proportion	Germination	Purity
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<u>Common Name</u>	<u>By Weight</u>	<u>Minimum</u>	<u>Minimum</u>
Tall Fescue	80%	85%	95%
Kentucky Bluegrass	10%	85%	90%
Perennial Rye	10%	90%	90%

- a. Bluegrass and rye grass varieties shall be within the top 50 percent and 25 percent respectively, of varieties tested in National Turfgrass Evaluation Program, or currently recommended as low maintenance varieties by University of Massachusetts or the University of Rhode Island.
  - b. Seeding rate for the General Lawn Seed Mix shall be 8 pounds per 1,000 square feet.
- C. Seed may be mixed by an approved method on the site or may be mixed by a dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's guaranteed analysis. If the seed is mixed by a dealer, the Contractor shall furnish the Landscape Architect the dealer's guaranteed statement of the composition of the mixture.

## 2.4 EROSION CONTROL MATTING

- A. Matting for erosion control shall consist of undyed and unbleached smolder resistant jute yarn woven into a uniform, open, plain weave mesh. Jute matting shall be furnished in rolled strips and shall conform to the following:

Width                      48 inches, plus or minus one inch 78 warp ends per width  
of cloth 41 weft ends per yard

Weight To average between 1.22 pounds and 1.80 pounds per linear yard: tolerance plus or minus 5%

- B. Stakes for pegging erosion control matting shall be sound hardwood approximately one inch (1") by three inches (3"). Stakes shall be free from insects and fungi and capable of remaining in the ground at least two (2) years.

## 2.5 CHEMICALS AND INSECTICIDES

- A. Provide chemicals and insecticides as needed for fungus or pest control.

## 2.6 WATER

- A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be held responsible to furnish adequate supplies at his own cost. Contractor likewise shall not cause damage to any vegetation during the watering operation. All work injured or damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

## 2.7 GRASS PAVERS

- A. Grass Pavers shall be as specified in SECTION 02795

## 3.0 EXECUTION

### 3.1 INSTALLATION OF GRASS PAVERS.

- A. Grass Pavers shall be installed on prepared subgrade in accordance with the Drawings and SECTION 02795 herein, and shall be installed prior to fine grading and loaming.

- G Seeding shall be done in two directions at right angles to each other. Sow the seed with approved seeding device. No seeding shall be done in windy weather.
- H. If covering and rolling is not properly accomplished by the seeding machine, the seed shall be lightly raked into the ground, after which the ground shall be rolled and compacted, and thoroughly and evenly watered with a fine spray to penetrate the soil to a depth of at least two inches (2").
- I. Erosion control matting shall be installed according to manufacturer's specifications in all drainage swales and all slopes of one vertical foot to three horizontal, or steeper, immediately after such areas have been seeded. Secure mesh with pegs following installation.

#### 3.4 MAINTENANCE AND PROTECTION

- A. Maintenance shall begin immediately after any area is seeded and shall continue for a minimum sixty (60) day active growing period following the completion of all seeding work, and until final acceptance of the project. In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, then maintenance shall continue into the following Spring.
- B. Maintenance shall include reseeding, mowing, watering, weeding, fertilizing, and resetting and straightening of protective barriers. Maintenance shall also include chemical treatments as required for fungus and/or pest control.
- C. During the maintenance period, any decline in the condition of seeded areas shall require the Contractor to take immediate action to identify potential problems and to undertake corrective measures.
- D. Watering of Seeded Areas:
  - 1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn or stand of grasses. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least two inches (2").
  - 2. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one (1) complete coverage to the seeded areas in an eight (8) hour period.

E. Protection:

1. Seeded areas shall be protected by a three foot (3') high barrier constructed of two inch by two inch (2" x 2") stakes or iron pipes set eighteen inches (18") in the ground at ten foot (10') intervals and connected by No. 10 wire. Flags of white cloth shall be secured to the wire at center points between stakes.
2. Barriers must be raised immediately after seeding and shall be maintained until Acceptance.

F. After the grass in seeded areas has appeared, all areas and parts of areas which, in the opinion of the Landscape Architect, fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the expense of the Contractor who shall spread the seed by a method approved by the Landscape Architect and during an approved season.

G. Mowing:

1. The Contractor shall keep seeded areas mowed until acceptance of the contract by cutting to a height of two inches (2") when growth reaches three inches (3") or as directed by the Landscape Architect
2. Remove and discard clippings and debris generated by each mowing legally off-site.

H. Fertilizing: A second application of fertilizer, as specified herein, shall be applied after one (1) season of growth of two (2) months duration only during the months of April, May, August or September. Fertilizer shall be applied at the rate of ten (10) lbs. per one thousand (1,000) square feet. A third application of fertilizer shall be applied after two (2) months or the following season as directed by the Landscape Architect. Fertilizer shall be applied at the rate of ten pounds (10 lbs.) per one thousand (1,000) square feet.

### 3.5 ACCEPTANCE

- A. Following the minimum required maintenance period for seeded area construction, the Contractor shall request the Landscape Architect in writing for a formal inspection of the completed work.
- B. At final acceptance of the project all areas shall have a close stand of grass with no weeds present and no bare spots greater than 3 inches (3")

in diameter over greater than five percent of the overall seeded area. At least 90% of the grass established shall be permanent grass species.

- C. Landscape Architect's inspection shall determine whether maintenance shall continue in any part.
- D. After all necessary corrective work and clean-up has been completed, the Landscape Architect will certify in writing the acceptance of the seeded areas. The Contractor's responsibility for maintenance of or parts of seeded areas shall cease on receipt of the Certificate of Acceptance.

(END OF SECTION)



## SECTION 02950 - PLANTING

### 1.0 GENERAL

#### 1.1 REFERENCE

- A. The GENERAL DOCUMENTS, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

#### 1.2 DESCRIPTION

- A. The work of this Section consists of all planting work and related items as indicated on the Drawings and/or as specified herein and includes, but is not necessarily limited to, the following:
  - 1. Soil additives
  - 2. Planting
  - 3. Maintenance
  - 4. Guarantee

#### 1.3 RELATED WORK UNDER OTHER SECTIONS

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

02100	1. SITE PREPARATION	SECTION
02200	2. EARTHWORK	SECTION

02210	3	SITE GRADING	SECTION
02920	4	TOPSOILING, FINEGRADING, SEEDING	SECTION

1.4 STANDARDS AND DEFINITIONS

- A. The following standards and definitions shall apply to the work of this Section.
  - 1. ASNS: "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by the American Association of Nurserymen (AAN)
  - 2. Hortus III, 1976, L.H. Bailey Hortorium.
  - 3. AOAC: Association of Official Agricultural Chemists
  - 4. Pruning Standards: The "Standards for Pruning Shade Trees" of the National Arborist Association, 174 Route 101, Bedford, NH 03102
  - 5. Hillier's Manual of Trees and Shrubs, 1971, Hillier & Sons.
  - 6. Manual of Cultivated Conifers, 1965, P. Den Ouden & B. K.

Boom.A.

1.5 SAMPLES AND SUBMITTALS

- A. Fertilizer: Submit one (1) sample packet of fertilizer and six (6) certificates showing composition and analysis for fertilizer.
- B. Planting Mulch: Submit a one (1) cubic foot sample.
- C. Antidesiccant: Submit manufacturer's product literature.

1.6 EXAMINATION OF CONDITIONS

- A. All areas to be planted shall be inspected by the Contractor before starting work and any defects such as incorrect grading, etc., shall be reported to the Landscape Architect prior to beginning this work. Contractor shall confirm that all proposed tree pits have been over-excavated and backfilled per Drawings prior to planting. The commencement of work by the Contractor shall indicate his acceptance of

the areas to be planted, and he shall assume full responsibility for the work of this Section.

- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing and maintaining plants temporarily and/or rehandling plants prior to final installation.

## 1.7 QUALITY ASSURANCE

- A. Contractor must be knowledgeable of National Arborist Association standards and have at least five (5) years experience involving this work. Contractor must be a licensed contractor or arborist in the State of Massachusetts.

## 2.0 PRODUCTS

### 2.1 LOAM

- A. Loam and testing, thereof shall be as specified in Section 02920.

### 2.2 SOIL ADDITIVES

- A. Additives shall be used to counteract soil deficiencies as recommended by the soil analysis and as approved by the Landscape Architect.
- B. Peat moss used in planting soil mix shall be composed of the partly decomposed stems and leaves of any of several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing A.O.A.C., latest edition. Its water absorbing capability shall be a minimum of 1,100 percent by weight on an oven-dry basis.
- C. Humus shall be manufactured compost. It shall be free from hard lumps and in a shredded or granular form. The acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 65 percent as determined by loss on ignition. The minimum water absorbing ability shall be 200 percent by weight on an oven-dry basis.

- D. Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) shall be agricultural grade; granular form with 90% passing through 100 mesh screen shall be used to modify planting soil in areas indicated on the Plans.
- E. Ground limestone for adjustment of loam pH shall be in accordance with the requirements of Section M6.01.0 of the Standard Specifications.
- F. Sulphur for adjustment of loam pH shall be commercial or flour sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- G. Organic Matter used as an amendment to loam in planting soil mix may be peat moss or humus. Levels of toxic elements and compounds in organic matter shall be below the Massachusetts Department of Environmental Protection Type I standards for sludge and the United States Environmental Protection Agency standards for "Exceptional Quality Sludge", whichever is more stringent, and shall be below the following levels:

<u>Toxic Elements</u>	<u>Maximum Concentration (mg/kg dry weight)</u>
Arsenic	41
Boron	300
Cadmium	14
Chromium	1000
Copper	1000
Lead	300
Mercury	10
Molybdenum	10
Nickel	200
Selenium	36
Zinc	2500
PCBs	1

- H. Sand shall consist of hard, durable grains of quartz or other rock, clean and free from foreign matter or chemical contamination, described as Sand Borrow, Type A, Section 02200-Earthwork.

## 2.3 PLANT MATERIALS

- A. The Contractor shall furnish all plants shown on the Drawings, as specified, and in quantities listed on the PLANT LIST. No substitutions will be permitted without written consent of the Landscape Architect. All plants shall be nursery grown and tagged in the nursery or approved at the site by the Landscape Architect prior to planting.
- B. Plants shall be in accordance with the ASNS Standards of the American Association of Nurserymen. Botanical plant names shall be in accordance with plant designations included in Hortus III and/or Hillier's Manual of Trees and Shrubs.
- C. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Only plant stock grown within hardiness Zones 1 through 5, as established by the Arnold Arboretum, Jamaica Plain, Massachusetts, will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown under Zone 5 or harder conditions. Plants not so certified will not be accepted.
- D. The root system of each plant shall be well provided with fibrous roots. All parts shall be moist and show active green cambium when cut. They shall be sound, healthy, and vigorous, well-branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae.
- E. All plants must be moved with the root systems as solid units with balls of earth firmly wrapped with untreated eight (8) ounce burlap, firmly held in place by a stout cord or wire. Processed or manufactured plant balls will not be accepted unless directed otherwise by the Landscape Architect in writing. Plants prepared with plastic or other non-biodegradable wrappings will not be accepted. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous and root feeding system necessary for the healthy development of the plant. No plant will be accepted when the ball of earth surrounding its roots has been badly cracked or broken preparatory to or during the process of planting or after the burlap, staves, ropes or platform required in connection with its transplanting have been removed. The plants and balls shall remain intact during all operations. All plants that cannot be planted at once must be heeled in by setting in the ground and covering the balls with soil and watering.
- F. Shrubs shall meet the requirements for spread or height stated in the PLANT LIST. The measurements for height shall be taken from the ground level to the average height of the shrub and not to the longest branch. Single stemmed or thin plants will not be accepted. The side branches must be generous, well-twigged, and the plant as a whole

well-branched to the ground. The plants must be in a moist vigorous condition, free from dead wood, bruises or other root or branch injuries. Plants shall not be pruned prior to delivery.

- G. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil together, firm and whole. No plants shall be loose in the container.
- H. Plants delivered by truck and plants requiring storage on site shall be properly wrapped and covered to prevent wind-drying and desiccation of branches, leaves or buds; plant balls shall be firmly bound, unbroken, reasonably moist to indicate watering prior to delivery and during storage and tree trunks shall be free from fresh scars and damage in handling. No trees with double-leaders or twin-heads will be acceptable without the written approval of the Landscape Architect. The Contractor shall reject such plants at time of delivery by the nursery/supplier unless such plants were selected by the Landscape Architect as indicated by tags and seals. No plant material from cold storage will be accepted.

## 2.4 FERTILIZER

- A. Fertilizer shall be provided for each plant through the use of tightly compressed, long-lasting, slow-release fertilizer tablets which are designed and certified by the manufacturer to provide controlled release of fertilizer over a minimum two (2) year period. Each tablet shall consist of 21 grams of water soluble fertilizer with a minimum guaranteed analysis as follows:

Total Nitrogen	20	%
7% water soluble N		
13% water insoluble N		
Available Phosphoric Acid	10	%
Available Potash	5	%
Calcium	2.8	%
Magnesium (water insoluble)	0.5	%
Sulfur	2	%
Boron	0.02	%
Copper	0.05	%

Iron	0.5	%
Manganese	0.05	%
Zinc	0.05	%

## 2.5 MULCH

- A. Bark Mulch. Mulch shall be shredded pine bark mulch aged a minimum of six (6) months and not longer than two years. The mulch shall be dark brown in color, free of dirt, extraneous materials and pieces of wood thicker than one-quarter inch (1/4"). Mulch must be free of stringy material or chunks over three inches (3") in size and shall not contain, in the judgment of the Landscape Architect, an excess of fine particles. Submit sample for the Landscape Architect's approval.

## 2.6 WATER

- A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost to the Owner in accordance with Section 02920. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

## 2.7 ANTIDESICCANTS

- A. Antidesiccants shall be emulsions or other materials which will provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose. Manufacturer of antidesiccant shall be subject to the Landscape Architect's approval and shall be used only after approval by the Landscape Architect. Antidesiccant shall be delivered in containers of the manufacturer and shall be mixed according to the manufacturer's instructions.

## 3.0 EXECUTION

### 3.1 PLANTING

- A. Furnishing and planting of any plant material includes the digging of the holes for individual plants and local excavation required for planting beds, provision of planting soil mix, furnishing the plants of specified size with roots in the specified manner, the labor of planting, fertilizing, mulching, and maintenance.

- B. Contractor shall strictly adhere to the limits of motorized vehicular access as shown on the plans, including allowable limits of machine excavation of plant beds. All work outside the limits of motorized vehicular access shall be done by hand or other approved methods.
- C. The placing of topsoil and loam shall be completed in accordance with Section 0292, prior to beginning the planting operation.
- D. The Contractor shall locate plant material sources and ensure that plants are shipped in timely fashion for installation. It shall be the Contractor's responsibility to locate and install plant material in its proper season for planting. No "Fall Hazard" or "Spring Only" plant material shall be planted in the fall.

E. Seasons for Planting:

Spring:           Deciduous materials - March 21 through May 15  
                           Evergreen materials - April 15 through June 1

Fall:                Deciduous materials - October 1 through December 1  
                           Evergreen materials - August 15 through

October 15

F. Plant Material Inspection:

1. At least one month prior to the expected planting date, the Contractor shall request that the Landscape Architect or his representative select and tag stock to be planted under this Section, at the source Nursery. The Contractor shall pay for the transportation, subsistence and overnight accommodations, if necessary, for the Landscape Architect during the period of time required to select and tag the plant material.
2. The Contractor shall be responsible to certify the availability of required plants in specified sizes from his sources of supply prior to requesting the Landscape Architect to make plant source inspections. In the event that plants at the inspection location are found to be unavailable or of insufficient size, the Contractor shall be liable to reimburse the Owner for all costs of the Landscape Architect's hourly services which are incurred during unproductive inspection trips.
3. Unless specifically designated otherwise, the Contractor or his representative shall accompany the Landscape Architect on all plant material selection field trips.
4. All plants for the project shall be individually tagged for approval with the Landscape Architect's Representative's seals, and no plants shall be accepted for delivery to the site without such seals.



5. Inspection and approval of plants at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work; if the Landscape Architect finds that plants have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, as required, shall be borne by the Contractor.

G. Planting:

1. Locations for all plants and outlines for planting areas shall be staked on the ground by the Contractor for approval by the Landscape Architect before any plant pits or plant beds are dug.
2. Shrub planting beds for mass planting of shrubs shall be excavated and backfilled with planting soil mix to a minimum uniform depth of twenty-four inches (24") below final grade, or as shown on the Drawings.
3. Loam and organic material for planting soil mix for planting beds shall be thoroughly premixed in the proportions of one (1) part of peat moss with two (2) parts on-site topsoil if available from the immediate area and three (3) parts of approved loam or approved topsoil from stockpiles. Maintain at all times during the planting operations one or more stockpiles of approved quality planting soil mix.
4. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation and on the ground until the final planting. Shrubs shall be planted in the center of the holes and at the same depth as they previously grew. Before the final layer of backfilling, remove burlap, rope, wires, etc. from the upper third of the root balls. Do not pull burlap out from the sides or under root balls. Planting soil mix shall be backfilled in layers of not more than six inches (6") and each layer watered sufficiently to settle before the next layer is put in place. Enough planting soil mix shall be used to bring the surface to finished grade when settled. A saucer shall be formed around each plant at a depth of four inches (4") for shrubs.

H. Fertilizer

1. Fertilizer tablets shall be added after the plant has been placed in the hole. Install fertilizer tablets at a depth of 6 to 8 inches equally spaced around the plant as it is being backfilled. Tablets shall be placed approximately one inch away from the plant roots or plant ball. Do not place tablets in the bottom of the hole.

2. Tablets shall be applied according to plant size. The application rates for fertilizer tablets shall be as follows:

<u>Type of Plant</u>	<u>Fertilizer Rate</u>
spread Shrubs	One tablet for each 12 inches of height or

Application for container plants shall be as follows:

Shrubs/Perennials

<u>Container Size</u>	<u>Tablets per Plant</u>
1 Gallon	1
2 Gallon	1-2
3-5 Gallon	2-3
5-7 Gallon	3-5
7-15 Gallon	5-15

- I. All plants shall be watered immediately following planting and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit.
- J. Mulch material shall be placed over entire area of mass planting beds except as noted below. Mulch shall be three inches (3") deep for shrub beds. No mulch shall be applied prior to the first watering of plant materials.
- K. Pruning:
  1. Each plant shall be pruned in accordance with the workmanship requirements of "Pruning Standards" to preserve the natural character of the plant.

- L. Antidesiccant shall be applied to all plants before digging at the nursery and/or as directed by the Landscape Architect once the plants have been delivered to the site.
- M. If planting is done after lawn preparation or installation, proper protection of lawn areas shall be provided and any damage resulting from planting operations shall be repaired immediately at no cost to the Owner.
- N. In the event that rock or underground construction work or obstructions are encountered in any plant pit or bed excavation work to be done under this Contract, alternate locations may be selected by the Landscape Architect.
- O. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition as directed by the Landscape Architect, at no cost to the Owner.

### 3.2 MAINTENANCE

- A. Following completion of all plant material installation, the Contractor shall request the Landscape Architect in writing for a formal inspection of the planting work. If plant materials and workmanship are acceptable, written notice will be given by the Landscape Architect to the Contractor stating that the work has received provisional acceptance, subject to maintenance requirements noted herein, and that the guarantee period has commenced from the date of provisional acceptance.
- B. If a number of plants are sickly or dead at the time of inspection, or if in the Landscape Architect's opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. All dead and unsatisfactory plants shall be removed promptly from the project. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner.
- C. Maintenance shall begin immediately after each plant is planted and shall continue for a minimum of one year following provisional acceptance of all planting installations. All additional conditions required to promote healthy growth of the installed plant material, whether specified or not, are the responsibility of the Contractor and no additional compensation will be allowed. Successful completion of contract requirements shall be based only on healthy, vital, and measurable plant growth.
- D. Maintenance shall consist of keeping the plants in a healthy growing condition and shall include but is not limited to watering, weeding,

cultivating, re-mulching, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.

1. Plants shall be inspected for watering needs at least twice each week during the growing season and watered as necessary to promote plant growth and vitality.
  2. Mulched planting beds shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.
  3. Plants that die or show obvious decline, loss of 25% of healthy growth during the maintenance or guarantee period, shall be removed and replaced at once, unless designated otherwise by the Landscape Architect.
  4. Spraying for both insect pests and diseases shall be included during the maintenance period as required and as directed.
- E. During the maintenance period, any decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures.

### 3.3 GUARANTEE

- A. Plants shall be guaranteed for a period of one (1) year after provisional acceptance and shall be alive and in satisfactory growth at the end of the guarantee period.
- B. At the end of the guarantee period, a final inspection will be held to determine whether any plant material replacements are required. Each plant shall show at least 75% healthy growth and shall have the natural character of the plant of its species as determined by the Landscape Architect. Plants found unacceptable shall be removed promptly from the site and replaced during the normal planting season, until the plants live through one year. A final inspection for acceptance will be made after the replacement plantings have lived through one (1) year.
- C. All replacements shall be plants of the same kind and size specified in the PLANT LIST. The cost shall be borne by the Contractor, in all cases. Under no circumstance shall the Contractor be relieved of his responsibility to replace plants due to unforeseen conditions.

### 3.4 ACCEPTANCE

- A. Following a minimum one (1) year maintenance period (coincidental with the one year guarantee period) after provisional acceptance, the Contractor shall request the Landscape Architect in writing for a formal inspection of the planting work.
- B. If plant materials and workmanship are acceptable at the end of the maintenance/guarantee period, written notice will be given to the Contractor stating that the work has received final acceptance.
- C. Final acceptance of the planting work shall be established by the Landscape Architect in writing, following the completion of all maintenance work and guarantee requirements as specified herein, and following the correction of all punch list deficiencies by the Contractor.

(END OF SECTION)

## SECTION 02990 - MISCELLANEOUS WORK AND CLEANUP

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. Furnish all labor, materials, equipment and incidentals necessary to complete the work under this section that includes operations which cannot be specified in detail as separate items, but can be sufficiently described as to the kind and extent of work involved.
- B. The work of this section includes, but is not limited to the following:
  - 1. Cleaning Up
  - 2. Incidental Work

#### 1.2 Cleaning Up

- A. The Contractor shall remove all construction material, excess excavation, buildings, equipment or other debris remaining on the job as a result of construction operations and shall render the site of the work in a neat and orderly condition.

#### 1.3 Incidental Work

- A. Do all incidental work not otherwise specified but obviously necessary to the proper completion of the Contract as specified and as shown on the Drawings .

## SECTION 03300 - CONCRETE

### 1.0 GENERAL

#### 1.1 Related Documents:

- A. All of the Contract Documents (including General and Supplementary Conditions and Division 1 General Requirements) apply to the work of this section.

#### 1.2 Description of Work

- A. The work of this section includes all cast-in-place concrete required for the project including but not limited to concrete, footings, bases, equipment pads, conduit enclosures, and other miscellaneous concrete work.

#### 1.3 Related Work Specified Elsewhere

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section.

Carefully review all of the Contract Documents for inserts, conduits, sleeves, anchors and all other items which must be cast into concrete construction.

Items needed to be embedded in concrete work are not described in detail and must be determined through careful coordination of all subcontractors and building trades:

#### 1.4 Quality Assurance

- A. Testing Agency: The Owner may provide the services of an independent testing agency acceptable to the Engineer, to test and evaluate materials, and to certify the work of this section.

Certificates signed by the concrete producer may be submitted by the Contractor instead of material testing when acceptable to the Engineer.

- B. Quality Control: The Contractor shall perform testing and sampling during concrete work as follows:

1. Sample Concrete in Compliance with ASTM C172.
2. Make one slump test in compliance with ASTM C143 for each load at discharge from truck.
3. Make one air content test in compliance with ASTM D173 for each set of compressive strength specimens.
4. Make one set of compressive strength tests in compliance with ASTM C39 for each fifty (50) cubic yards of concrete or fraction thereof. Test one specimen at

seven (7) days, one specimen at twenty-eight (28) days and retain one specimen for future testing if needed

- C. Reference Standards: Strictly comply with the following referenced standards.
1. ACI 318 Building Code Requirements for Reinforced Concrete.
  2. ACI 301 Specifications for Structural Concrete and Buildings.
  3. ACI 614 Recommended Practice for Measuring, Mixing and Placing Concrete
  4. ACI 306 Recommends Practice for Cold Weather Concreting.
  5. ACI 347 Recommended Practice for Concrete Formwork.
  6. ACI 315 Recommended Practice for Detailing Reinforced Concrete Structures.
  7. ACI 302 Recommended Practice for Concrete Floor and Slab Construction.
  8. CRSI Reinforced Concrete - A Manual of Standard Practice.
  9. CRSI Recommended Practice for Placing Reinforcing Bars.
  10. CRSI Recommended Practice for Placing Bar Supports.

#### 1.5 Mix Design

- A. Mix Design: Mixes shall be proportioned in compliance with ACI 301. Provide concrete of a consistency which will work easily into corners and around reinforcement with a method of placement used which will not cause segregation of the mix or allow excess free water to collect on the surface. The Contractor shall provide concrete having the following characteristics:
1. Compressive Strength: 3000 psi at twenty-eight (28) days minimum.
  2. Slump: Three (3) to four (4) inches.
  3. Entrained Air Content: 4% to 6% for concrete exposed to freezing and 2% to 4% for all other.
  4. Maximum Aggregate Size: 3/4".
  5. Minimum Cement Content: 5.5 sacks of cement per cubic yard of concrete.
- B. Mix Design Revisions: When necessary because of job conditions, weather, test results or other reasonable circumstances, mix design may be adjusted if submitted to and accepted by the Engineer in advance of use.



## 1.6 Submittals

- A. Product Data: The Contractor shall submit manufacturer's product data installation instructions. Use limitations and recommendations for each proprietary material used and for all other materials as requested by the Engineer and provide certifications stating that materials comply with requirements.
- B. Shop Drawings: The Contractor shall provide:
  - 1. Shop drawings for fabrication, installation and erection of steel reinforcing.
  - 2. Sufficient information and detail so that reinforcing can be placed without the use of the Contract Drawings.
  - 3. Information on the number of pieces, sizes, grade of steel, accessories, and all other information needed for fabrication and placement.
  - 4. Drawings showing coordination of reinforcing with all items which are to be embedded into concrete construction.
- C. Mix Designs: The Contractor shall submit written reports for each proposed mix design at least fifteen (15) working days in advance of the start of work, including specific information on quantities of admixtures and water use.
- D. Test Reports: The Contractor shall submit certified reports for required tests within forty-eight (48) hours after tests are made. Three copies each shall be provided to the engineer, contractor, and the concrete producer.
- E. Day Slips: The Contractor shall provide concrete delivery slips showing job name and location, date and time of delivery, quantity of concrete, quality and type of concrete admixtures, and all other relevant information. Slips shall be submitted at the end of each week.

## 1.7 Project Conditions

- A. Weather: The Contractor shall protect concrete from damage and reduced strength or performance due to weather conditions during mixing, placing and curing.
- B. Cold Weather: Unless special precautions are taken to protect concrete, the Contractor shall not work when temperatures are below 40 degrees F or when temperatures are expected to fall below 40 degrees F within seventy-two (72) hours after placing concrete. The Contractor shall:
  - 1. Comply with ACI 306 in cold weather.
  - 2. Maintain concrete temperature of at least 60 degrees F. Reinforcement, forms and ground in contact with concrete shall be free of frost.

- 3 Keep concrete and formwork at least 50 degrees F for at least ninety-six (96) hours after placing concrete.

The use of calcium chloride in any form is not permitted.

- C Hot Weather: Concrete, when deposited, shall be less than 80 degrees F. The Contractor shall cool the mix in a manner acceptable to the Engineer if the concrete temperature is higher and comply with ACI 305 in hot weather.

## 2.0 PRODUCTS

### 2.1 Materials and Products

- A. Portland Cement: ASTM C150 type as required. Use only one brand of cement throughout the project.

Temperature of cement shall not exceed 140 degrees F when delivered to batching plant.

- B. Aggregates: ASTM C33. Fine aggregate shall be graded from one-quarter (1/4) inch to fines and coarse aggregate from one-quarter (1/4) inch to size specified.
- C. Water: Potable free from all impurities which are detrimental to concrete.
- D. Air-Entraining Admixture: ASTM C260; use only admixtures which have been accepted in mix designs and provide one of the following products:
  1. W.R. Grace, Darex AEA
  2. Master Builders, MBVR
  3. Sika Chemical, Sika AER
- E. Water-Reducing Admixture: ASTM C494; use only admixtures which have been accepted in mix designs and one of the following products:
  1. W.R. Grace, WRDA
  2. Master Builders, Pozzolith
  3. Sika Chemical, Plastocrete
- F. Reinforcing Bars: ASTM A615. Grade 60. New, deformed unless indicated otherwise. Tag and identify reinforcing with waterproof marks for checking, sorting, and placing.

- G. Welded Wire Fabric: ASTM A185. New, rectangular Tag and identify reinforcing with waterproof marks for checking, sorting, and placing.
- H. Formwork: The type of forms used shall be at the discretion of the Contractor but shall be suitable to provide straight, flat, accurately aligned surfaces within specified tolerances. Where exposed to view in the finished work, formwork shall be new and capable of providing exposed surface as specified.
- I. Ready-Mix Concrete: Shall comply with ASTM C94, except where more restrictive requirements are specified in this section. The batch plant shall be certified in compliance with National Ready-Mixed Concrete Association standards.
- J. Tie Wire: 16 gage minimum, galvanized steel wire complying with ASTM A82.
- K. Form Release Coating: The Contractor shall provide a non-staining release coating which does not leave a residue on the finished concrete which would impair later bonding to concrete surfaces. Provide one of the following products:
  - 1. Nox-Crete Form Coating. Nox-Crete Company
  - 2. Arcal-80. Arcal Chemical Company
  - 3. Synthex. Industrial Synthetics Company
- L. Grout: Provide non-shrink, 5000 psi minimum grout. Provide one of the following products:
  - 1. U.S.Grout Corporation. Five Star Grout
  - 2. Sonneborne. Sonogrout
  - 3. Master Builders. Embeco
  - 4. Upcon. High Flow

### 3.0 EXECUTION

#### 3.1 Inspection

- A. The Installer/Erector shall examine substrates supports and conditions under which this work is to be performed and notify the Contractor in writing of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.

#### 3.2 Formwork

- A. Securely construct and brace formwork to provide concrete members and structures of sizes, shapes, elevations, profiles, alignments and positions indicated within specified tolerances.
- B. Provide openings and sleeves in formwork to accommodate work of other trades. Coordinate installation to ensure correct sizes and locations.
- C. Clean and adjust forms immediately prior to placing concrete. Apply form release agent to aid form removal before placing reinforcing steel.
- D. Remove standing water from formwork before placing concrete. Except in freezing weather, wet soil bearing immediately before placing concrete but do not soften bearing surfaces.

### 3.3 Reinforcement

- A. Place and tie reinforcing in position and secure against displacement. Tie all splices and at least 25% of all intersections but in no case tie less than necessary to maintain secure position.

Except as indicated otherwise, lap splices at least forty (40) bar diameters. Stagger splices in adjacent bars. Maintain clear spacing between parallel bars at least the greatest of the following: one and one-half (1 1/2) inches the maximum aggregate size, or two (2) times the bar diameter.

- 1. Provide chairs, bolsters, spacers, and hangers as needed to maintain at least minimum concrete coverage over steel. Provide plastic-tipped accessories where finished work will be exposed to view. Turn tie wire back into center of form to avoid exposed wire.
- B. Do not rebend or rework steel reinforcing at the site.

### 3.4 Joints

- A. At locations indicated or accepted by the Engineer, provide construction isolation, contraction, and control joints as needed to control cracking and/or differential settlement. Provide shear transfer dowels and galvanized steel keyway sections at construction and control joints.

### 3.5 Embedded Work

- A. The Contractor shall build into work all items indicated and required to be embedded into cast-in-place concrete and accurately place embedded items using templates and setting diagrams provided with embedded items by other trades.
- B. The Contractor shall not embed any wood into concrete.

- C. The Contractor shall pay for all cutting, patching and remedial work necessary because of failure to properly place and coordinate embedded items.

### 3.6 Concrete Mixing, Transport and Placement

- A. Ready-mixed concrete from plant shall be dispatched at intervals not exceeding 30 minutes. Keep drums in constant rotation during transportation and delivery. Water shall not be added during transit nor at the job site without the written permission of the Engineer.
- B. The Contractor shall provide at least seventy-two (72) hours advance notice to the Engineer before placing any concrete. Obtain Engineer's approval of soil bearings for footing and slabs before placing concrete.
- C. Concrete shall be placed continuously and in compliance with ACI, except where more restrictive requirements are specified. Place concrete within ninety (90) minutes after the cement has been mixed with the aggregate or within forty-five (45) minutes after the addition of water and admixtures. The Contractor shall:
  - 1. Avoid excessive handling and flowing of concrete. Avoid segregation of the mix.
  - 2. Not drop concrete "freefall" for more than six (6) feet without the use of elephant trunks.
- D. Pumping of concrete will be permitted only if the Contractor provides full-time independent inspection and testing acceptable to the Engineer and the cost of this special inspection and testing is included in the base Contract Price.
- E. The Contractor shall consolidate concrete with electric/mechanical vibrating equipment acceptable to the Engineer to eliminate honeycombs and air pockets and to ensure full coverage of reinforcing steel. Avoid over vibration and do not use vibrators to move concrete within forms.

### 3.7 Finishes

- A. Surfaces Exposed in the Finished Work. Contractor shall:
  - 1. Provide smooth uniform surfaces that appear monolithic.
  - 2. Remove fins and projections.
  - 3. Fill and patch voids with fine concrete grout. Rub entire surface with burlap bags and neat cement paste or other acceptable technique to create a fine textured, uniform "plaster-like" surface.

### 3.8 Curing

- A. Curing shall begin immediately after placement and preliminary finishing. Keep concrete continuously moist for at least 7 days after placement.
- B. Slabs shall be cured with use of membrane forming curing compound applied in strict compliance with manufacturer's instructions and recommendations. Protect fresh concrete surfaces from drying winds, rain soiling, and damage with plastic film sheeting as needed.

3.9 Tolerances

- A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Document and shall not be added to allowable tolerances indicated for other work:
  - 1. Allowable Variation for Plumb, Level and Line + 1/8 in 10'0"
  - 2. Allowable Variation from True Wall Thickness + 1/4"
  - 3. Allowable Variation from True Plane of Adjacent Surfaces + 1/8" before finishing; after finishing joints shall be flush and invisible.

(END OF SECTION)

## SECTION 11305 - SUBMERSIBLE PUMP STATIONS

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. Pump Stations shall consist of the furnishing of all equipment, labor, tools and machinery for the construction of a complete and operational submersible pump stations with all necessary fittings and appurtenances as shown on the Drawings, Pump Station Equipment Matrix and specified herein. Pump stations shall include pumping equipment, piping, valves, tanks, access materials, electrical equipment, instrumentation, control cabinet, all excavation refill and restoration and all appurtenant work within the pump station site as shown on the drawings.

#### 1.2 Work Specified Elsewhere

- A. Site work is specified in Division 2.
- B. Concrete cast-in-place is specified in Section 03300.
- C. Precast concrete is specified in Section 02601, and Section 03300.
- D. Structural steel and miscellaneous metals are specified in Division 8.
- E. Wood screening fence is specified in Section 02825.
- F. Generator is specified in Section 16000.
- G. Electrical work is specified in Section 16000.

### 2.0 MATERIALS

- 2.1. The Contractor shall furnish, install and make operational the following two Submersible Pumping Stations as specified herein and as shown on the Contract Drawings. Pump data is provided on the Pump Station detail sheets.
- 2.2. The Contractor shall furnish the following materials as specified in this or other sections of this Specification.
  1. Circuit breaker panelboard, electric meter base, control cabinet, piping, wiring fasteners, alarm terminal strip and housing, and all else necessary for complete installation.
  2. Control panel, pump controls, alarm contacts and wiring, and panelboard for the pump station installation shall be housed in a free-standing, rain-tight, pad-mounted cabinet.

3. Electric meter base shall meet local electric company requirements for a vandal resistant meter

## 2.3 Manufacturer's Responsibilities

- A. The Contractor shall be responsible for obtaining the following services, tests and information from the manufacturer of the equipment.

### B. Operational Test

1. The pumps, motors, and controls shall be given an operational test in accordance with the standards of the Hydraulic Institute. Recordings of the test shall substantiate the correct performance of the equipment at the design head, capacity, suction lift, speed and horsepower as herein specified.
2. The Engineer and his representative shall witness the operational test at the manufacturer's facility or other location designated by the manufacturer.

### C. Pump Chamber Test

1. The pump chamber shall be tested for structural strength and watertight integrity predicated on depth of setting by subjecting the chamber to a minimum vacuum test of fifteen (15) inches or more of mercury for thirty (30) minutes.
2. Alternative testing shall be an exfiltration test as specified in Section 02601.

### D. Support Literature

1. The manufacturer of the pump station shall be responsible for delivery to the Engineer of six (6) copies of the support literature required herein.
2. Shop Drawings: Six (6) sets of shop drawings including manufacturer's data sheets, showing illustrated cuts of the item(s) to be furnished, scale details, sizes, dimensions, capacities, performance characteristics, wiring diagrams, controls, and other pertinent information shall be submitted to the Engineer for review and approval. If more than one size or type is shown, indicate clearly intended item(s).
3. Installation Instructions: Installation of the pump station and related appurtenances shall be performed in accordance with written instructions by the manufacturer.
4. Operation and Maintenance Instructions: The pump station manufacturer shall be responsible for supplying six (6) sets of written instructions, which shall be sufficiently comprehensive to enable the operator to operate and maintain the pump station and all equipment supplied by the station manufacturer. Said instructions shall assume that the operator is familiar with pumps, motors, piping,



and valves, but that he has not previously operated and/or maintained the exact equipment supplied.

5. These instructions shall be prepared as a systems manual applicable solely to the pump station and equipment supplied by the manufacturer to these specifications, and shall include those devices and equipment for which the station manufacturer has made mounting or other provisions, but which he has not supplied, may be excluded from these instructions. These instructions shall include, but not be limited to, the following:
  - a. Descriptions of, and operating instructions for, each major component of the pump station as supplied.
  - b. Instructions for operation of the pump station in all intended modes of operation.
  - c. Instructions for all adjustments which must be performed at initial startup of the pump station, adjustments which must be performed after the replacement of level control system components, and adjustments which must be performed in the course of preventive maintenance as specified by the manufacturer.
  - d. Instructions for the adjustment, calibration, and testing of selected electronic components or assemblies, normally considered replaceable by the manufacturer, whose performance is not ascertainable by visual inspection.
  - e. Service instructions for major components not manufactured by the pump station manufacturer but which are supplied by him in accordance with these specifications. The incorporation of literature produced by the actual component manufacturer shall be acceptable.
  - f. Electrical schematic diagram of the pump station as supplied, prepared in accordance with NMTBA and JIC standards. Schematics shall show, to the extent of authorized repair, pump motor branch, control, and alarm system circuits, and interconnections among these circuits. Wire numbers shall be shown on the schematic. Schematic diagrams for electronic equipment, the detail parts of which are normally repairable by the station operator, need not be included, and shall not be substituted for an overall schematic diagram. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall schematic diagram.
  - g. Layout drawing of the pump station as supplied, prepared in accordance with good commercial practice, showing the locations of all pumps, motors, valves and piping.

Operation and maintenance instructions which are limited to a collection of component manufacturer literature without overall pump station instructions shall not be acceptable.

Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications.

Instruction manuals applicable to many different configurations and pump stations, and which require the operator to selectively read portions of the instructions, shall not be acceptable.

## 2.4 General

- A. Pump station shall be a complete duplex unit and shall include two sewage pumps, mercury switch level controls, discharge piping, discharge elbow, guide rails and supports, and lifting ropes. Pumping equipment shall be installed in a precast reinforced concrete cylinder wet well and valve pit, each with a concrete cover, and an access cover. Installation and location shall be as shown on the contract drawings

## 2.5 Pumps

- A. Furnish and install dual seal submersible grinder pumps, as shown on the drawings. All pumps shall be Series 1GA81H1GD Submersible Grinder Pumps, as manufactured by Goulds Pumps.

### B. Pump Design

1. Each pump shall have a capacity, total dynamic head (TDH), horsepower, and electrical requirements, as shown on the pump station drawing in the contract drawings. Pumps shall be capable of handling, and specifically designed for, raw sewage. The pump(s) shall be automatically connected to the discharge piping when lowered into place on the guide rail system, requiring fasteners, handling or seals to effect sealing to the discharge connection.
2. Pumps shall have 2" NPT vertical discharge. The pump shall be capable of grinding domestic and commercial raw sewage containing small quantities of plastic, rubber, cloth, paper and non-abrasive solids.

### C. Pump Construction

1. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel or brass construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic

dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

2. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Vitron rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
3. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

#### D. Volute

1. Pump volute shall be of grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.

#### E. Impeller

1. The impellers shall be of grey cast iron, Class 35B, dynamically balanced, single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Impellers shall be taper collet fitted and retained with an allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

#### F. Grinder Assembly

1. The pump shall contain special cutters to reduce sewage to a fine slurry. The stationary cutter shall be constructed of hardened 316L stainless steel. The rotary cutter shall be constructed of chrome-alloyed cast iron. The cutter materials shall provide corrosion and abrasion resistance.

#### G. Motor

1. The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 104 ° F (40° C) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal

switches set to open at 260° F (125° C) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and pump shall be designed and manufactured by the same source

2. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 104° F (40° C) ambient and with a temperature rise not to exceed 176° F (80° C).

#### H. Bearings

1. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular bearing to compensate for axial thrust and radial forces. Sleeve or single row lower bearings are not acceptable.

#### I. Cooling Systems

1. Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

#### J. Pump Shaft

1. The pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. The shaft shall be AISI type 420 stainless steel.
2. The use of type 420 stainless steel shaft sleeves and shaft material of lower quality than 420 stainless steel shall not be allowed or considered equal. This is because a shaft sleeve only protects the shaft around the lower mechanical seal and in the oil housing and above.

#### K. Mechanical Seal

1. Each pump shall be provided with a tandem mechanical shaft sleeve consisting of two totally independent seal assemblies. The seals shall operate in a lubricated reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and lubricant chamber, shall contain one stationary and one positively driven rotating ceramic ring. Seal lubricants shall be FDA approved, non-toxic. The upper, secondary seal unit, located between the lubricating chamber and the motor housing, shall contain one stationary hard faced steel ring and one positively driven rotating hard face steel ring. Refer to nomenclature page for specific seal materials. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both

mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.

2. The following seal types shall be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common or single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.
3. Each pump shall be providing with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication.

#### L. Cable Entry Seal

1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. Epoxies, silicones or other secondary sealing systems shall not be considered acceptable.

#### M. Power Cable

1. Lifting rope shall be 3/8"; polypropylene rated a minimum 200 pound working strength. Lifting ropes shall be attached to the pump with corrosion proof hardware. Loose end of rope shall terminate with stainless steel clip for attaching to 3/4" opening eyebolt. Rope shall be tied to provide 6-inch diameter lifting loops at 3-foot intervals.
2. The power cable shall be sized according to NEC and ICEA standard and shall be sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

#### N. Protection

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 260° F (125° C) the thermal switches shall open, stop the motor and activate the alarm.
2. A leakage sensor shall detect water in the stator chamber. When activated, the FLS, when connected to a Mini CAS, will send an alarm and, if desired, stop the motor.
3. The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS is designed to be mounted in any control panel. Use of voltage sensitive solid state sensors and trip temperature above 260° F (125° C) shall not be allowed.

## 2.6 Guide Rails

- A. Pump guide rails and lifting chain shall be galvanized steel of the size required by the manufacturer for proper placement and removal of the pumps.

## 2.7 Wet Well and Valve Chamber

- A. The pump station wetwell and valve chamber shall be a precast concrete tank of the dimensions shown on the Drawings meeting all requirements of Section 03300.

The Contractor shall core drill holes in the walls of pump chamber and valve pit of a diameter and a sufficient quantity to allow completion of the installation. Such holes shall be provided for electrical, controls, wiring, pump discharge line and inlet pipe. After drilling the holes, the appropriate sleeves, conduits and piping shall be sealed into place by methods specified in Section 03300.

## 2.8 Access Cover

- A. Access cover shall be type J-AL H20 as manufactured by the Bilco Company, or equal, installation shall be in accordance with manufacturer's recommendations.
- B. Cover shall be supplied with cable hangers and upper guide rail brackets for pump slide rail system.
- C. Access cover drain shall be piped to an adjacent drywell, using 1 ½" diameter SCH 80 PVC pipe, as shown on the drawings.

## 2.9 Pipe

- A. Ductile iron and PVC pipe installed in the pump station conform to the requirements of Section 02616 and Section 02622. All piping in valve pit shall be heat traced for freeze protection. Heat tracing shall be designed to maintain a minimum fluid temperature of 40°F in accordance with manufacturer's guidelines. Thermostat and disconnect switch shall be provided at each structure. Heat tracing shall not contact any part of the flow meter housing.

## 2.10 Valves

- A. All pumping station isolation valves shall be eccentric plug valves as specified herein and shall be DeZurick of equal. Plug valves shall be of non-lubricated eccentric type with resilient faced plugs with flanged connections. Port areas of all plug valves shall be at least 80% of full pipe area. Valve bodies shall be ASTM A126 Class B cast iron in compliance with AWWA Standard C504 Section 5.4. All exposed nuts, bolts, springs, washers, etc. shall be zinc plated or stainless steel. Resilient plug facings shall be of neoprene, suitable for use with sewage. All exposed nuts and bolts threads shall be coated with a lubricant such as "Never SeeZ" or equal. Valves shall be furnished with corrosion resistant seats and replaceable, sleeve-type bearings. Valves shall be capable of providing drip-tight shut-off up to the full rating with pressure in either direction. All wetted parts shall be of materials suitable for continuous contact with septic tank effluent.
- B. Check valves shall be furnished and installed on pump discharge lines where shown on the Drawings. Check valves shall be ASTM A126 Class B cast iron body, with flanged connections faced and drilled to ANSI B16.1 Class 125 standard template, bronze-fitted with resilient seating, full opening, adjustable weighted lever type with stainless steel shaft. Check valves shall meet the hydrostatic test requirements of AWWA C509, Section 5. Valves shall be supplied with a coat of the manufacturer's standard shop primer.

## 2.11 Pump Controls

- A. A circuit breaker and a magnetic starter with overload protection shall be provided for each pump. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. Starters shall have auxiliary contacts to operate both pumps on override condition. Adjustable delay circuitry shall be provided to reduce the starting electrical load should both pumps be called to start. An interlock relay shall be provided to automatically reconnect the control circuit in case of circuit breaker trip on one pump. H-O-A switches, run lights and run time meters shall be included for each pump. Terminal strips shall be provided for connecting pump and control wires. Additional terminals shall be provided to connect alarm system. A transformer shall be supplied to give 24 volt control circuit power. The transformer shall be sized to meet the requirements of the control circuitry. Pump controls shall be supplied by the manufacturer of the pumps.

Resin encased float type mercury switches shall be installed to control pump operations and alarm signal. Float switches shall be supplied by manufacturer of the pumps and the pump control system. Support/control wire shall have a heavy Neoprene jacket. Control wire shall be continuous to the junction box terminal strip without splicing. One switch shall be for lead pump start, one for low level alarm, one for pumps stop, and one for lag pump start. A fifth switch shall be provided for high water alarm.

On sump level rise the lower mercury switch shall first be energized, then upper level switch shall next energize and start lead pump. With lead pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. Alternating relay shall index on stopping of pump so that lag pump will start on next operation. If sump level continues to rise when lead pump is operating, override switch shall energize and start lag pump. Both lead and lag pump shall operate together until low level switch turns off both pumps. If level continues to rise when both pumps are operating, alarm switch shall energize and signal the high water alarm. If one pump should fail for any reason, the second pump shall operate on the override control and the lead pump failure alarm shall signal.

## 2.12 Pump Control Panel

- A. Pump controls shall be housed in a watertight, NEMA 4X enclosed cabinet. The control panel and all associated monitoring equipment displays shall be housed in the same cabinet as the electrical supply. The Electrical and Control Cabinet is specified in Section 16000.

The following components shall be provided in the cabinet:

1. Plastic wireways shall be provided for routing wiring within the cabinet. Wireway shall be 1-1/2 inch x 1-1/2 inch constructed of high impact extruded vinyl with open side slots and snap-on cover. Wireway shall be by Taylor Industries, Inc. Type "OA" or equal.
2. Terminal strips of the solderless box lug type, rated 600 volts, with mounting tracks, mounting assembly kits, marking strips, shall be provided as indicated. The number of terminal strips shall be provided as required to connect all alarm and control wires terminating in the enclosure. Four spare terminals shall be provided. Terminal strips, etc. shall be Class 9080, Type K, as manufactured by Square D Company.
3. Control relays shall be miniature plug-in type with 120 volt coil and three pole double throw contacts rated not less than 10 amperes, 120 volts. Relays shall be provided with dust cover enclosure and suitable socket bases with screw type terminals. Control relays shall be Square D Company Class 8501 Type KP with Type NR sockets.
4. Timing relays shall be solid state, or delay type with two pole double throw contacts rated 10 amperes at 120 volts, 120 volt coil and adjustable timing range of 1.8 to 180 seconds. Timing relays shall be Square D Class 8501, Type J with type NR socket.

Alarm and control cabinet with all appurtenances shall be assembled and supplied by one manufacturer, Wincom Corp., or equal.

## 2.13 Flowmeter



- A. An inline electromagnetic flow meter system shall be installed as shown on the plans and in accordance with the manufacturer's recommendations.

The flow meter system shall operate on the principle of electromagnetic induction, with a pulsed DC excitation frequency, and shall produce a signal output that is directly proportional and linear with the volumetric flow rate of the liquid flowing through the metering tube.

The metering system shall include a metering sensor tube (Detector Head), a signal amplifier, and the necessary connecting wiring. The flow meter shall be manufactured by Badger Meter or approved equal.

B. Metering Tube

1. The metering tube shall be constructed of 316 Stainless Steel, and rated for a standard working pressure of 150 PSI (300 PSI when required).
2. The end connections shall be Carbon Steel flanged, according to ANSI B16.5 Class 150 standards (or ANSI B16.5 Class 300 where applicable).
3. The insulating liner material shall be made of a hard rubber elastomer suitable for potable water, in conformance with manufacturer's recommendation for the intended service or NSF listed model with PTFE liner material.
4. The detector head metering tube shall include two self-cleaning measuring electrodes.
5. The detector head shall include a third Empty Pipe detection electrode located in the upper portion of the inside diameter of the flow tube in order to detect an empty pipe condition, when the flow tube is running partially empty. Empty Pipe detection that is not activated until 50% of the pipe is empty is not acceptable.
6. The electrodes material shall be corrosion resistance Alloy C (or 316 Stainless Steel).
7. The detector head housing shall be constructed of carbon steel, welded at all joints, and rated to meet NEMA 4 standards.
8. In its submersible option, with remote electronics, the detector head housing shall meet NEMA 6P standards including the junction box for remote electrical connections.
9. When installed in non-metallic or internally lined piping, the detector head shall be provided with a pair of stainless steel corrosion resistance grounding rings.

C. Signal Amplifier

1. The signal amplifier shall be microprocessor based, and shall energize the detector coils with a digitally controlled pulsed DC, low excitation frequency.
2. The signal amplifier shall feature a precise signal management software to ensure the capture of up to 42 flow measurement sample points per second, thus providing an accurate averaging of the process generated signal.
3. The amplifier shall include a non-volatile memory chip capable of storing all programmable data and accumulated totalizer values in the event of a power interruption.
4. Automatic zero stability, low flow cut-off, empty pipe detection and bi-directional flow measurement shall be inherent capabilities of the signal amplifier.
5. The amplifier shall include a 4 line, 16 characters, backlit LCD display to display simultaneously the following values:
  - Flow Rate in selected unit of measure
  - Forward flow totalizer in selected unit of measure
  - Reverse flow totalizer/Externally Reset totalizer in selected unit of measure
  - Current software revision number/Error or alarm messages.

The display shall be located in the Electrical and Control Cabinet.
6. The signal amplifier shall be provided with all the basic operating functions already pre-programmed as per customer's request. No field programming shall be necessary upon power-up. The amplifier software shall include the option to program a customer's selected password for tamper protection.
7. The signal amplifier shall include a three button programming keypad, easily accessible through front cover for special programming and/or changes. The programming functions shall be available in a user-friendly menu driven software through the 4 line LCD display interface.
8. In addition to the LCD display interface, the amplifier shall provide:
  - Two scaled pulse outputs: one forward and one reverse.
  - One Current (4-20 or 0-20 mA) analog output, 800 Ohms max. load.
  - Two separate flow monitoring alarm output relays (maximum and minimum flow alarms).
  - One hardware and/or internal errors alarm output relay.
9. All outputs shall be galvanically isolated to 500 volts.

10. The power supply shall be 85/265 VAC 50/60 Hz, 20 VA.
11. The amplifier housing shall be rated to meet NEMA 4X standards and be constructed of cast aluminum.

#### D. System Performance and Calibration

1. The metering system shall perform to an accuracy better than  $\pm 0.25\%$  of rate over a flow velocity range from 1.0 to 39.4 feet per seconds. The accuracy performance shall be  $\pm 0.5\%$  of rate for flow velocities between 0.1 and 1.0 feet per second.
2. The metering system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 5 micromhos/centimeter.
3. The system measuring repeatability shall be 0.1% full scale.
4. Each meter shall be hydraulically calibrated in an ISO 9000 certified testing facility which utilizes a computerized gravimetric testing method with a measuring uncertainty of 0.1%.
5. Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow for each size.

#### 2.14 Pressure Gauge

- A. A pressure gauge shall be provided on the discharge pipe from each pump, as shown on the drawings. Pressure gauges shall be NEMA 4X, watertight, and be equipped with analog output capabilities to allow for transmitting the 4-20mA signal to the Holding Tank Site. Local readout shall be provided in the control cabinet. Pressure gauge shall be 1200 series by Gems Sensors, or equal, with a local readout display located in the Electrical and Control Cabinet.

#### 2.15 Signal Transmission

- A. The following signals shall be transmitted to the holding tank site for data collection:
  - Common alarm condition for pump failure, loss of power and/or high/low water alarms.
  - Pump run time meter signal
  - Flow signal
  - Pressure Signal

Care should be taken to ensure signal strength is sufficient to transmit signals over the required distance. Provide additional transmitters if necessary.

## 2.16 Wetwell Junction Box

- A. Furnish and install one (1) waterproof, explosion proof electrical junction box meeting NFPA Class I, Division 1, Group D requirement. Electrical Junction Box shall be Model GUBO2 with 2" conduit entrance as manufactured by Crouse-Hinds or equal. Junction box shall be supplied with conduit hubs and cable seals of the number, size, type and configuration required for the level floats and pumps supplied and installed under this Contract.

## 3.0 EXECUTION

### 3.1 Wet Well and Valve Pit

- A. The precast reinforced concrete sections of the wet well and valve pit shall be as specified in Section 02601 of these specifications. They shall be installed vertical and straight on gravel bedding.
- B. The access covers shall be cast in the wet well covers. The wet well access cover shall be located as required by the pump manufacturer for removal of the pumps using the guide rails and lifting chain.
- C. All pipe shall be cut accurately to size, and installed without forcing. Pipes shall be carefully fitted to the equipment and care shall be used not to force either the pipe or equipment into place. After the piping has been placed, the equipment shall be checked for level and alignment.
- D. All interior valves and accessories must be placed for easy operation, inspection and removal. Unless otherwise called for, valves shall be set normal to the walls or floor.
- E. Whenever valves or other equipment are located in or connected to a pipe line, the connections must be such that the valves or equipment can be removed without disturbing the rest of the piping.
- F. Supports for the piping shall be provided throughout its length and shall be able to support the pipe lines entirely independent of other equipment. Pipe support, hangers and brackets shall be of a type and design to carry all loads imposed upon them with a safety factor of at least four (4) and adjusted so that the supported pipe can be located at the exact elevations and location shown on the Drawings. Wherever flow or pressure may cause the pipe line to separate, approved ties, anchors or braces shall be installed to prevent such separation.

- G. Pumps, guide rails, discharge pipe and float switches shall be installed at the elevation shown on the Drawings and as required by the pump manufacturer for proper operation of the station. One intermediate discharge pipe support shall be installed. Intermediate guide rail supports shall be as required by the pump manufacturer.
- H. Pressure piping, when completed, shall be tested by water for tightness at the rated pipe working pressure, and show no leakages after testing as outlined in Section 2E.
- I. Pump controls and alarm shall be tested after installation to assure conformance with Drawings and Specifications. Testing shall be conducted by the Engineer prior to conditional acceptance of pump station.
- J. Alarm System Terminal

The Contractor shall furnish and install an enclosed terminal strip appropriately tagged with terminals for each alarm contact in the pumping station. The terminal strip shall be installed in the alarm/monitoring cabinet. The Contractor shall also furnish and install a local disconnect for one 125v, 60hz, 20 amp circuit in said alarm/monitoring cabinet.

### 3.2 Testing

#### A. Pumping Equipment

All pumps, controls and appurtenant equipment furnished under this section of the Specifications shall be given shop tests at the manufacturer's plants to establish performance characteristic curve and data, which must be certified by the manufacturers and submitted to the Engineer for approval before delivery. All pumping equipment shall be tested after installation to assure conformance with manufacturer's performance certification. The Contractor shall supply a flowmeter, pressure gauges and temporary piping for testing the pump installation prior to acceptance and connection to the discharge force main. The Contractor shall also supply the water used for testing. Pressure gauges will be temporarily installed in the pump discharge between the pumps and check valves and the pumps will be operated against partially closed valves in the valve pit to verify the capacity head curve of the pumps.

#### B. Wet Well and Valve Pit

The wet well and valve pit shall be tested for watertightness using the same procedures as those specified for manholes in Section 02601 using a water leakage test.

(END OF SECTION)

## SECTION 13000 - SOIL ODOR FILTER EQUIPMENT

### 1.0 GENERAL

#### 1.1 Scope of Work

- A. The Contractor shall furnish all labor materials, equipment, and incidentals necessary to construct a complete soil odor filter as shown on the Contract Drawings and as specified herein.

#### 1.2 Related Work Specified Elsewhere

- A. Site work including excavation and backfill is specified in Section 02620.
- B. Electrical work is specified in Section 16000.
- C. Intake and exhaust piping are specified in Section 02622.
- D. Soil filter media (compost) is specified in Section 02920+.
- E. Peastone is specified in Section 02200.
- F. Perforated PVC pipe and fittings are specified in Section 02622.
- G. Topsoil is specified in Section 02200

### 2.0 MATERIALS

#### 2.1 Description of Operation

- A. At each Pump Station, as shown on the Contract Drawings, air from the wetwell will be collected and forced by a blower fan to an intake header and then distributed to the soil odor filter through perforated pipes. The air which is purified as it passes through the soil filter is collected in a perforated pipe and then discharged to the atmosphere through a vent. Optimum moisture content (45%) in the soil odor filter shall be maintained by an automatic irrigation system consisting of moisture sensors in the filter bed, valve controllers located in the control cabinet and irrigation piping in the upper part of the filter bed.

#### 2.2 Blowers

- A. Soil odor filter blower shall be driven by adjustable V-belt drive units. Blower shall have fiberglass blades, weatherproof enclosures, noise enclosures, exhaust shutter for outdoor installation, and coating for corrosive (hydrogen sulfide) service. Blower shall be Type 3E as manufactured by Buffalo Forge Co., Buffalo, N.Y., or equal. The blower shall have a rated capacity of 40 cubic feet per minute.

Blower shall be coated on all surfaces exposed to the air stream with materials recommended by the manufacturer for extended life in a corrosive air stream.

Blower shall be provided with flanged inlet and outlet, a threaded drain connection at the lowest point on the scroll, and a gasketed cleanout door for access to the scroll.

The blower shall be controlled by a timer adjustable for operation between 0 and 60 minutes per hour. Initial setting shall be for constant operation.

Motor shall be drip proof and fully enclosed in the blower housing.

### 2.3 Air Pressure Gauge

- A. Air pressure gauge shall be 3-1/2 inch diameter face capable of measure 0-10 inches of water full scale and shall be as manufactured by Marsh Instrument Co. or equal.

### 2.4 Geotextile Material

- A. Geotextile material shall have average openings of 0.4 mm, permeability of 2-4 10<sup>6</sup> cm/sec and shall be grade 140 N MIRAFL, manufactured by Mirafi, Inc., or equal.

### 2.5 Fiberglass Enclosure

- A. The Contractor is to furnish and install maintenance free, all purpose equipment enclosures to house the exhaust blowers used for the soil odor filters as shown on the Contract Drawings. Enclosures shall be installed in accordance with the details shown on the Contract Drawings. The enclosures shall be constructed of fiber reinforced polyester and are to be manufactured using flame retardants. These enclosures are to be of molded, piece construction. All metal parts used are to be stainless steel. The doors shall be of the lift-off type and shall be lockable.

The enclosures shall be sized as shown on the Contract Drawings and shall provide sufficient space for operation of the enclosed equipment. The enclosures shall be Model 41-2 as manufactured by Western Power Products, Inc., or equal.

### 2.6 Irrigation System Controller

- A. The controller shall be of a hybrid type that combines electro-mechanical and micro-electronic circuitry capable of fully automatic or manual operation. The controller shall be housed in a wall-mountable, weather-resistant, plastic cabinet suitable for either indoor or outdoor installation.

The controller shall be Model ESP-4, manufactured by Rain Bird Corporation, Glendora, California. The controller shall be located in the Electrical and Control Cabinet.

## 2.7 Moisture Sensor

- A. The moisture sensor shall employ conductivity, which exists due to ionic content in water, to measure the resistance in the soil. The soil sensor shall be manufactured with two non-corrosive carbon rods for prolonged life in subterranean environments. The moisture sensor shall incorporate a provision that allows the installer to select from sixteen different moisture settings.

These sixteen settings shall be derived from comparable resistance measurements between the carbon rods of the soil sensor for varying levels of moisture content. When the moisture content increases above a user selected setting, the internal interrupt circuit shall temporarily disable the irrigation controller by creating an open circuit on the valve control signal.

Once the moisture content falls below a user selected setting, the internal interrupt circuit shall allow the irrigation controller to resume watering by restoring the valve control signal continuity.

The device shall have an integrated Bypass Switch to override the sensor.

The device shall be of rugged construction to withstand the elements, including exposure to sunlight (U.V.). The device shall be housed in a NEMA-type 3R rain proof enclosure, suitable for outdoor or indoor mounting. The device shall include a U.L. listed, 3A @ 125/250 VAC rated electrical switch. The device shall be of sufficient capacity to be used with a maximum of three 24 VAC solenoid valves per station, plus one master valve.

The Rain Bird MS-100 Moisture Sensor shall be manufactured by Rain Bird Corporation, Glendora, California.

## 2.8 Moisture Control Valve

- A. The valve shall be normally closed 24 VAC 50/60 Hz (cycles per second) solenoid actuated, balanced pressure type. The valve pressure rating shall not be less than 150 psi (10.4 bar). The valve body and bonnet shall be constructed of high impact weather-resistant plastic, stainless steel and other chemical/UV resistant materials. The valve shall have a one unit diaphragm constructed of durable Buna-N rubber material with a clog resistant metering orifice. The valve shall have one 90-mesh (200 micron) filter attached to the diaphragm. The valve shall have one fully encapsulated solenoid with captured plunger. The valve shall have one 90-mesh (200 micron) filter attached to the solenoid base.

The valve body shall have a 1" slip x slip inlet and outlet for solvent pipe connection.



The valve shall be actuated by a low power 0.30 A (7.2 VA) in-rush current and 0.23 A (5.5VA) holding current. The valve shall be capable of on/off control by turning the solenoid ¼ turn.

The remote control valve shall be Model 075-DV, manufactured by Rain Bird Corporation, Glendora, California.

## 2.9 Water Service Connection

Contractor shall install a ¾" PVC water service connection complete with heat tracing as required for freeze prevention.

## 3.0 EXECUTION

### 3.1 Soil Odor Filter

A. Work under this section shall meet all of the requirements of Section 02200, as well as any additional requirements stated herein.

All PVC inlet and exhaust pipes and headers shall be laid to the elevations, lines and grades shown on the Drawings.

The soil filter bed shall be constructed in layers, as shown on the Contract Drawings, in the following sequence:

1. Timber walls shall be constructed as shown on the Contract Drawings.
2. PVC liner shall be attached to the timber walls. Liner shall not extend more than 2-feet over the bottom of the filter.
3. A 2-inch layer of 3/8" peastone shall be installed over the surface of the excavation.
4. The PVC inlet manifold and 4-inch perforated PVC air distribution pipe shall be laid with holes faced downward over the peastone shown on the Drawings. The perforated face of the pipe shall face downward.
5. Following installation and alignment, the distribution piping shall be covered with 3/8" peastone to a depth of 2-inches above the top of the piping.
6. Compost of the type and quality specified in Section 02200 shall be placed in the soil odor filter to the required elevation. Compost shall be allowed to settle for 24 hours at the specified moisture content before the installation of gravel, perforated PVC pipe or topsoil. Compost shall not be tamped or compacted during placement. Density of compost after placement and settling shall be subject to the approval of the Engineer.
7. Geotextile shall be placed over the top of the compost.

8. A 2-inch layer of 3/8" peas tone shall be laid over the compost prior to installing the outlet manifold and 4-inch perforated PVC pipe. The PVC pipe shall be laid to the elevations and lines shown on the Contract Drawings, and shall be covered with 3/8" peas tone to a depth approximately 2 inches above the top of the pipe.
9. Geotextile shall be placed at the topsoil-gravel interface.
10. Final cover over the filter bed shall be 9-inches of topsoil. Topsoil over the filter bed may not be tamped or compacted and no grading machinery shall be allowed to pass over the area. The surface shall be hand raked to slope away from the center of the filter before plantings, as shown on the Drawings, are installed. The irrigation pipe shall be installed within the topsoil.

(END OF SECTION)

## SECTION 15060 - FLANGED PIPE AND FITTINGS

### 1.0 GENERAL

#### 1.1 Description

- A. The Contractor shall furnish, lay, joint and test all process pipe, including: fittings, special casting and appurtenant work, as indicated on the drawings and as specified.

#### 1.2 Related Work Specified Elsewhere

- A. All ductile iron piping shall be as specified in Section 02616, Ductile Iron Pipe and Fittings.
- B. Finish painting shall be as specified in Section 09900, Painting.

#### 1.3 Standards

- A. The following standards form a part of this specification and indicate the minimum standards required:
  - a. ANSI A21.4 Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water
  - b. ANSI A21.10 Ductile Iron Fittings, 2 inches through 48 inches, for Water and Other Liquids
  - c. ANSI A21.11 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
  - d. ANSI A21.15 Flanged Ductile Iron Pipe with Threaded Flanges
  - e. ANSI A21.50 Thickness Design of Ductile Iron Pipe
  - f. ANSI A21.51 Ductile Iron Pipe, Centrifugally Cast in Metal or Sand-lined Molds for Water or Other Liquids
  - g. ASTM A307 Low-Carbon Steel, Externally and Internally Threaded Standard Fasteners
  - h. All flanged piping shall be Class 53 ductile iron

#### 1.4 Fittings

- A. Fittings shall conform to the requirements of ANSI A21.10 and shall be of a pressure classification at least equal to that of the pipe with which they are used.
- B. Flanged fittings shall be faced and drilled in accordance with ANSI A21.10 except that special drilling or tapping shall be provided as necessary to ensure correct alignment and bolting.

C. Fittings shall be provided with standard bases where so indicated.

#### 1.5 Pipe For Use With Flexible Couplings

A. Pipe for use with flexible couplings shall be as specified above except that the ends shall be plain (without bells or beads). The ends shall be cast or machined at right angles to the axis.

#### 1.6 Flexible Couplings

A. To ensure correct fittings of pipe and couplings, all flexible couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.

B. Flexible couplings shall be Style 38 by Dresser Mfg. Div., Bradford, PA; Style 441 Smith-Blair, Inc., San Francisco, CA; R.H. Baker and Co., Inc., Huntington Park, CA; Clow Corporation, Rochester, NY; or approved equal products.

C. All couplings shall be furnished with the pipe stop removed.

D. Couplings shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.

#### 1.7 Filling Rings

A. The Contractor shall provide suitable filling rings where the layout of the flanged piping is such as to necessitate their use. In materials, workmanship, facing and drilling, such rings shall conform to the 125-lb ANSI Standard. Filling rings shall be of suitable length with nonparallel faces and corresponding drilling if necessary, to ensure correct assembly of the adjoining piping or equipment.

#### 1.8 Inspection And Testing

A. All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish, in duplicate, to the Engineer sworn certificates of such tests.

B. In addition, the Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

C. Pipes and fittings shall be subjected to a careful inspection and a hammer test just before being installed.

#### 1.9 Tapped Connections

- A. Tapped connections in pipe and fittings shall be made in such a manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses shall not exceed that listed in the appropriate table of the Appendix to the ANSI A21.51 based on 3 full threads for ductile iron.
- B. Where the size of the connection exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of a tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plus or reducing flange, or tapping tee and tapping valve, all as indicated or approved.
- C. All Drilling and tapping of ductile iron pipe shall be done normal to the longitudinal axis of the pipe; fittings shall be drilled and tapped similarly, as appropriate. Drillings and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

#### 1.10 Gaskets, Bolts, And Nuts

- A. For flanged joints, gaskets shall be full face gaskets of rubber with cloth insertion. Gaskets 12 inches in diameter and smaller shall be 1/16-inch thick; larger than 12-inch, 3/32-inch thick.
- B. Gaskets shall be of a composition suitable for exposure to the liquid within the pipe.
- C. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same ANSI Standard as the flanges. Bolts and nuts shall, except as otherwise specified or noted on the drawings, be Grade B conforming to the ASTM A307. Bolt studs and studs shall be of the same quality as machine bolts.

#### 1.11 Socket Pipe Clamps, Tierods, And Bridles

- A. Where indicated or necessary to prevent joints or flexible couplings from pulling apart under pressure, suitable socket pipe clamps, tierods, and bridles shall be provided. Bridles and tierods shall be at least 3/4-inch diameter except where they replace flange bolts of smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges.

#### 1.12 Handling And Cutting Pipe

- A. The Contractor's attention is directed to the fact that ductile iron used for pipe and fittings and the cement linings are comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe and linings, scratching or marring machined surfaces, and abrasion of the pipe coating or lining.

- B Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused and incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C In any pipe showing a distinct crack and in which it is believed there is not incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.
- D Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters or knives adapted to the purpose. Hammer and chisel shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.
- E The Contractor's attention is directed to the fact that damage to the lining of pipe or fitting will render them unfit for use; he shall use the utmost care in handling and installing lined and coated pipe and fitting to prevent damage. Protective guards shall not be removed until the pipe is to be installed.
- F Lined and coated pipe and fittings shall be installed as, and assembled with approved packing or gaskets of the type, recommended by the pipe manufacturer for the particular lining used.

#### 1.13 Installing Pipe And Fittings

- A No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
- B Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.
- C Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the completed work.
- D Flanged joints shall be made up tight, care being taken to prevent undue strain upon pump nozzles, valves, and other pieces of equipment.
- E Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure a good alignment both horizontally and vertically.
- F Castings to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned.

- G Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.

#### 1.14 Assembling Flexible Couplings

- A Prior to the installation of flexible couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe and until it is properly centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
- B After the bolts have been inserted and all nuts have been made up fingertight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.
- C The correct torque as indicated by a torque wrench shall not exceed 90 feet per pound.

#### 1.15 Piping Support

- A The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or specified.
- B All pipes and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the Contractor shall submit a certification from the manufacturer stating that such requirements have been complied with.
- C Piping within buildings shall be adequately supported from floors, walls, ceilings or beams. Supports from the floor shall be by approved saddle stands, or suitable concrete or brick piers as indicated or approved. Pipe saddles shall be shaped to fit the pipe with which they will be used and shall be capable of screw adjustment. Brick and concrete piers shall conform accurately to the bottom one-third to one-half of the pipe. Piping along walls shall be supported by approved wall brackets with attached pipe rolls or saddles or by wall brackets with adjustable hanger rods. For piping supported from the ceiling, approved rod hangers on a type capable of screw adjustment after erection of the piping and with suitable adjustable concrete inserts or beam clamps shall be used.

#### 1.16 Lining, Coating And Painting

- A All pipe and fittings shall be lined and coated as specified below.
- B Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.
- C The inside of pipe and fittings shall be given a cement lining and bituminous seal coat in accordance with ANSI A21.4. The thickness of lining shall be double that specified in the above referenced specification.
- D The outside of pipe and fittings within structures shall not be coated with the bituminous coating, but shall be thoroughly cleaned and given one shop coat of Intertol Rustinhibitive Primer No. 621 made by Koppers Co., Inc., Pittsburgh, PA; Multiprime made by Pittsburgh Plate Glass Co., Pittsburgh, PA; Chromox 13R50 Primer made by Mobil Chemical Co., Edison, NJ; or an approved equal product.

#### 1.17 Cleaning

A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

#### 1.18 Pressure And Leakage Tests

- A. Test pipe as specified in Section 02616.3.8
- B. Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.
- C. The inside of pipe and fittings shall be given a cement lining and bituminous seal coat in accordance with ANSI A21.4. The thickness of lining shall be double that specified in the above referenced specification.
- D. The outside of pipe and fittings within structures shall not be coated with the bituminous coating, but shall be thoroughly cleaned and given one shop coat of Intertol Rustinhibitive Primer No. 621 made by Koppers Co., Inc., Pittsburgh, PA; Multiprime made by Pittsburgh Plate Glass Co., Pittsburgh, PA; Chromox 13R50 Primer made by Mobil Chemical Co., Edison, NJ; or an approved equal product.

#### 1.19 Cleaning

A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

#### 1.20 Pressure And Leakage Tests



- A. Except as otherwise directed, all pipelines shall be given combined pressure and leakage tests in section of approved length. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner or Engineer shall have the privilege of using their own gauges.
- B. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.
- C. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants and blowoffs are not available at high points of releasing air, the Contractor shall make the necessary excavations and do the necessary backfilling and made the necessary taps at such points and shall plug said holes after completion of the test.
- D. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- E. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gauge location) to a pressure rating of the pipe. If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed to pass the pressure test.
- F. Following or during the pressure test, the Contractor shall make a leakage test by metering the flow of water into the pipe while maintaining in the section being tested a pressure equal to the pressure rating of the pipe. If the average leakage during a two-hour period exceeds a rate of 11.6 gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the leakage test.
- G. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- H. If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications, in the procedure shall be made as required and approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line within the above leakage and pressure requirements.

## SECTION 16000 - ELECTRICAL WORK

### 1.0 GENERAL

#### 1.1 GENERAL CONDITIONS

- A. Include Conditions of the Contract and applicable parts of Division 1.
- B. Examine all other sections of the Specifications for requirements which affect the work of this Section, whether or not such requirements are particularly mentioned herein.
- C. Coordinate the work of this Section with the related work of other trades, and cooperate with such trades to assure the steady progress of all work of this Contract.
- D. Where the National Electrical Code appears in this specification, it shall be interrupted to mean the latest edition.

#### 1.2 SCOPE

- A. The work covered by this Section consists of furnishing all labor, materials, equipment, supplies, devices, electrical apparatus, stand-by power and connections, alarm dialers, special enclosures, disconnects, panel boards, fixtures, and lamps and the performance of all operations necessary for the installation and/or modification of electrical facilities in and about the structures and around the grounds, as indicated on the Contract Documents.
- B. This work shall include all costs involved in providing power service and distribution and new telephone service and distribution at the facilities and any costs involved with any other special utilities on the project. Without limiting the work required under this specification section, the following is included:
  - 1. Electrical and telephone service and distribution, including provisions for portable standby power for two wastewater pump stations.
  - 2. Conduit and hand holes to provide main power feed from tight Tank site on Bay Road.
  - 3. Wiring of all pumping station power feeds, relays, trip switches and other control mechanisms for the proper operation of all pumping station equipment.
  - 4. Wiring and connect all alarms, etc. to autodialers at each site, including provision of dialers, and order telephone service to the nearest telephone box and provide conduit from control panel to the telephone box.
  - 5. Furnishing and installing water tight control cabinets at each site
  - 6. Incorporation of stand-alone equipment, such as flow meter control, pressure reading controls, odor control blower system, and irrigation system control into the comprehensive electrical system within the control cabinet.
  - 7. All other electrical installations required to provide a complete, functioning facilities operating as per design and specifications, including odor control blower system, and site irrigation system.

8. Obtain all electrical permits, etc. required.

### 1.3 WORK OF OTHER SECTIONS

- A. Refer to other Sections in this specification as appropriate and/or required.

### 1.4 SUBMITTALS

#### A. Shop Drawings

1. Within thirty days after award of the Contract, submit shop drawings in accordance with the requirements of the General Conditions and in the manner described therein. Shop drawings shall indicate specifications section and paragraph requiring equipment indicated.
2. Shop drawings are required on all major pieces of equipment in the following list, but not necessarily limited thereto: breakers; motor starters; contactors; relays of all types involved; push button stations; panel boards; transformers; pull, junction, and terminal boxes; disconnect switches; lighting fixtures; wiring devices; portable stand-by power receptacles; special enclosures, etc.

#### B. Samples

1. Within thirty days after award of the Contract, submit samples of all materials requested by the Engineer. Samples shall be prepared and submitted in accordance with the requirements of General Conditions, all postage and transportation costs being paid by the Contractor submitting same.

#### C. Record Drawings

1. In accordance with requirements of the Supplementary General Conditions, the Subcontractor shall furnish and keep on the job at all times one complete set of blackline prints of the electrical work, on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all architectural and electrical changes, revisions and additions to the work. Wherever work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.
2. The Subcontractor shall indicate on these prints the daily progress by coloring in the various apparatus and associated appurtenances as they are installed.
3. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.
4. At the conclusion of work, prepare record drawings in accordance with the requirements of the Supplementary General Conditions.

#### D. Operating Instructions and Maintenance (O&M) Manual

1. The Subcontractor shall instruct, to the Owner's satisfaction, such persons as the Owner designates in the proper operation and maintenance of systems and their parts.

2. Parties indicated above sign affidavits stating that the above instructions were given by the Electrical Subcontractor.
3. Furnish in accordance with General Conditions operating and maintenance manuals and forward same to the Engineer for transmittal to the Owner.
4. The operating instructions shall be specific for each system and shall include copies of posted specific instructions.
5. For maintenance purposes, provide shop drawings, parts lists, specifications and manufacturer's maintenance bulletins for each piece of equipment. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.

#### E. Manufacturers' Data

1. Within thirty days of award of Contract, the Subcontractor shall submit for Engineer's approval a complete list of manufacturers' names of all materials and equipment proposed for the project.
2. After approval of the above list, the Subcontractor shall submit for Engineer's approval complete detailed manufacturers' data consisting of bulletins, shop drawings, and parts lists of the materials and equipment to be furnished, as required.
3. Shop drawings and manufacturers' data submitted must bear the Electrical Subcontractor's stamp stating that the shop drawings and data have been checked and meet the plans and specifications before being submitted for Engineer's approval, or they will not be considered and will be returned for resubmission. If the shop drawings and data show proposed variations from the requirements of the plans and specifications because of standard practice or other reason, specific mention shall be made of such variations in the letter of transmittal.
4. The Electrical Subcontractor shall assume the entire cost and responsibility for any changes in the work which may be occasioned by approval of materials other than those specified.
5. Errors, omissions, and coordination of shop drawings shall be the sole responsibility of the Subcontractor whether or not the shop drawings are approved.
6. In the event that any specified manufacturer's number has been superseded by a new number since the writing of this specification, the new manufacturer's number shall be immediately submitted to the Engineer for approval. It shall be the responsibility of the Subcontractor to notify the Engineer of any superseded manufacturers' numbers mentioned in these specifications.

## 1.5 QUALITY ASSURANCE

### A. Applicable Standards, Permits and Codes

1. The installation shall comply with all laws applying to electrical installations in effect in Massachusetts, and with regulations of any other governmental body or agency having jurisdiction, including OSHA; with regulations of the National Electrical Code where such regulations do not conflict with those laws, with the regulations of the company involved, with the telephone utility, and with ASHRAE Standard 70, as amended.
2. File all required notices and plans. Obtain and pay for all permits, inspections, licenses, and certificates required for work under this Section.
3. If any portion of the electrical plans or specifications conflict with any laws or ordinances with regard to type of materials, equipment, or fixtures to be used, the Electrical Subcontractor shall bring it to the Engineer's attention at least seven days before submitting the bid. Otherwise the cost of all work necessary to make the installation comply with said laws or ordinances shall be paid by the Electrical Subcontractor and shall become a part of this Contract.

## 1.6 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- A. Before submitting prices or beginning work, thoroughly examine the site and the Contract Documents
- B. No claim for extra compensation will be recognized if difficulties are encountered which an examination of site conditions and Contract Documents prior to executing the Contract would have revealed.

## 1.7 DRAWINGS

- A. The Subcontractor shall refer to the electrical drawings and civil plans and details for a full comprehension of the extent and detail of the work to be performed. These drawings are intended to be supplementary to the specifications, and any work indicated, mentioned, or implied in either is to be considered as specified by both.
- B. All work shown on the drawings is intended to be approximately correct to the scale of the drawings, but figured dimensions and detailed drawings are diagrammatic and are not intended to show every detail of construction or the exact location of equipment. Where building construction makes it advisable or necessary to change the location of equipment, the Subcontractor shall perform such work without cost to the Owner on written request of the Engineer. Any doubt as to the intended location of equipment shall be resolved by the Engineer before proceeding with the installation.
- C. The intent is to obtain an electrical installation of all systems, complete in every detail within and about the building, and with all facilities properly interconnected with power and telephone. The Electrical Subcontractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and to the satisfaction of the Engineer. Upon completion, the electrical systems and all equipment throughout the structures shall operate properly and adequately and function as intended.

- D In any discrepancy between requirements of any Section, between notes on the drawings, between drawings, between details in the specifications, or between drawings and specifications, that which is in the best interest of the Owner shall apply.

Testing by Contractor: Provide equipment and personnel for operating test of electrical system.

Changes by Contractor: The contract drawings indicate the extent and schematic arrangement of the conduit and wiring systems. If changes from the drawings are deemed necessary by the Contractor, submit details of such changes within 30 days of award of Contract. Make no changes without written authorization of Engineer. Where conduit routings are not indicated, coordinate with Engineer, General Contractor, and other Subcontractors to insure no conflicts result from routings selected.

## 1.8 ELECTRICAL REFERENCE SYMBOLS

- A. Standard symbols have been employed where such will meet the need. These are augmented and modified to illustrate as necessary. The chart on the Contract Drawings is intended to illustrate all symbols and explain the function and installation method of the device represented. When not clear, or where one has been inadvertently omitted, it shall be the responsibility of the Electrical Subcontractor to obtain a ruling on the intent before proceeding with any work.

## 1.9 TEMPORARY POWER

- A. The Contractor or Electrical Subcontractor shall furnish and install temporary feeders of proper capacity power required for construction. Contractor is responsible for providing an adequate source of power at no added cost to Owner. Sufficient outlets shall be installed at convenient locations so that extension cords of not over 50 feet will reach all areas requiring power.
- B. The General Contractor and all subcontractors shall furnish their own extension cords and such lamps as may be required for their work, and shall pay for the cost of temporary wiring of construction offices or shanties used by them and any temporary wiring of a special nature for light and power required other than that mentioned above.
- C. All temporary wiring shall be completely removed as its use is no longer required. No temporary wiring shall remain at completion of the project.

## 1.10 GUARANTEE

- A. Contractor's Guarantee for items furnished covers and includes:

Faulty or inadequate design

Improper installation

Defective workmanship and materials.

B. Warranties of Manufacture

Not less than one year

As specified

As normally supplied if greater than one year.

2.0 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All materials, devices, and equipment, unless specifically excepted, shall be new.

2.2 IDENTIFICATIONS

- A. All materials shall bear UL labels where such have been established for the particular device.
- B. All devices shall show make, type, serial number (where applicable), voltage, amperage, wattage, motor ratings, and all other pertinent data.
- C. All wire shall have make, type of insulation, size, and voltage rating clearly marked upon it.

2.3 SLEEVES/JUNCTION BOXES/ANCHORS

A. The Subcontractor shall advise the Contractor of locations for all sleeves, openings, anchors, supports, conduits, and boxes, and shall provide same so that they may be built into the job wherever feasible.

2.4 ACCESS PANELS

- A. Furnish, for installation by the General Contractor, all metal access panels required for access to services provided under this Section.
- B. Coordinate locations and sizes of all such panels with the Contractor, subject to the Engineer's approval.

2.5 CONDUITS

A. Exterior

1. Direct buried conduit shall be Schedule 40 PVC or rigid galvanized steel. Conduits below concrete slabs, and to five feet outside of foundation walls shall be rigid galvanized steel, PVC coated. Where steel is used, it shall be double coated with bitumastic dried at least 24 hours between coats before installation. Where PVC is used, all elbows and/or offsets shall be rigid galvanized steel. Only rigid galvanized steel shall be used above grade. Signal cable conduits shall be PVC coated rigid galvanized steel only (per "E" below).

B Exterior Above Grade

- 1 Rigid galvanized steel only

C Interior

1. Interior conduits shall be rigid galvanized steel or intermediate metallic conduit.
2. Fittings, boxes, and related items for interior work shall be manufactured by Crouse Hinds, Appleton, or approved equal.
3. Minimum size conduit for light and power wiring, where required, shall be 3/4".

D. General

- 1 The use of nonmetallic conduit or raceway within a building or below floor slabs is not permitted.
2. Rigid galvanized conduit shall be manufactured by Youngstown Sheet and Tube Company, Republic Steel, or equivalent.
3. Liquid-tight flexible metallic conduit shall be used to tie in all motors or similar equipment. Provide minimum 2 ft. diameter loop at all locations.
4. PVC conduit shall be Type II by Carlon Products or approved equal.
5. PVC coated rigid galvanized conduit shall be approved equal to Rob Roy "Plasti-Bond Red" with 40 mil PVC exterior coating and with urethane (red) interior coating.
- 6 Aluminum conduit shall not be used on this project.
7. All terminations of conduits shall have smooth, rounded bushings. All conduit 1" and larger shall have insulation which may be integral with the bushing connector, or an insulated bushing may be added.
8. All rigid conduit joints shall be threaded. Do not use any type of clamp on fittings. All plastic joints shall be cemented or heat welded.
9. All bends for telephone/data conduits or ducts shall be 36" minimum radius.
10. Provide expansion joints on all conduits rising from below grade at utility and/or building, or pump station, and at all other locations required by codes/ordinances.
11. Provide fireproofing of all conduit penetrations of fire walls, partitions, or floors per code.

2.6 WIRES AND CABLE

- A. All cable and wire shall comply with the latest requirements and specifications of the NFP and/or the Insulated Power Cable Engineers Association (IPCEA) and shall be as manufactured by General Cable, General Electric, Anaconda, Phelps Dodge, or approval equal, unless otherwise specified or indicated.



- B. All conductors used in the wiring system shall be soft-drawn copper wire having a conductivity of not less than 98% of that of pure copper, unless otherwise indicated or specified. All conductors shall be stranded. Solid conductors are not acceptable. Aluminum conductors are not permitted.
- C. All wire and cable shall be stamped approximately every two feet to indicate voltage, type, temperature rating, UL listing, manufacturers' name, size, etc.
- D. All underground conductors shall be installed in concrete encased conduits. All underground conductors shall enter manholes, building walls or termination points through a protective galvanized steel conduit sleeve of appropriate size.
- E. All cable and wire shall be: 600 volt; installed in approved raceways or conduit; not less than No. 12 AWG (except that No. 14 AWG may be used for control wiring).
- F. Insulation for cable and wire shall be as follows:

Wet or Moist Locations	XHHW-2
Feeders to Panels, other	XHHW-2

- G. All internal wiring to fixtures shall be minimum, No. 14 AWG, silicon rubber insulated (150°C) with minimum 300 volt insulation.
- H. All branch circuit wiring from panelboards to any outlet on the circuit over 50' but under 100' shall be No. 10 AWG for the first half of the circuit, over 100' but under 175', use No. 8 AWG for the first half, or as otherwise required to provide no greater than 3% voltage drop at the most remote device on the circuit.
- I. The following color code shall be used for all conductors. The colors must be fast, fadeless, and capable of withstanding cleaning.

	120/280 Volt <u>(3 Phase)</u>	120/240 Volt <u>(Single Phase)</u>
Phase A	Black	Black
Phase B	Red	Red
Phase C	Blue	-
Neutral	White	White
Bond	Green	Green

- J. Multiconductor control cables shall be approved equal to GE SI-58779, Flame resistant.

- K. Multiconductor shielded cables shall be approved equal to GE SI-58760, #16 AWG, with individual grouping shielded.
- L. All circuit wires shall be tagged in cabinets, etc., with 1/16" thick tags securely fastened to the conductors with a heavy type of linen wrap at time wires are pulled in and tested. Circuit numbers shall be indicated on the tags. Tags shall not be removed for any reason.
- M. At least 8" loops or ends shall be left at each outlet for the installation of devices or fixtures in the future. All wires in outlet boxes not for the connection to fixtures at that outlet shall be rolled up, connected together, and taped.
- N. Wires and cables shall be carefully handled during installation.
- O. When a lubricant is necessary for pulling wires, it must be listed by UL and be of such consistency that it will leave no obstruction or tackiness that will prevent pulling out old wires or pulling in new wires or additional wires. No soap flakes or vegetable soaps will be permitted.
- P. Conductors shall be continuous from panelboard to outlet and from outlet to outlet. No splices shall be made except within junction or outlet boxes.
- Q. Splices and tapes in wires No. 8 AWG and larger shall be made with crimp-on type connectors designed for the purpose. All connections between wires at fixtures and boxes shall be made with UL approved 600 volt pressure connectors equal to Ideal "Wire-Nut" "Wing-Nut" (on lighting or general purpose receptacles only).
- R. Type NM, NMC, AC, MC, or similar cables shall not be permitted on this project. All wiring is to be installed in conduit.
- S. All conductors and connections shall be free of grounds, shorts, and opens.
- T. Telephone wiring/cables shall conform to requirements of the local telephone company.

## 2.7 OUTLET BOXES

- A. For concealed wiring to wall switches and duplex outlets in dry locations, use gaugeable steel boxes not less than 2-3/4" deep, such as Raco 560 to 568 Series. These may have cable clamps or a connector added to them. Four-inch square or larger boxes with raised plaster rings are equally acceptable. These boxes may be directly nailed to a stud if they fall adjacent to one; otherwise, wood straps a minimum of 2 1/2" x 3/4" between studs shall be added and mounting shall be by ears on the box. Solid or adjustable bar hangers are equally acceptable. (Wiring is surface mounting on this project in some locations).
- B. Flush ceiling and device outlet boxes (if any) shall be 4" octagonal by 2 1/8" deep or 4" square boxes with raised plaster rings.
- C. Set all flush boxes (if any) to have edge precisely in the same plane as the finished wall surfaces.
- D. All boxes shall be held to wood surfaces by wood screws. On metal surface, boxes shall be held by metal-to-metal screws or by machine bolts.

- E. Any outside boxes or boxes mounted exposed in the buildings shall be cast metal type with integral threaded hubs (style similar to Crouse Hinds FS or FD). Bell style boxes will not be accepted.

## 2.8 PULL BOXES AND JUNCTION BOXES

- A. Pull boxes, cabinet boxes and junction boxes shall be constructed of code gauge galvanized sheet metal of not less than the minimum size recommended by the National Electrical Code. Boxes shall be furnished with screw-fastening covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number and panel designation. Where pull boxes must be used in finished areas, the Engineer shall be consulted for the location, style of cover, and finish of box. The location shall always be as inconspicuous as possible. Where shown on the drawings, sizes of pull boxes, terminal boxes and junction boxes shall be followed or next larger standard trade size shall be used. Add pull boxes when such are deemed advantageous. Where required due to length of exterior or underground conduit runs, underground cast concrete shall be provided, per details on Contract Drawings.

NOTE: Those installed in corrosive areas shall be stainless steel or non-metallic with stainless hardware.

## 2.9 PULLING CABLES

- A. All raceways are to be equipped with conductors. Swab all conduit before cable is drawn into them. Any crushed raceways shall be replaced before drawing in cable. Where cable pulling compounds are required, materials specifically intended for that purpose may be utilized.

## 2.10 DISCONNECTS

- A. Where shown on the Drawings, or when NEC required whether or not shown, install disconnect switches appropriate for the application. When serving motors, they shall be motor rated. Those for equipment (if any) outdoors shall be in NEMA 4X SS enclosures, or as otherwise indicated on Contract Drawings.
- B. Switches shall be heavy duty, quick make and break type. They may be non-fused by a solid copper bar, silverplated, heavy duty on motors over 2 h.p. For small motors (1/8 h.p. and less), a toggle switch, motor rated, may be used; otherwise, they shall be similar to Square D Type HU. Manual starters with overload protection built in are approved when NEC acceptable.
- C. Where multiple equipment items are supplied from a common circuit, disconnects shall be fused type.

## 2.11 OVERCURRENT PROTECTION SERVICES

- A. Overcurrent protection for motors is to be in the starters. There is to be protection in each phase wire. Overcurrent protection of conductors is by thermal and magnetic molded case circuit breakers in the panelboards. Where combination starters are used, the breaker is to

be a motor circuit protector with only magnetic trips. These must be supplied from a branch circuit protected by a thermal and magnetic trip breaker

## 2.12 WIRE CONNECTORS AND DEVICES

- A. All wire joints shall be made with a pressure squeezed connector such as T & G Stakon and Ideal, or bolted clamp such as made by Dessert. Twist-on type wire nuts are also permitted for general lighting and receptacle circuits, only. Make up to terminals shall be mechanical squeeze connector. Wherever only a screw connector is available, install a conductor terminal like T & G Stakon spade or donut and designed for the application and compression set to the conductor.
- B. Cover all joints made with non-insulated clamp devices with Scotch brand plastic electrical tape. Type #88 may be used at any joint and shall be used whenever the temperature of joint or the room is below 50°F. In the summer, or when temperature is above 60°F, new type #33 plus may be used. Triple wrap joints, each wrap having a 50% overlay.

## 2.13 SWITCHES AND PLATES

- A. Switches shall be specification grade, 20 amperes at 120/277 volts, with ivory handle, such as Bryant 4901-I, for SPST applications. For three-way use No. 4903-I, and for four-way use 4904-I. All switches shall have clamp type terminals screw set.
- B. Mount all switches vertically, wall-flush, and at a height of 4' 0", adjusted to minimize cut of tile or masonry unit, unless otherwise specified.
- C. All switches must have machine screw held wire and be back wired. Automatic grips will not be permitted. All switches must be classed as heavy duty.
- D. All flush plates are to be smooth-line nylon, one piece construction for all grouped switches, or Mulberry equivalent. On surface boxes they shall match the box style for the device installed.
- E. Switches and plates shall be a product of Bryant, General Electric or Hubbell.

## 2.14 CONVENIENCE AND OTHER OUTLETS AND PLATES

- A. Convenience outlets shall be duplex, specification grade, ivory face, side wired binding screw type, two pole, three wire, rated 20 amperes at 120 volts, Bryant 5362-I or equal. On flush mounted units use Bryant ivory nylon plates or equal. Mount all outlets a minimum of 24" AFF. Where single outlet unit is indicated, use Bryant #5361-I. Where corrosion resistant, provide Bryant 5361-CR for single outlets.
- B. Where "GFI" receptacles are indicated on drawings, it is the intent that ground fault protection be provided by individual Class A, 20 Ampere, 120 volt, GFI receptacles for each device shown, equal to Bryant GFR53FT-I.
- C. Outdoors and elsewhere as shown, use weatherproof covers.
- D. Automatic grip set outlets are not permitted.

- E. On flush mounted boxes for concealed wiring, use ivory nylon plates. On exposed FS and FD boxes, use cast ferrous covers matching the box or stainless steel as above, if styled for the box. In corrosive areas, outdoors and in damp locations, use device plate that is weather proof with the attachment plug inserted or removed, in full conformance with NEC Article 410-57 (b)(1), so the load may be plugged in and not attended while in use. Enclosures shall be U/L listed and must include a gasket between the hinged cover and mounting/base plate, and between the enclosure and the mounting surface. These devices shall be as manufactured by Tay Mac Corp., Tempe, AZ; 1-888-440-9045.
- F. Outlets and plates shall be a product of Bryant, Hubbell, or General Electric.

## 2.15 MOTORS

- A. These specifications relating to motors and motor control apply to all motors and controls furnished by this Section or any other section.
- B. Each section supplying motor drive apparatus will be responsible for supplying an electric motor of sufficient size for the duty performed. These shall not be oversized beyond a normal safety factor, except that standard design ratings for next above motor size required will be used. Unless otherwise specified, all motors shall have open frames, Class A insulation and continuous duty classification based on a 40°F ambient temperature of reference.
- C. Motor Control: Each motor, or group of motors, requiring a single control shall be provided with a suitable controller and devices which shall perform the functions as specified for the respective motors in other sections of these specifications. All controllers shall conform to the adopted standards and recommended practices of the Industrial Control Standards of the National Electrical Manufacturers Association and the Standards for Industrial Control Equipment of Underwriters' Laboratories, Inc.
- D. All motors utilized with VFD drives shall be premium efficiency, inverter duty rated, in conformity with serving utility efficiency requirements to permit OWNER to obtain rebate.
- E. Thermal Overload Protection. Each motor shall be provided with an overload protective device, integral with either the motor or controller. Unless otherwise specified, the protective device shall be of the manually reset type. Manual controllers for motors shall be specifically designed for the purpose, and shall have a h.p. rating adequate for the motor. Automatic control devices such as thermostats or floats are satisfactory, for direct control provided they are designed for that purpose and have an adequate h.p. rating.

## 2.16 PRIMARY AND SECONDARY SERVICE

- A. A new 240/120 volt, single phase, 3 wire service shall be provided underground from the Community center Site on Bay Road to each of the pumping station sites by the CONTRACTOR. A single power feed conduit and a spare conduit shall be installed in accordance with the Contract Drawings.
- B. The electrical service shall be terminated by the CONTRACTOR in a handhole on the Community Center parcel on Bay Road. The Electrical Subcontractor's work will begin in this

hand hole. Transformers, permanent and secondary power shall be provided by OTHERS under the Wastewater Holding Tank Contract.

#### 2.17 ELECTRICAL SERVICE AND DISTRIBUTION SYSTEM

- A. The Subcontractor shall furnish all labor, materials, etc. necessary for a complete approved electrical service as required by the structure, including inspection and approval by the utility and local inspection departments.
- B. The Subcontractor shall notify the utility company in writing, with a copy to the Engineer, no later than ten days after signing construction contracts, as to when the power service will be required.
- C. If the utility has any charges for service modifications required at the Pumping Station Sites, the CONTRACTOR shall include all such costs in his bid.

#### 2.18 UNDERGROUND ELECTRICAL SERVICES

- A. Underground service shall comply with all the requirements of the Massachusetts and/or National Electrical Code, National Electrical Safety Code, local utility company, and local enforcing authority.
- B. Furnish and install secondary lugs on transformer as required.
- C. It may be run in rigid galvanized conduit or in PVC coated rigid galvanized conduit (as indicated on Contract Drawings) approved for electrical use. Conduit shall be 36" below grade and pitched to drain.
- D. Install yellow plastic marking tape 12" above all buried distribution.

#### 2.19 METERING

- A. Permanent metering, in accordance with utility company requirements, shall be provided by OTHERS under the Wastewater Holding Tank Contract. Temporary power for construction shall be coordinated, metered, and paid for by the CONTRACTOR.
- B. Any utility charges for poles, service cable, meters, etc., in connection with the provision of temporary power shall be paid in full by the Electrical Subcontractor under this Section.
- C. Where required, provide metering transformer enclosure to serving utility's standards.

#### 2.20 HAND HOLES

- A. Hand holes shall be as specified on the plans.

#### 2.21 PANELBOARDS

- A. Panelboards shall be provided with main lugs or main breakers and branch circuit breakers according to the schedule on the Drawings.

- B. The general requirements for the panels are shown on the drawings including mounting and gutters. Mount the panels 6'-6" up to top of roughing cabinets. Gutters shall not be less than 5". Breaker frame size is shown on the drawings. Handle ties will not be permitted anywhere. Multi-pole breakers shall have common trip and one handle.
- C. All breakers shall be trip-free, suitable for switching, and thermal magnetic. All breakers shall be bolted to bus type secured in place by holding bolt. "Space" means provisions for adding breakers. Breakers or busses shall contain terminations or tappings designed for these attachments. All points of contact between bus and sub-bus shall be of copper full silvered between all contact surfaces. All breakers shall have an interrupting capacity of 22,000 amperes at 240 volts AC (symmetrical RMS amperes), except the panel at the Wastewater Treatment Facility which shall have breakers rated at no less than 30,000 AIC.
- D. Provide a typewritten tabulation indicating fixture outlets, devices, machines, or apparatus served by each breaker and their room location. This shall follow coding on the drawings with breakers numbered from top to bottom. Mount tabulation inside the door in a frame for the purpose, with a transparent plastic cover.
- E. All panelboards shall be manufactured by Square D, or approved equal.
- F. Provide TVSS (transient voltage surge suppressor) approved equal to surge logic by Square D and rated 160KA/phase surge capacity, wired to panel board. Where stand-by Power is Portable, and at main service breaker where stand-by Power is fixed mounted.

## 2.22 BALANCING OF LOADS

- A. The Contractor shall balance all loads between phases in all panels, etc., around the neutral. Neutral conductors shall be the same size as phase conductors unless specifically noted otherwise. No Common neutrals will be permitted.
- B. All circuits shall be distributed among the phases so as to restrict any phase load imbalance to less than 10% at any panelboard.
- C. After completion of the installation, record under full load conditions the current flow in each phase feeder. Submit four copies to the Engineer giving name and location of each panel, etc.
- D. Circuit members assigned to home runs and devices on the Drawings are for purposes of indicating individual circuits and are intended to correspond with the circuit numbers in the panels. The panelboard directory shall designate each circuit and its associated load. If the numbers deviate from the Drawings, the as-built Drawings shall reflect this.

## 2.23 TELEPHONE

- A. Provide new underground telephone service conduit at each site. Provide wiring to auto dialers at each facility.

## 2.24 EMERGENCY LIGHTS, EXIT SIGNS

- A. Provide emergency lights per contract drawings.

## 2.25 WIRING OF MECHANICAL AND OTHER EQUIPMENT

- A. The Electrical Subcontractor shall wire all power to, providing and installing local disconnects for, all mechanical equipment and equipment by other trades or this section per Contract Drawings. This shall include but not be limited to:

Odor Control blower fans

Pumps, etc

- NOTE: Review plans and specifications for all sections providing equipment to be wired to determine special wiring or control requirements to be provided for such under this specification section.

## 2.26 TRANSFORMERS (if any)

- A. NEMA ST20, general purpose, dry-type, self-cooled, ventilated. Provide transformers in a NEMA 1 enclosure. Transformer shall have 220°C insulation system with a temperature rise not exceeding 150°C under full rated load in a maximum ambient of 40°C. Transformer shall be capable of carrying continuously 115% of the nameplate kVA without exceeding the insulation rating.

## 2.27 INSTRUMENTATION

- A. The subcontractor under this section shall provide all conduit for and provide and install all signal cables for instrumentation provided under all Sections of these specifications, including provision of all required 120 volt power wiring and interconnections of signal cables. Review other Specification Sections for equipment requirements.

## 2.28 STAND-BY POWER PROVISIONS

- A. Provide all conduit, wire and connections for stand-by generator connection at all locations.
- B. At each Pump Stations provided a portable stand-by power connection, manual transfer switch, generator receptacle (Crouse Hinds AREA Series), 100 Ampere, 3 phase, 4 wire, with matching plug for OWNER's portable generator, conduit, wiring, etc. for stand-by power provisions. The manual transfer switch shall be rated 100 Amperes, 3 phase, 4 wire, and shall have a U/L listing for service in NEC Article 702 installations. If owner has no receptacle/plug standard to be duplicated, plugs (on generator cord) shall be female and receptacles (at pump stations) shall be male configurations.
- C. At single phase served stations all wiring is being provided to permit future conversion to 3 phase power. Provide placard on manual transfer switches indicated service voltage and phases.

## 2.29 PUMPING STATIONS

- A. Provide water tight, outdoor enclosures for installation of pump station control panels, utility main service, telephone service and manual transfer switches and receptacles or automatic



transfer switches, generator service main service overcurrent protection, dialers, and other ancillary devices. Panels shall be per details on Contract Drawings, stainless steel construction, and sized for all items to be installed within them.

- B. Provide all conduit and wiring for connection of all equipment and install control panels, automatic transfer switches, etc. as provided under other specifications sections.
- C. Provide concrete foundation for enclosure.
- D. Provide wood posts, disconnects, junction boxes per details on Contract Drawings.
- E. Provide all connections, etc. required to leave a complete installation at each site, operating per project specifications.

## 2.30 MAIN SERVICE BREAKERS/OVERCURRENT PROTECTIVE UNITS

- A. Provide new main service breakers for utility and stand-by power at each pump station.

## 2.31 DIALERS

- A. Provide at each site, a telephone auto dialer approved equal to Verbatim Modular Senses VSS by Raco Manufacturing and Engineering Co. as represented by Energy Resources Group (603) 436-6962. Dialers shall include Verbatim Parallel Printer Port Adapter Cable for connection to a local printer. Each dialer shall utilize a separate input connection for each alarm condition at the facility involved. The dialer, as specified, is to be capable of future interface to a future SCADA system.

## 2.32 DELIVERY, STORAGE AND PROTECTION

- A. The Subcontractor shall be responsible for the work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to the site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.
- B. Each Subcontractor shall protect work and material of other trades from damage that might be caused by that Subcontractor's work or workers and shall make good a damage thus caused.

## 3.0 INSTALLATION

### 3.1 GENERAL

- A. The entire work provided in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner.
- B. The Subcontractor shall obtain detailed information from the manufacturer of apparatus as to the proper method of installing and connecting same. The Subcontractor shall also obtain all information from the Contractor and other Subcontractors that may be necessary to facilitate the work and the completion of the whole project.

- C. Before installing any of the work, the Subcontractor shall see that it does not interfere with the clearances required for finished columns, pilasters, partitions, walls, and ceilings, as shown on the Contract drawings and details.
- D. Work installed by the Subcontractor which interferes with or modifies the architectural design as shown on the Contract Drawings shall be changed as directed by the Engineer, and all costs incidental to such changes shall be paid by the Subcontractor.
- E. In any and all cases of discrepancy in figures, plans or specifications the matter shall be immediately submitted to the Engineer for decision.

### 3.2 SITE VISITS

- A. The Subcontractor will be required to visit the site as the work progresses and to carefully investigate the structural and finished conditions affecting all details of the work, and shall arrange such work required to meet such conditions.

### 3.3 CUTTING AND PATCHING

- A. It is the duty of the Subcontractor to furnish and install all sleeves required in the performance of this Contract and to furnish to the Contractor the size and location of all openings required on the performance of this contract; and it shall be the duty of the Contractor to provide the required openings during building construction.
- B. If this Subcontractor fails to provide for all sleeves and openings as required in the performance of this Contract, the Subcontractor shall instruct the Contractor, who shall do such cutting, drilling, patching and grouting and so forth necessary for the proper installation of this Subcontractor's work. The Contractor is to charge this Subcontractor for this work and it shall be done at no additional expense to the Owner.
- C. Should the Contractor, after having been fully advised by the Subcontractor, fail to arrange for this work, the Subcontractor shall promptly notify the Engineer in writing of such failure. In the event of any disagreement between the Electrical Subcontractor and the Contractor over the foregoing, and in the absence of any written requests or agreements between the two, the decision of the Engineer shall be final.

### 3.04 ALUMINUM CONDUITS

- A. Aluminum conduits shall not be installed.

### 3.05 INTERIOR CONDUIT SYSTEMS

- A. Electrical Subcontractor shall coordinate with Engineer as to locations, sizes and number of conduit sleeves to be installed through cast concrete.
- B. Exposed runs of conduit shall have supports not more than 6'-0" apart and shall be installed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings with right angle turns consisting of cast metal fittings or symmetrical bends. Conduit bends and offsets shall be avoided where possible, but where necessary, shall be made with an approved hickey or conduit bending machine. Conduit which has been crushed or deformed in any way shall not be installed. Expansion fittings shall be used to

provide for expansion joints. Wooden plugs inserted in masonry or concrete shall not be used to secure conduits or boxes. Conduits shall be supported on approved types of stainless steel wall brackets, ceiling trapeze, straphangers or pipe straps, secured by means of toggle bolts in hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surfaces, and wood screws on wood construction. Provide stainless steel hardware for stainless steel support systems. Conduit shall be installed in such a manner as to insure against trouble from the collection of condensation, and all runs of conduit shall be so arranged as to be devoid of traps wherever possible. The Contractor shall exercise the necessary precautions to prevent the lodgment of dirt, trash, or plaster in conduits, fittings, or boxes during the course of installation. A run of conduit which has become clogged shall be entirely freed of the accumulation or shall be replaced.

- C. In corrosive/damp areas, all clamps, fasteners, etc. shall be stainless steel with stainless steel fasteners.
- D. Conduits shall be securely fastened to all junction boxes, pull boxes, and panelboards with galvanized locknuts and bushings, care being taken to establish a firm mechanical and electrical contact between the box and the conduit.
- E. Flexible conduit shall be installed only where necessary to overcome vibration at motor connection, and shall be as short as possible between the motor terminal box and the junction box on the branch circuit rigid conduit. All flexible conduit shall be of the liquid-tight type similar to "Sealtite", with proper fittings. Provide minimum 2 ft. diameter loop.
- F. All rigid metallic conduit shall utilize threaded fittings.
- G. Pull boxes, junction boxes and cabinet boxes shall be constructed of code gauge galvanized sheet steel of not less than the minimum size recommended by the National Electrical Code. Boxes shall be furnished with screw fastened covers. Where pull boxes are used in finished areas, the Engineer shall be consulted as to the location, type of cover, and finish of box and cover. Locations shall be as inconspicuous as possible.

### 3.6 CONDUCTORS

- A. A complete system of conductors shall be installed in the raceway system, except where otherwise noted. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Compression type connectors properly taped shall be utilized for all splices.

### 3.7 OUTLETS

- A. Outlets shall be installed in locations as indicated on the Contract Drawings. The Subcontractor shall study the general building plans in relation to the spaces surrounding each outlet in order that the work may fit the other work required by these specifications. Where necessary, the Subcontractor shall relocate outlets so that installed fixtures are symmetrically located according to room layout and will not interfere with other work or equipment.

### 3.8 DEVICE PLATES

- A. Device plates shall be installed on each outlet to suit the device installed therein. Plates shall normally be installed vertically, with an alignment tolerance of 1/16".

### 3.9 GROUNDING

- A. The conduit system and the neutral conductor of the wiring system shall be grounded. The grounded connection between the electric system neutral and the conduit system shall be made at the main electrical service panel. A bare copper conductor sized per NEC shall be installed in non-metallic conduit from the breaker enclosure to a driven ground rod (or rods).
- B. In addition, the ground electrode conductor shall be connected by a process approved equal to "Cadweld" process to ground rods, 3/4" diameter by 10 feet long. Provide certified test of recognized testing agency that ground resistance does not exceed 25 ohms.
- C. Ground wires shall be grouped and bonded to panel boxes, not to system neutrals. The ground terminal or receptacles shall be bonded to outlet boxes with No. 12 AWG bare or green insulated wire, or other suitable means per the National Electrical Code.
- D. All electric equipment shall be grounded.
- E. Conduit and/or raceway shall not be utilized as the bonding conductor.

### 3.10 EXPLOSION PROOF REQUIREMENTS

- A. Where encountered, equipment shall be Class I, Division I, Group D rated.

### 3.11 PULLING CABLES

- A. Cables shall be installed utilizing pulling equipment designed for the types of wireways or conduits installed. Where lubricating material is required, it shall be a material manufactured for and designated by UL label as suitable for the types of insulation involved on the conductors. Care shall be taken during cable pulling not to cause kinks or sharp bends in the conductors. If insulation on conductors is cut or nicked during pulling, the conductors involved shall be removed and replaced at no added cost to the Owner. During pulling, the maximum strain applied to the conductors shall not exceed 50% of the ultimate strength of the conductors.

### 3.12 FIELD TESTS

- A. As an exception to requirements that may be stated elsewhere in the Contract, the Engineer shall be given 5 working days notice prior to each test.
- B. Distribution Conductors 600 Volt Class
  - 1. Test all 600 volt class conductors to verify that no short circuits or accidental grounds exist. Make tests using an instrument which applies a voltage of approximately 500 volts to provide a direct reading in resistance.
- C. Ground Rods

1. Test ground rods for ground resistance value before any wire is connected. Use a portable ground testing meggar to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground electrode under test. Provide one copy of the meggar manufacturer's directions for use of the ground meggar indicating the method to be used.

#### D. Test Report

1. 600 volt cables (identify each cable & test result).
2. Grounding Electrodes & Systems (identify electrodes and systems, each test).

### 3.13 EXAMINATION AND APPROVAL OF WORK

- A. No work shall be covered before examination and approval by the Engineer and by all inspectors and authorities having jurisdiction. Replace any imperfect or condemned work with work conforming to requirements and satisfactory to the Engineer, without extra cost to the Owner. If work is covered before due inspection and approval, the Subcontractor shall pay all costs of uncovering and reinstating work.

### 3.14 CLEAN UP AND REPAIR

- A. At the completion of the work, the work area shall be left clean. Any damage caused to work of other trades by electrical installation shall be repaired at the expense of the Electrical Subcontractor.

### 3.15 GUARANTEE

- A. Attention is directed to provisions of the General Conditions regarding guarantees and warranties for work under this Contract.
- B. Manufacturer shall provide standard guarantees for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities which the manufacturer and Subcontractor may have by law or by other provisions of the Contract Documents.
- C. All materials, items or equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in material and workmanship for a period of not less than one year from the date of final acceptance of the work. Any fault due to defective or improper material, equipment, workmanship or design which may develop within that period shall be made good, forthwith by and at the expense of the Subcontractor, including all other damage done to areas, materials and other systems resulting from this failure.
- D. This Subcontractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as are set forth herein or as indicated.
- E. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the Subcontractor shall replace the affected part or parts.
- F. This Subcontractor shall furnish, before the final payment is made, a written guarantee covering the above requirements

(END OF SECTION)

## APPENDIX A: SOILS AND BORING LOGS

### CURRENT STATUS OF BORINGS

<u>Boring #</u>	<u>Status</u>	<u>Boring Log in Spec</u>	<u>Completed &amp; in Spec</u>	<u>Not received</u>	<u>Not performed</u>
B-01	Completed	Yes	1		
B-02	In Process	No			1
B-03	Completed	No	1		
B-04	Completed	Yes	1		
B-05	Completed	Yes	1		
B-06	Completed	Yes	1		
B-07	Completed	Yes	1		
B-08	Completed	Yes	1		
B-09	Completed	Yes	1		
B-10	Completed	Yes	1		
B-11	Completed	Yes	1		
B-12	Completed	Yes	1		
B-13	Completed	Yes	1		
B-14	Completed	Yes	1		
B-15	Completed	Yes	1		
B-16	Completed	Yes	1		
B-17	Completed	Yes	1		
B-18	Completed	Yes	1		
B-19	Completed	Yes	1		
B-20	Completed	Yes	1		
B-21	Completed	Yes	1		
B-22	Completed	Yes	1		
B-23	Completed	Yes	1		
B-24	Completed	Yes	1		
B-25	Completed	Yes	1		
B-26	Completed	Yes	1		
B-27	Completed	Yes	1		
B-28	Completed	Yes	1		
B-29	Eliminated	N/A			
B-30	Eliminated	N/A			
B-31	Completed	Yes	1		
B-32	Eliminated	N/A			
B-33	Completed	Yes	1		
B-34	Completed	Yes	1		
B-35	Completed	Yes	1		
B-36	In Process	No			1
B-37	In Process	No			1
B-38	Completed	Yes	1		
B-39	Completed	Yes	1		
B-40	Completed	Yes	1		
B-41	In Process	No			1
B-42	Completed	Yes	1		
B-43	Completed	Yes	1		
TOTAL			36	0	4

Boring	Date Drilled	Elev. GS	Lithology			Comments
			Depth	Description	Stratum	
B-6	11/2/2004	28	0-6	Lt brown F-C SAND & Silt, poorly sorted (dry)	Fill: Sand	
			6-7	Brown F SAND, some M-C Sand (dry)		
			7-15	Lt. brown clayey Silt (dry)	Till: Clayey Silt	
B-7	11/2/2004	29	0-4	Lt brown F-C SAND & Silt, poorly sorted (dry)	Fill: Sand	groundwater encountered at 5.8 ft bgs, low permeability
			4-8	Lt brown/Gray mottled CLAYEY SILT (dry)	Till: Clayey Silt	
			8-15	Light brown SILT, tr f. sand (damp)	Till: Silt	
B-9	11/2/2004	34	0-4	Dk brown F-M SAND, some Silt, poorly sorted	Fill: Sand	groundwater encountered at 6.8 ft bgs, v low permeability
			4-15	Lt brown CLAYEY SILT, little (-) f. sand (dry)	Till: Clayey Silt	
B-10	11/3/2004	54	0-2	No recovery	Fill	Soft Fill Refusal at 7 ft. (move rig 3 ft) After 12 ft, very dense and slow augering
			2-5	Lt brown-gray SILT, little (-) C Sand-Gravel (dry)	Till: Silt	
			6-7	boulders- augers grinding		
			7-15	Lt. brown, CLAYEY SILT and M Sand- Gravel		
B-11	11/3/2004	82	0-1	No recovery	Fill	Soft Fill After 10 ft, very dense and slow augering
			1-8	Dk brown-black, SILT, little (-) F-M Sand	Till: Silt	
			8-12	Brown CLAYEY SILT, and F Sand -F Gravel (dry)		
			12-15	Brown CLAYEY SILT, some F Sand-F Gravel (dry)		
B-12	11/3/2004	88	0-2	No recovery	Fill	Soft Fill After 9 ft, very dense and slow augering
			2-9	Brown CLAYEY SILT, little M-C Sand (dry)	Till: Silt	
			9-15	Lt. brown CLAYEY SILT, some C Sand -F Gravel Gravel coarser at 15 ft. (dry)		
B-13	11/3/2004	86	0-2	No recovery	Fill	Soft Fill After 10 ft, very dense and slow augering
			2-10	Brown CLAYEY SILT, some M Sand-F Gravel (dry)	Till: Silt	
			10-15	Brown CLAYEY SILT and C Sand -F Gravel (dry)		
B-14	11/3/2004	80	0-2.5	No recovery	Fill	Soft Fill After 10 ft, very dense and slow augering
			2.5-7	Brown SILT, little (-) M-C Sand-F Gravel (dry)	Till: Silt	
			5.7-12	Brown SILT, little (-) F-C Sand (dry)		
			12-15	Brown CLAYEY SILT and C Sand -F Gravel (dry)		



B-15	11/3/2004	67	0-4.5	No recovery	Fill	very Soft Fill very Dense 6-7 ft, Boulder at 10 ft gravel is subangular to subrounded slow augering after 6 feet to end boring
			4.5-11	Brown CLAYEY SILT and F-C Sand-Gravel (dry)	Till: Silt	
			11-13	F-C Gravel and brown Clayey Silt (dry)	Gravel Seam	
			14-15	Brown CLAYEY SILT and M-C Sand (dry)	Till: Silt	
B-18	11/3/2004	52	0-2	No Recovery	Fill	
			2- 5.5	Brown - dk gray SILTY CLAY (damp)	Organics	
			5.5-11	Brown SILTY CLAY, tr F-C. Sand (dry)	Till: Silt	
			11-15	Brown SILTY CLAY, little F-M Sand (dry)		
B-19	11/3/2004	56	0-4	No Recovery	Fill	
			4- 5.5	Dk brown CLAYEY SILT, homogeneous (damp)	Organics	
			5 5-15	Lt brown CLAYEY SILT, little (-) C. Sand -	Till: Silt	
B-20	11/2/2004	58	0-5	Dk brown F-C SAND and Silt	Fill	Slow augering, dense formation
			5-11	Lt brown SILT and F-C Sand (dry)	Till: Silt	
			11-15	Lt. brown F SAND to Gravel and Silt (poorly sorted) dense		
B-21	11/2/2004	66	0-7	Dk, brown-black F-M Sand and Silt	Fill	Denser at 7 ft.
			7-10	No recovery	Till: Silt	
			10-13	Lt brown SILT and F-C Sand to F. Gravel (dry)		
			13-15	Lt. brown clayey Silt, some f-c Sand (dry)		
B-22	11/2/2004	63	0-6	No recovery	Fill	@10' augers grinding on rock
			6-12	Lt brown/Gray mottled SILT, little (-) f sand (dry)	Till: Silt	
			12-15	Lt. brown Silt, tr f. sand (dry)		
B-23	11/2/2004	46	0-5	No recovery	Fill	Augers occassionally grinding on rocks
			5-15	Lt brown CLAYEY SILT, some (-) f-m sand (dry)	Till: Clayey Silt	
B-24	11/2/2004	36	0-4	Lt brown F-C SAND & Silt, poorly sorted (dry)	Fill: Sand	
			4-10	No recovery - soft material		
			10-15	Lt brown CLAYEY SILT, little (-) f. sand (dry)	Till: Silt	

Notes: 1. Borings drilled using 5-inch diameter augers with non-hollow bit.

BORING LOG

pg 1/1

Boring Name **B-1**  
 Project No **BW0041**  
 Client **Lombardo Associates, Inc**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co **Soil Exploration (Tim Flores)**  
 Completion **December 29, 2004**  
 Geologist **Joe Lurgio**  
 Drilling Method **Solid Auger**  
 Borehole Dia **5"**  
 Northing **3079909**  
 Easting **846511**



**GEO.SYNTec CONSULTANTS**

255 Great Neck Road, Suite 103  
 Amesbury, Massachusetts 01720  
 Tel: (978) 263-9300 • Fax: (978) 263-9304

Checked By: **LJA**

Depth (Feet)	Soil Type	Drilling Method	Soil Sample	Uthologig Description	Comments
0 - 1				FILL: SAND	
1 - 4				ORGANICS Dk brown organic SAND, some Silt	
4 - 6				<h1>Page 1</h1>	
6 - 9				SAND Dk - Lt brown SAND, some Silt, (moist)	dense
9 - 12					
12 - 15				SAND Lt brown SAND, some Silt (moist)	dense

Groundwater not Observed

**BORING LOG**

PS 1/1

**Boring Name** B-1  
**Project No.** BW0041  
**Client** Lombardo Associates, Inc.  
**Project Name** Little Neck  
**Location** Ipswich, MA  
**Drilling Co.** Soil Exploration (Tim Flores)  
**Completion** December 29, 2004  
**Geologist** Joe Lurgio  
**Drilling Method** Solid Auger  
**Borehole Dia** 5"  
**Northing** 3079909  
**Easting** 846511



**GEO SYNTEC CONSULTANTS**

229 Great Road, Suite 103  
 Andover, Massachusetts 01720  
 Tel: (978) 263-9383 • Fax: (978) 263-9384

Checked By: DJL

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
0			FILL: SAND	
1			ORGANICS Dk brown organic SAND, some Silt	
2				
3				
4				
5				
6				
7				
8			SAND Dk - Lt brown SAND, some Silt, (moist)	dense
9				
10				
11				
12			SAND Lt brown SAND, some Silt (moist)	dense
13				
14				
15				

**Page 1**

Groundwater not Observed

**BORING LOG**

pg 1/1

Boring Name: B-04  
 Project No: BW0041  
 Client: Lombardo Associates, Inc  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: December 13, 2004

Geologist: Jeff Rogers  
 Drilling Method: Auger  
 Borehole Dia: 8"

Nothing: 3079544  
 Existing: 845969



**GEO SYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel: (978) 263-9583 • Fax: (978) 263-9594

Checked By: DJM

Depth (ft)	Peak Level During drilling	Stratigraphy	Lithologic Description	Comments
1				
2				
3			<b>BANDY FILL</b> Dk brown Silt and Clay, little sand, trace gravel (damp)	
4				
5				Grinding at 5 feet
6				
7				
8				
9				
10				
11			<b>TEL: SILT</b> Lt. brown SILT, little Sand, trace Gravel (dry)	
12				
13				
14				
15				

Groundwater not observed

**BORING LOG**

pg 1/1

Boring Name B-5  
 Project No. BW0041  
 Client Lombardo Associates  
 Project Name Little Neck Island  
 Location Ipswich, MA  
 Drilling Co. Soil Exploration (Tim Flores)  
 Completion 12/22/2004

Geologist D. Bourdau  
 Drilling Method Auger  
 Borehole Dia. 8"

Northing 3079333  
 Easting 845878



219 Great Road, Suite 105  
 Acton, Massachusetts 01720  
 Tel. (978) 263-9588 • Fax (978) 263-9594

Checked By JMR

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Sample ID	Recovery (inch)	Blows (per 6 inches)	Comments on Sample
0			LOAM FILL		S1	14		
1						7		
2						2		
3						2		
4			SANDY FILL Mod. brown M SAND, little gravel (dry)					loose, poorly sorted
5					S2	22		
6						30		
7						30		
8						27		loose with 7.5 YR 5/6 mottles
9			TILL: SILT Lt Brown F-M SANDY SILT, some M Gravel (moist)					
10					S3	24		
11						16		firm, poorly sorted
12						14		observed water in spoon
13			TILL: CLAYEY SILT Lt Brown CLAYEY SILT, some M Sand, trace M Gravel (moist)			12		
14						15		
15					S4	20		
16						15		firm, poorly sorted
17						21		observed water in spoon
18			TILL: CLAYEY SILT Lt Brown CLAYEY SILT, trace F Gravel and M Sand (wet)			22		
19						27		
20								
25								
30								
35								

Groundwater not observed  
 Samples taken using 24" long, 2.4inch diameter soil spoon sampler, driven by a 140lb hammer dropped 30 inches

**BORING LOG**

Boring Name: B-6  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: November 2, 2004

Geologist: David Adelman  
 Drilling Method: Auger  
 Borehole Dia: 5"  
 Northing: 3079432  
 Easting: 845823



**GEOSYNTEC CONSULTANTS**

289 Canal Road, Suite 105  
 Acton, Massachusetts 01720  
 Tel: (978) 261-9588 • Fax: (978) 261-9564

Checked By: JNR

Depth (ft)	Soil Type	Comments
0 - 1	SANDY FILL	U brown F.C. SAND & Silt, poorly sorted (dry)
1 - 6	BANDY FILL	Brown F. SAND, some M.C. Sand (dry)
6 - 15	TILL: CLAYEY SILT	U brown clayey SILT (dry)

**BORING LOG**

Boring Name **B-7**  
 Project No **BW0041**  
 Client **Lombardo Associates, Inc**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co **Soil Exploration (Tim Flores)**  
 Completion **November 2, 2004**

Geologist **David Adelman**  
 Drilling Method **Auger**  
 Borehole Dia **5"**

Northing **3079350**  
 Easting **845799**



**GEOSYNTEC CONSULTANTS**

789 Gray Road, Suite 103  
 Amesbury, Massachusetts 01724  
 Tel: (978) 263-9585 • Fax: (978) 263-9394

Checked By **JNR**

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Comments
1			<b>SANDY FILL</b> Lt brown F-C SAND & Silt, poorly sorted (dry)		
2					
3					
4					
5					
6	▼		<b>TILL: CLAYEY SILT</b> Lt brown/Gray mottled CLAYEY SILT (dry)		Groundwater encountered at 5.8 ft bgs. v. low permeability
7					
8					
9					
10					
11			<b>TILL: SILT</b> Light brown SILT, w f. sand (damp)		
12					
13					
14					
15					

# BORING LOG

DG 1/1

**Boring Name:** B-8  
**Project No:** BW0041  
**Client:** Lombardo Associates, Inc.  
**Project Name:** Little Neck  
**Location:** Ipswich, MA.  
**Drilling Co:** Soil Exploration (Tim Flores)  
**Completion:** December 22, 2004  
**Geologist:** D. Bourdeau  
**Drilling Method:** Auger  
**Borehole Dia:** 8"  
**Northing:** 3079274  
**Easting:** 845675



**GEO-SYNTec CONSULTANTS**

289 Great Road, Suite 105  
 Acton, Massachusetts 01720  
 Tel: (978) 263-9581 • Fax: (978) 263-9594

Checked By: JNP

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
			Pavement	
1			<b>SANDY FILL</b> Dk brown C SAND, some Silt (moist)	
2				
3				
4				Light chamber at 4 ft
5				
6			<b>TILL: SILT</b> LI brown SILT, trace F Sand (moist)	
7				
8				LiCh Recovery at 8 ft
9				
10				
11			<b>TILL: SILT</b> LI brown Sil T, some C Gravel and M Sand (moist)	
12				
13				
14			<b>TILL: CLAYEY SILT</b> LL brown CLAYEY SILT, some M Sand, trace F Gravel	
15				

Groundwater not observed



**BORING LOG**

Boring Name: B-9  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: November 2, 2004

Geologist: David Adelman  
 Drilling Method: Auger  
 Borehole Dia: 5"  
 Northing: 3079297  
 Easting: 845856



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 103  
 Acton, Massachusetts 01720  
 Tel: (978) 262-9582 • Fax: (978) 262-9594

Checked By: JNR

Depth (ft)	Water Level during drilling	Permeability	Lithologic Description	USCS Classification	Comments
1			<p><b>SANDY FILL</b>                      Dk brown F-M SAND, some SILT, poorly sorted (dry)</p>		
2					
3					
4					
5					
6					
7	▼				Groundwater encountered at 6.8 ft bgs, v. low permeability
8					
9			<p><b>TILL: CLAYEY SILT</b>                      Lt brown CLAYEY SILT, little (-) f sand (dry)</p>		
10					
11					
12					
13					
14					
15					

**BORING LOG**

Boring Name: B-10  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: November 3, 2004

Geologist: David Adelman  
 Drilling Method: Solid Auger  
 Borehole Dia: 5"

Northing: 3079261  
 Easting: 846050



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 103  
 Amesbury, Massachusetts 01726  
 Tel: (978) 267-9588 - Fax: (978) 267-9594

Checked By: JMG

DEPTH (ft)	WATER LEVEL (ft)	LOGGING	LITHOLOGY (Description)	COMMENTS
0				
1			NO RECOVERY	Soil Fill
2				
3				
4			TILL, SILT U brown-gray SILT, little (-) C Sand-Gravel (dry)	
5				
6				
7			BOULDER Brown CLAYEY SILT and F Sand-F Gravel (dry)	Refusal at 7 ft. (moving 3 ft)
8				
9				
10			TILL, CLAYEY SILT U brown, CLAYEY SILT and M Sand-Gravel	
11				
12				After 12 ft. very dense and slow augering
13				
14				
15				

**BORING LOG**

**Boring Name** B-11  
**Project No** BW0041  
**Client** Lombardo Associates Inc.  
**Project Name** Little Neck  
**Location** Ipswich, MA  
**Drilling Co.** Soil Exploration (Tim Flores)  
**Completion** November 3 2004

**Geologist** David Adelman  
**Drilling Method** Solid Auger  
**Borehole Dia** 5"  
**Northing** 3079230  
**Easting** 846316



**GEOSYNTEC CONSULTANTS**

289 Great Road Suite 105  
 Acton, Massachusetts 01720  
 Tel (978) 263-9388 • Fax (978) 263-9394

Checked By: JSP

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Comments
1			NO RECOVERY	Soil Fill	
2					
3					
4			TILL: SILT Dk brown-black, SILT, little (-) F-M Sand		
5					
6					
9			TILL: CLAYEY SILT Brown CLAYEY SILT, and F Sand-F Gravel (dry)		
10					After 10 ft, very dense and slow augering
11					
12					
13			TILL: CLAYEY SILT Brown CLAYEY SILT, some F Sand-F Gravel (dry)		
14					
15					

**BORING LOG**

Boring Name B-12  
 Project No BW0041  
 Client Lombardo Associates, Inc.  
 Project Name Little Neck  
 Location Ipswich, MA  
 Drilling Co Soil Exploration (Tim Flores)  
 Completion November 3, 2004

Geologist David Adiraman  
 Drilling Method Solid Auger  
 Borehole Dia 6"

Northing 3079262  
 Easting 846505



**GEO SYNTEC CONSULTANTS**

289 Green Road, Suite 101  
 Amesbury, Massachusetts 01776  
 Tel: (978) 263-9588 • Fax: (978) 263-9594

Checked By: JND

Depth (ft)	Level Log / During Drilling / Sample	Geologic Description	Comments
0			
1		NO RECOVERY	Soft Fill
2			
3			
4			
5		TILL: CLAYEY SILT Brown CLAYEY SILT, little M. C. Sand (dry)	
6			
7			
8			
9			After 9 ft. very dense and slow augering
10			
11			
12		TILL: CLAYEY SILT LL brown CLAYEY SILT, some C Sand - F Gravel Gravel coarser at 15 ft. (dry)	
13			
14			
15			

**BORING LOG**

Boring Name B-13  
 Project No BW0041  
 Client Lombardo Associates, Inc.  
 Project Name Little Neck  
 Location Ipswich, MA  
 Drilling Co. Soil Exploration (Tim Flores)  
 Completion November 3, 2004

Geologist David Adelman  
 Drilling Method Solid Auger  
 Borehole Dia 5"

Northing 3079334  
 Easting 846643



**GEO SYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Amesbury, Massachusetts 01720  
 Tel: (978) 263-9588 • Fax: (978) 263-9594

Checked By: JNR

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Comments
1			NO RECOVERY	Soft Fill	
2					
3					
4					
5			TILL: CLAYEY SILT Brown CLAYEY SILT, some M Sand-F Gravel (dry)		
6					
7					
8					
9					
10					After 10 ft. very dense and slow augering
11					
12			TILL: CLAYEY SILT Brown CLAYEY SILT and C Sand-F Gravel (dry)		
13					
14					
15					

**BORING LOG**

Boring Name: B-14  
 Project No: BW0041  
 Client: Lombardo Associates Inc  
 Project Name: Little Neck  
 Location: Ipswich MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: November 3 2004

Geologist: David Adelman  
 Drilling Method: Solid Auger  
 Borehole Dia: 5"

Northing: 3079415  
 Easting: 846778



**GEO SYNTEC CONSULTANT**

289 Great Road, Suite 101  
 Amesbury, Massachusetts 01726  
 Tel: (978) 243-9588 • Fax: (978) 263-9584

Checked By: JAD

Depth (ft)	Water Level / Pumping / Logging	Stratigraphic Description	USCS Description	Comments
0		NO RECOVERY	Soft Fill	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

**TILL: SILT**  
 Brown SILT, little (-) M-C Sand-F Gravel (dry)

**TILL: SILT**  
 Brown SILT, little (-) F-C Sand (dry)

After 10 ft very dense and slow augering

**TILL: CLAYEY SILT**  
 Brown CLAYEY SILT and C Sand-F Gravel (dry)

**BORING LOG**

Boring Name **B-15**  
 Project No **BW0041**  
 Client **Lombardo Associates, Inc**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co **Soil Exploration (Tinn Flores)**  
 Completion **November 3, 2004**

Geologist **David Adelman**  
 Drilling Method **Solid Auger**  
 Borehole Dia **5"**

Northing **3079478**  
 Easting **846943**



**GEOSYNTEC CONSULTANTS**

289 Green Road, Suite 103  
 Ames, Massachusetts 01720  
 Tel: (978) 263-9388 • Fax: (978) 263-9384

Checked By **JNP**

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Comments
1					
2			<b>NO RECOVERY</b>		Very Soft Fill
3					
4					
5					
6					very Dense 6-7 ft. Boulder at 10 ft slow augering after 6 feet to end boring
7			<b>TILL: CLAYEY SILT</b> Brown CLAYEY SILT and F-C Sand-Gravel (dry)		
8					
9					
10					
11					
12					
13			<b>GRAVEL BEAM</b> F-C Gravel and brown Clayey Sil (dry)		gravel is subangular to subrounded
14					
15			<b>TILL: CLAYEY SILT</b> Brown CLAYEY SILT and M-C Sand (dry)		

BORING LOG

Boring Name B-16  
 Project No BW0041  
 Client Lombardo Associates, inc  
 Project Name Little Neck  
 Location Ipswich, MA  
 Drilling Co Soil Exploration (Tim Flores)  
 Completion December 29, 2004  
 Geologist Joe Lurgio  
 Drilling Method Auger  
 Borehole Dia 5"  
 Northing 3079748  
 Easting 847037



GEOSYNTEC CONSULTANTS

289 Oriskany Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel: (978) 261-9388 • Fax: (978) 261-9394

Checked By: DJL

Depth (ft)	Soil Type / Description	Comments
0 - 0.5	Pavement	
0.5 - 4.5	SANDY FILL (brown F SAND) (dry)	
4.5 - 6.5	TILL SAND (brown F SAND) some silt (dry)	little recovery
6.5 - 12.5	TILL SAND (brown F SAND) some silt and gravel (dry)	Dense
12.5 - 14.5	TILL SAND brown F SAND, some C gravel (dry)	Little recovery, DnR Chatter
14.5 - 15.0	TILL SAND brown F SAND, some M gravel (dry)	

Page 1

Groundwater: not observed



**BORING LOG**

**Boring Name** B-17  
**Project No.** BW0041  
**Client** Lombardo Associates, Inc.  
**Project Name** Little Neck  
**Location** Ipswich, MA  
**Drilling Co.** Soil Exploration (Tim Flores)  
**Completion** December 13, 2004

**Geologist** Jeff Rogers  
**Drilling Method** Auger  
**Borehole Dia.** 8"  
**Northing** 3079682  
**Easting** 846858



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Andover, Massachusetts 01760  
 Tel: (978) 263-9588 • Fax: (978) 263-9594

Checked By DJA

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
1			<b>SANDY FILL</b> Dk brown F-M SAND, some Silt (damp)	
2			<b>TILL: CLAYEY SILT</b> Lt brown CLAYEY SILT, trace F Sand (damp)	
3				
4				
5				
6				
7			<b>TILL: SILT</b> Lt brown SILT, trace C Sand and Gravel (dry)	
8				
9				
10				Encountered Small Rock through 12"
11				
12				
13				
14			<b>TILL: CLAYEY SILT</b> Lt brown CLAYEY SILT, little F Sand (damp)	
15				

Groundwater not observed

**BORING LOG**

06.11.04

Boring Name: B-18  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: November 3, 2004

Geologist: David Adelman  
 Drilling Method: Solid Auger  
 Borehole Dia: 5"  
 Northing: 3079300  
 Easting: 847032



**GEO-SYNTec CONSULTANTS**

289 Great Road, Suite 105  
 Andover, Massachusetts 01770  
 Tel: (978) 761-9388 • Fax: (978) 761-9394

Checked By: JAV

Depth (ft)	Water Level during drilling	Soil Category	USCS Disturbance	Comments
1				
2		NO RECOVERY	FD	
3		TILL: SILTY CLAY Brown dk gray SILTY CLAY (damp)	Organics	
4				
5				
6		TILL: SILTY CLAY Brown SILTY CLAY w/ F.C. Sand (dry)		
7				
8				
9				
10				
11				
12				
13		TILL: SILTY CLAY Brown SILTY CLAY w/ F-M Sand (dry)		
14				
15				

**BORING LOG**

pg 1/1

Boring Name B-19  
 Project No BW0041  
 Client Lombardo Associates, Inc  
 Project Name Little Neck  
 Location Ipswich, MA  
 Drilling Co Soil Exploration (Tim Flores)  
 Completion November 3, 2004

Geologist David Adelman  
 Drilling Method Solid Auger  
 Borehole Dia 5"  
 Northing 3079242  
 Easting 846875



**GEO SYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel: (978) 263-9388 • Fax: (978) 263-9384

Checked By: JNF

Depth (ft)	Water Level (during drilling)	Stratigraphy	Lithologic Description	USCS Classification	Comments
1			NO RECOVERY	FR	
2					
3					
4			TILL: CLAYEY SILT Dk brown CLAYEY SILT, homogeneous (damp)	Organics	
5					
6					
7					
8					
9			TILL: CLAYEY SILT L brown CLAYEY SILT, little (-) C Sand - F Gravel (dry)		
10					
11					
12					
13					
14					
15					

**BORING LOG**

Boring Name: B-20  
 Project No: BW0041  
 Client: Lombardo Associates Inc  
 Project Name: Little Neck  
 Location: Ipswich MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: November 2, 2004

Geologist: David Adelman  
 Drilling Method: Solid Auger  
 Borehole Dia: 6"  
 Northing: 3079190  
 Easting: 846776



**GEOSYNTEC CONSULTANTS**

299 Great Road Suite 107  
 Acton, Massachusetts 01726  
 Tel: (978) 263-9388 • Fax: (978) 263-9384

Checked By: JAF

Depth (ft)	Water Level during drilling	Soil Sample	Lithologic Description	UCS Description	Comments
1					
2					
3			<b>FILL</b> Dk brown F-C SAND and Silt		
4					
5					
6					
7			<b>TILL: SILT</b> U brown SILT and F-C Sand (dry)		
8					
9					
10					
11					
12					Slow augering dense formation
13			<b>TILL: SILT</b> LL brown F SAND to Gravel and Silt (poorly sorted) dense		
14					
15					

**BORING LOG**

**Boring Name** B-21  
**Project No.** BW0041  
**Client** Lombardo Associates, Inc.  
**Project Name** Little Neck  
**Location** Ipswich, MA  
**Drilling Co** Soil Exploration (Tim Flores)  
**Completion** November 2, 2004  
**Geologist** David Adelman  
**Drilling Method** Solid Auger  
**Borehole Dia.** 5"  
**Northing** 3079078  
**Easting** 846532



**GEOSYNTEC CONSULTANTS**

289 Green Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel: (978) 263-9588 • Fax: (978) 263-9594

Checked By: JNP

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Comments
1					
2					
3			FILL Dk. brown-black F-M Sand and Silt		
4					
5					
6					
7					Denser at 7 ft
8					
9			NO RECOVERY		Tilt: Silt
10					
11			TLL: BILT U. brown SILT and F-C Sand to F. Gravel (dry)		
12					
13					
14			TLL: BILT LL brown clayey SILT, some fc Sand (dry)		
15					

**BORING LOG**

Boring Name: B-22  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich MA  
 Drilling Co: Soil Exploration (Tim Fiorese)  
 Completion: November 2, 2004

Geologist: David Adelman  
 Drilling Method: Solid Auger  
 Borehole Dia: 5"  
 Northing: 3079041  
 Easting: 846259



**GEOSYNTEC CONSULTANTS**

285 Great Road Suite 105  
 Ames, Massachusetts 01770  
 Tel: (978) 263-9389 • Fax: (978) 263-9394

Checked By: JAF

Depth (ft)	Vertical Scale	Stratigraphy	Geologic Description	Remarks	Comments
0	0				
1	1				
2	2				
3	3				
4	4				
5	5				
6	6				
7	7				
8	8				
9	9				
10	10				
11	11				
12	12				
13	13				
14	14				
15	15				

NO RECOVERY

Fill

TILL: SILT  
 Lt brown/Gray mottled SILT, inter (-) sand (dry)

@ 10' auger's grinding on rock

TILL: SILT  
 Lt brown SILT w/ sand (dry)

**BORING LOG**

pg 1/1

Boring Name **B-23**  
 Project No **BW0041**  
 Client **Lombardo Associates, Inc.**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co **Soil Exploration (Tim Flores)**  
 Completion **November 2 2004**

Geologist **David Adelman**  
 Drilling Method **Solid Auger**  
 Borehole Dia. **5"**  
 Northing **3079081**  
 Easting **845969**



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Amesbury, Massachusetts 01720  
 Tel (978) 263-9381 • Fax (978) 263-9384

Checked By **JNR**

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

**NO RECOVERY**

Soft Material Fill

**TILL: CLAYEY SILT**  
 Lt brown CLAYEY SILT, some (-) f-m sand (dry)

Augers occasionally grinding on rocks

**BORING LOG**

Boring Name B-24  
 Project No BW0041  
 Client Lombardo Associates Inc.  
 Project Name Little Neck  
 Location Ipswich MA  
 Drilling Co Soil Exploration (Tim Flores)  
 Completion November 2 2004

Geologist David Adilman  
 Drilling Method Auger  
 Borehole Dia 5"  
 Northing 3079197  
 Easting 845854



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 107  
 Amesbury, Massachusetts 01726  
 Tel: (978) 263-9986 Fax: (978) 263-9394

Checked By JAF

DEPTH (ft)	REMARKS	SYMBOL	DESCRIPTION	COMMENTS
0			<b>SANDY FILL</b> Light brown F.C. SAND & Silt, poorly sorted (dry)	
4			<b>NO RECOVERY</b>	Soil Material
10			<b>TILL SILT</b> Light brown CLAYEY SILT little (??) sand (dry)	



## BORING LOG

pg 1/1

**Boring Name** B-25  
**Project No.** BW0041  
**Client** Lombardo Associates, Inc.  
**Project Name** Little Neck  
**Location** Ipswich, MA  
**Drilling Co.** Soil Exploration (Tim Flores)  
**Completion** December 22, 2004

**Geologist** D. Bourdeau  
**Drilling Method** Auger  
**Borehole Dia.** 8"  
**Northing** 3079096  
**Easting** 845715



**GEOSYNTEC CONSULTANTS**

219 Grand Road, Suite 105  
 Acton, Massachusetts 01720  
 Tel: (978) 263-9581 • Fax: (978) 263-9594

Checked By: JNR

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
			Pavement	
1			<b>SANDY FILL</b> Dk brown C SAND, some Silt (moist)	
2				
3				
4				Light chatter at 4'
5			<b>TILL: CLAYEY SILT</b> Lt brown CLAYEY SILT, trace F Sand (moist)	
6				
7				
8			<b>TILL: CLAYEY SILT</b> Lt brown CLAYEY SILT, some F Gravel, trace M Sand (moist)	
9				
10				
11				
12				
13			<b>TILL: SILT</b> Lt. brown SILT, some M Gravel, trace F Sand	Light chatter, 100% recovery
14				Heavy chatter at 14'
15				

Smoke observed from borehole during extraction  
Groundwater not observed

BORING LOG

pg 1/1

Boring Name B-26  
 Project No BW0041  
 Client Lombardo Associates, Inc  
 Project Name Little Neck  
 Location Ipswich, MA  
 Drilling Co Soil Exploration (Tim Flores)  
 Completion December 29, 2004  
 Geologist Joe Lurgio  
 Drilling Method Auger  
 Borehole Dia 5"



**GEO SYNTEC CONSULTANTS**

269 Great Road, Suite 103  
 Acton, Massachusetts 01725  
 Tel: (978) 263-9385 • Fax: (978) 263-9384

Checked By: GJM

Depth (ft)	Soil Log	Soil Description	Comments
0 - 0.5	Pavement		
0.5 - 6.0	SANDY FILL Dk brown SAND AND GRAVEL (dry)		
6.0 - 8.5	TILL - SILT Lt brown SILT some M Sand (moist)		
8.5 - 9.5	TILL - SILT Lt brown SILT some M Sand trace clay (moist)		Some chatter till recovered at 9ft
9.5 - 15.0	TILL - SAND and GRAVEL Lt brown SAND some C Gravel (dry)		

Page 1

Groundwater not observed

BORING LOG

pg 1/1

Boring Name **B-27**  
 Project No. **BW0041**  
 Client **Lombardo Associates, Inc.**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co. **Soil Exploration (Tim Flores)**  
 Completion **December 29, 2004**

Geologist **Joe Lurgio**  
 Drilling Method **Solid Auger**  
 Borehole Dia **5"**  
 Northing **3078999**  
 Easting **846005**



**GEOSYNTEC CONSULTANTS**

289 Orel Road, Suite 103  
 Acton, Massachusetts 01726  
 Tel: (978) 263-9388 • Fax: (978) 263-9394

Checked By

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
			PAVEMENT	
1			PEAT LT brown PEAT and Sand	
2				
3				
4				
5				
6				
7				
8			SAND LT brown F-M SAND (wet)	
9				
10				
11				
12				
13				
14				
15				

Groundwater encountered, depth is uncertain

**BORING LOG**

pg 1/1

Boring Name: B-28  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co.: Soil Exploration (Tim Flores)  
 Completion: December 22, 2004

Geologist: Bourdeau  
 Drilling Method: Auger  
 Borehole Dia: 8"  
 Northing: 3078856  
 Easting: 846148



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Amesbury, Massachusetts 01720  
 Tel: (978) 261-9581 • Fax: (978) 261-9394

Checked By: JNR

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
			Pavement	
1			SANDY FILL Dk brown C SAND, some Silt (moist)	
2				
3				
4			CLAYEY SILT Lt brown CLAYEY SILT, trace F Sand (dry)	light chatter at 4'
5				
6			SAND Lt brown M SAND (dry)	Clear
7				
8			SAND Moderate brown M SAND, trace silt (wet)	Little recovery, rapid advancement through 9 ft
9				
10			SILT Gray Organic SILT, little f-m sand (wet)	Morphy odor
11				
12				
13			CLAY LL brown CLAY, some F-M Sand, trace Silt (wet)	
14				
15				

Boring conducted at 12:45 during low tide  
 Groundwater not observed

**BORING LOG**

**Boring Name** B-31  
**Project No.** BW0041  
**Client** Lombardo Associates, Inc.  
**Project Name** Little Neck  
**Location** Ipswich, MA  
**Drilling Co.** Soil Exploration (Tim Flores)  
**Completion** December 13, 2004

**Geologist** Jeff Rogers  
**Drilling Method** Auger  
**Borehole Dia.** 8"  
**Northing** 3078841  
**Easting** 846542



**GEOSYNTEC CONSULTANTS**

219 Great Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel. (978) 263-9588 • Fax (978) 263-9594

Checked By: DJA

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
1				
2				
3			<b>SANDY FILL</b> Dk brown F-M SAND, some Gravel, little Silt (dry)	
4				
5				
6	▽			Approximate Water Level
7				
8				
9				
10				
11			<b>SAND</b> Lt brown F-M SAND, trace Silt (wet)	
12				
13				
14				
15				

BORING LOG

Boring Name: B-33  
 Project No: BW0041  
 Client: Lombardo Associates, Inc.  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co: Soil Exploration (Tim Flores)  
 Completion: December 29, 2004  
 Geologist: Joe Lurgio  
 Drilling Method: Auger  
 Borehole Dia: 5"



GEOSYNTEC CONSULTANTS

277 Great Road, Suite 101  
 Andover, Massachusetts 01875  
 Tel: (978) 265-2385 • Fax: (978) 261-0946

Checked By: DJL

Depth (m)	Soil Type / Description	Comments
0.0 - 0.2	Pavement	
0.2 - 4.0	SANDY FILL LT brown F. SAND (dry)	
4.0 - 5.0	TILL: SAND LT brown F. SAND, some clay (moist)	
5.0 - 12.5	TILL: CLAY LT brown CLAY (moist)	
12.5 - 13.5	TILL: SAND and GRAVEL brown S.L.T. some f sand (dry)	

Page 1

(Some chatter: smoky)

Groundwater not observed

**BORING LOG**

pg 1/1

Boring Name **B-34**  
 Project No. **BW0041**  
 Client **Lombardo Associates, Inc**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co. **Soil Exploration (Tim Flores)**  
 Completion **December 29, 2004**

Geologist **Joe Lurgio**  
 Drilling Method **Auger**  
 Borehole Dia **5"**  
 Northing **3079198**  
 Easting **847042**



**GEOSYNTEC CONSULTANTS**

289 Great Road, Suite 103  
 Andover, Massachusetts 01720  
 Tel: (978) 263-9388 • Fax: (978) 263-9394

Checked By **DJA**

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
			<b>Pavement</b>	
1			<b>SANDY FILL</b> Lt brown F. SAND (dry)	
2				
3				
4				Dense
5				
6				
7				
8				
9			<b>TILL: SAND</b> Lt brown CLAY, some sand (moist)	
10				
11				
12				
13				
14				
15				

**Page 1**

Groundwater not observed

**BORING LOG**

Boring Name B-35  
 Project No BW0041  
 Client Lombardo Associates, Inc  
 Project Name Little Neck  
 Location Ipswich, MA  
 Drilling Co Soil Exploration (Tim Flores)  
 Completion December 22, 2004

Geologist D. Bourdeau  
 Drilling Method Auger  
 Borehole Dia 6"  
 Northing 3079197  
 Easting 847102



**GEOSYNTEC CONSULTANTS**

219 Great Road, Suite 105  
 Andover, Massachusetts 01770  
 Tel (978) 263-9588 • Fax (978) 263-9594

Checked By JNR

Depth (ft)	Moisture Content Liquid Limit Plasticity Index	Stratigraphy	Lithologic Description	Comments
0			Pavement	
1				
2			SANDY FILL DK brown C SAND, some Silt (moist)	Heavy choker at 2 ft
3				
4			TILL: CLAYEY SILT LI brown CLAYEY SILT, some M-C Sand, trace Gravel (dry)	V. Soft
5				
6				Light choker at 6 ft
7				
8			TILL: CLAYEY SILT LI brown CLAYEY SILT, some M-C Sand, trace Gravel (moist)	V. Soft
9				
10				Dark choker at 10 ft, 100% recovery with C Gravel
11				
12				Smalls observed from borehole
13				Light choker, 100% recovery
14				
15				

Groundwater not observed



### BORING LOG

pg 1/1

Boring Name	B-38	Geologist	Jeff Rogers
Project No.	BW0041	Drilling Method	Auger
Client	Lombardo Associates, Inc.	Borehole Dia.	8"
Project Name	Little Neck		
Location	Ipswich, MA		
Drilling Co.	Soil Exploration (Tim Flores)	Northing	3078581
Completion	December 13, 2004	Easting	846554



**GeoSYNTEC CONSULTANTS**

289 Canal Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel: (978) 263-9581 • Fax: (978) 263-9594

Checked By: DJA

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
1			<b>SANDY FILL</b> Dk brown F-M SAND, some Silt (damp)	
2				
3				
4			<b>TILL: SILTY CLAY</b> L brown SILT and CLAY (wet)	
5				Reamed through 6. Reamed 7' mark
6				
7				
8				
9			<b>TILL: CLAYEY SILT</b> L brown CLAYEY SILT, trace M-C Sand (damp)	Very Dense Till
10				
11				
12				Breaks from the borehole at 12'
13				
14			<b>TILL: SILTY CLAY</b> L brown SILTY CLAY, little M Sand (wet)	
15				

Groundwater not observed

**BORING LOG**

PC 1/1

Boring Name: B-39  
 Project No.: BW0041  
 Client: Lombardo Associates, Inc  
 Project Name: Little Neck  
 Location: Ipswich, MA  
 Drilling Co.: Soil Exploration (Tim Flores)  
 Completion: December 13, 2004  
 Geologist: Jeff Rogers  
 Drilling Method: Auger  
 Borehole Dia.: 8"  
 Northing: 3079591  
 Easting: 846701



**GEO SYNTEC CONSULTANTS**

289 Great Road, Suite 105  
 Andover, Massachusetts 01720  
 Tel: (978) 261-9583 • Fax: (978) 263-9594

Checked By: ELA

Depth (ft)	Water Level during drilling	Borehole	Uthology: Description	Comments
1			<b>SANDY FILL</b> Dk brown F-M SAND, some Silt (damp)	
2				
3				
4				
5				
6				
7			<b>TILL: CLAYEY SILT</b> L brown CLAYEY SILT, little M-C Sand, trace Gravel (dry)	
8				
9				
10				
11				
12				
13				
14			<b>TILL: SILT</b> L brown SILT, some Gravel (dry)	
15				

Groundwater not observed

**BORING LOG**

Boring Name **B-40**  
 Project No. **BW0041**  
 Client **Lombardo Associates, Inc.**  
 Project Name **Little Neck**  
 Location **Ipswich, MA**  
 Drilling Co **Soil Exploration (Tim Flores)**  
 Completion **December 22, 2004**

Geologist **D. Bourdeau**  
 Drilling Method **Auger**  
 Borehole Dia. **8"**

Northing **3079807**  
 Easting **846633**



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 Andover, Massachusetts 01720  
 Tel (978) 263-9381 • Fax (978) 263-9594

Checked By **JNR**

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	Comments
			Pavement	
1			<b>SANDY FILL</b> Moderate brown C SAND (moist)	
2				
3				
4				
5				
6			<b>TILL: CLAYEY SILT</b> Lt brown CLAYEY SILT, some M Sand, trace Gravel (moist)	Light chatter, little recovery at 6 ft
7				
8				
9				
10			<b>TILL: SILT</b> Lt brown SILT, trace M Sand and Gravel (dry)	v. stiff
11				
12			<b>TILL: CLAYEY SILT</b> Lt brown CLAYEY SILT, some M-C Sand, trace F Gravel (wet)	
13				
14				
15				

Groundwater not observed

# BORING LOG

pg 1/1

Boring Name	B-47	Geologist	D. Bourdeau
Project No	BW0041	Drilling Method	Auger
Client	Lombardo Associates	Borehole Dia	8"
Project Name	Little Neck Island		
Location	Ipswich, MA	Northing	3079402
Drilling Co	Soil Exploration (Tim Flores)	Easting	845859
Completion	12/22/2004		



GEOSYNTEC CONSULTANTS

289 Great Road, Suite 105  
 Andover, Massachusetts 01776  
 Tel: (978) 261-9588 • Fax: (978) 261-9594

Checked By: JNR

Depth (ft)	Stratigraphy	Lithologic Description	USCS Classification	Sample ID	Recovery (inches)	Blow (per ft. notes)	Comments on Sample
		LOAM FILL		S1	8	8 3 3 6	
		SANDY FILL Mod. brown F SAND, some S#1 (moist)					Compact, poorly sorted
5				S2	12	5 7 14 15	
		TILL SILT Lt Brown SILT, some F Sand (dry)					firm, poorly sorted
10				S3	16	12 13 13 17	
		TILL CLAYEY SILT Lt Brown CLAYEY SILT, some F-#2 Sand trace F Gravel (moist to wet)					stiff, well sorted with 10 YR 3/4 mottling
15				S4	22	13 31 41 46	
		TILL CLAYEY SILT Lt Brown CLAYEY SILT, some Gravel, trace M Sand (moist)					V stiff, poorly sorted with 10 YR 4/4 mottling
20							
25							
30							
35							

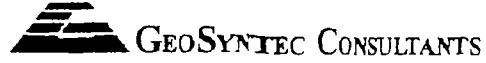
No Groundwater Observed  
 Samples taken using 24" long, 2-inch diameter split spoon sampler, driven by a 140lb hammer dropped 30 inches

# BORING LOG

PG 1/1

Boring Name: B-43  
 Project No.: BW0041  
 Client: Lombardo Associates  
 Project Name: Little Neck Island  
 Location: Ipswich, MA  
 Drilling Co.: Soil Exploration (Tim Flores)  
 Completion: 12/13/2004

Geologist: J. Rogers  
 Drilling Method: Auger  
 Borehole Dia.: 8"  
 Northing: 30794.58  
 Easting: 845843



289 Great Road, Suite 1025  
 Ames, Massachusetts 01820  
 Tel: (978) 263-9588 • Fax: (978) 263-9594

Checked By: DJA

Depth (ft)	Water Level during drilling	Stratigraphy	Lithologic Description	USCS Classification	Sample ID	Recovery (inch)	Blow (per 6-inches)	Comments on Sample
0								
0			<b>SANDY FILL</b> Dk brown F-C SAND, some SILT, trace gravel (dry)		S1	6	6 12 13 10	
5			<b>TILL: SILT</b> LI Brown SILT, trace F-M Sand, trace Gravel (dry)		S2	6	24 21 18 21	Perched water at 4.5 feet
10			<b>TILL: CLAYEY SILT</b> LI Brown CLAYEY SILT, trace F Gravel (dry)		S3	12	34 24 25 35	Mottled gray
15			<b>TILL: SILTY CLAY</b> LI Brown SILTY CLAY, trace F Sand (dry)		S4	15	15 62 43 38	gravelly sand Mottled gray, very dense Smoke from borehole during augering
20			<b>TILL: SILTY CLAY</b> LI Brown SILTY CLAY, trace Gravel (dry)		S5	15	15 18 18 28	Mottled gray, plastic
25			<b>TILL: CLAYEY SILT</b> Gray CLAYEY SILT, trace Gravel (dry)		S6	12	11 18 27 26	
30								
35								

Samples taken using 24" long, 2-inch diameter split spoon sampler, driven by a 140lb hammer dropped 30 inches

**APPENDIX B  
CHIMNEY LOCATIONS AND APPROXIMATE HEIGHTS**

HOUSE ADDRESS	HOUSE CONNECTION STATION	APPROXIMATE CHIMNEY HEIGHT (feet)
8 COVE RD	01+83	3.0
8 CLIFF RD	01+27	3.1
5 MIDDLE RD	01+02	3.1
12 COVE RD	00+07	3.2
46 RIVER RD	00+51	3.2
10 CLIFF RD	00+79	3.3
23 BAYCREST RD	01+51	3.3
16 BAY RD	05+64	3.3
22 KINGS WAY	02+24	3.4
5 GALA WAY	01+30	3.5
4 PLUM SOUND RD	00+55	3.6
22 PLUM SOUND RD	02+53	3.6
48 RIVER RD	00+83	3.7
15 PLUM SOUND RD	03+45	3.7
41 MIDDLE RD	01+70	3.8
9 MIDDLE RD	02+44	3.8
43 MIDDLE RD	01+56	3.9
14 KINGS WAY	04+00	3.9
33 BAY RD	07+87	3.9
17 COVE RD	00+93	3.9
27 PLUM SOUND RD	00+80	3.9
11 RIVER RD	09+74	3.9
10 HILLTOP RD	03+56	4.0
24 PLUM SOUND RD	01+68	4.3
6 RIVER RD	12+86	4.3
24 BAYCREST RD	01+55	4.4
47 RIVER RD	01+50	4.5
25 KINGS WAY	01+44	4.5
7 MIDDLE RD	01+56	4.6
25 PLUM SOUND RD	01+29	4.6
21 MIDDLE RD	04+94	4.6
17 KINGS WAY	03+43	4.9
37 RIVER RD	01+21	4.9
5 PLUM SOUND RD	01+36	5.2
3 BAYCREST RD	00+84	5.3
30 MIDDLE RD	08+83	5.3
35 HILLTOP RD	03+33	5.5
6 MIDDLE RD	01+47	5.6
30 BAYCREST RD	00+11	5.6
19 PLUM SOUND RD	02+69	5.6
4 CLIFF RD	02+67	5.7

7 HILLTOP RD	00+84	5.7
22 BAYCREST RD	02+14	5.8
10 COVE RD	01+17	5.9
HOUSE ADDRESS	HOUSE CONNECTION	APPROXIMATE CHIMNEY HEIGHT
14 MIDDLE RD	04+10	6.1
16 KINGS WAY	03+47	6.1
45 RIVER RD	00+86	6.2
43 RIVER RD	00+20	6.2
31 MIDDLE RD	01+73	6.3
19 HILLTOP RD	04+86	6.3
37 HILLTOP RD	03+26	6.3
25 BAYCREST RD	01+23	6.3
28 MIDDLE RD	07+73	6.4
31 RIVER RD	02+82	6.4
6 COVE RD	01+93	6.5
39 MIDDLE RD	01+23	6.5
13 PLUM SOUND RD	03+52	6.5
5 COVE RD	02+93	6.6
12 PLUM SOUND RD	03+38	6.6
6 CLIFF RD	02+06	6.6
9 BAYCREST RD	00+53	6.7
28 PLUM SOUND RD	00+92	6.7
26 MIDDLE RD	07+25	6.8
33 HILLTOP RD	01+12	6.8
16 RIVER RD	11+30	6.8
9 COVE RD	02+11	6.9
2 CLIFF RD	03+19	6.9
22 MIDDLE RD	06+14	6.9
21 PLUM SOUND RD	00+41	7.0
39 RIVER RD	00+94	7.0
12 BAY RD	00+50	7.0
1 HILLTOP ROAD	00+50	7.1
24 MIDDLE RD	07+03	7.1
8 MIDDLE RD	00+47	7.1
35 RIVER RD	01+69	7.2
42 MIDDLE RD	12+36	7.4
11 KINGS WAY	02+91	7.5
6 BAYCREST RD	01+55	7.5
26 HILLTOP RD	03+34	7.6
15 COVE RD	01+44	7.6
12 HILLTOP RD	03+95	7.7
11 HILLTOP RD	03+17	7.7
21 RIVER RD	00+45	7.7
3 COVE RD	03+55	7.8
26 BAYCREST RD	01+14	7.9
20 HILLTOP RD	04+12	8.0

21 KINGS WAY	02+32	8.3
43 HILLTOP RD	13+51	8.4
[REDACTED SECTION]		
53 RIVER RD	03+69	8.6
12 RIVER RD	12+19	8.9
24 HILLTOP RD	03+95	8.9
27 BAYCREST RD	00+65	8.9
49 RIVER RD	02+50	9.0
4 KINGS WAY	00+64	9.0
3 RIVER RD	13+12	9.1
23 HILLTOP RD	05+90	9.3
37 Bay rd	08+12	9.3
20 KINGS WAY	02+39	9.3
20 MIDDLE RD	05+62	9.4
16 MIDDLE RD	04+55	9.6
2 RIVER RD	13+56	9.7
21 HILLTOP RD	05+61	9.8
5 KINGS WAY	00+70	10.0
10 KINGS WAY	02+63	10.2
30 PLUM SOUND RD	00+14	10.2
21 BAYCREST RD	01+96	10.4
12 MIDDLE RD	03+46	10.5
57 RIVER RD	04+48	11.1
24 KINGS WAY	01+66	11.3
10 MIDDLE RD	00+76	11.4
61 RIVER RD	06+21	11.7
55 RIVER RD	04+24	11.7
15 HILLTOP RD	03+88	11.8
35 BAY RD	07+98	12.4
63 RIVER RD	06+85	12.4
37 MIDDLE RD	01+41	12.7
8 KINGS WAY	02+47	13.0
14 PLUM SOUND RD	03+75	13.0
28 BAYCREST RD	00+60	13.5
35 MIDDLE RD	01+66	13.5
59 RIVER RD	05+09	14.4
19 KINGS WAY	00+69	21.3
41 RIVER RD	00+22	21.9

Note: 1. Chimney heights shown are approximate. Actual measurements will be taken in the field during construction (Refer to Measurement and Payment section)



2. Contractor shall confirm each individual chimney location and height, in the field, with the Engineer, prior to the construction of every chimney.

**Little Neck Wastewater Collection System  
Addendum # 1 to Contract Specifications and Drawings, Dated December 28<sup>th</sup> and  
Revised January 10<sup>th</sup>**

**Specifications:**

- Delete Section 01020, Paragraph 10.0 in it's entirety and replace with the following:

**"10.0 GRAVITY SEWER PIPE, FORCE MAIN AND BURIED ELECTRICAL CONDUIT**

- A. The quantity for Items 10A -10F shall be the actual length of trench in which 8" gravity sewer pipe, 4" PVC force main, 3" PVC force main, 2" PVC force main and 2" PVC electrical conduit is installed, in the combinations described in Table 01020-1, measured in place after acceptance by the Engineer, on a linear foot basis along the horizontal projection of the centerline, at ground level, of the new trench. The lengths of manhole inverts (as measured between the inside walls of the manholes) are to be deducted.

**Table 01020-1 Trench Types**

<b><u>Trench type</u></b>	<b><u>Pipes to be installed</u></b>
10A	8" PVC Gravity Sewer
10B	8" PVC Gravity Sewer, 3" PVC Force Main, Two (2) 2" PVC Electrical Conduits and Pull Boxes as Needed
10C	8" PVC Gravity Sewer, 4" PVC Force Main, 2" PVC Force Main, Four (4) 2" PVC Electrical Conduit and Pull Boxes as Needed
10D	4" PVC Force Main, 2" Force Main, Four (4) 2" Electrical Conduits and Pull Boxes as Needed
10E	3" PVC Force Main, Two (2) 2" PVC Electrical Conduits and Pull Boxes as Needed
10F	8" PVC Gravity Sewer, 4" PVC Force Main, Four (4) 2" Electrical Conduits and Pull Boxes as Needed

The unit price for items 10A -10F shall constitute full compensation for excavation and disposal (except rock and below normal grade), clearing and grubbing, removal and disposal of tree stumps, sheeting not left in place, backfill, crushed stone bedding and backfill material, testing, installing the pipe, and all work incidental thereto, complete, as indicated, specified, or directed by the Engineer. For trenches with electrical conduit, price shall include electrical hand holes spaced at approximately every 200 feet, at termination points and as needed for 90° bends."

- Delete Section 01020, Paragraph 15.0 Part C in it's entirety and replace with the following:

**C. WASTEWATER PUMPING STATION #1 EMERGENCY STORAGE TANK.**

The quantity for Item 15C shall be the number of 6-foot diameter 6,000 gallon FRP storage tanks installed complete as shown on the Drawings and accepted by the Engineer at pumping station #1.

The lump sum price for Item 15C shall constitute full compensation for furnishing and installing the tank, complete, as shown on the drawings and as specified. The lump sum price shall include, but not necessarily be limited to, the following: excavation, shoring, installation of the FRP tank, antifoatation slab, piping, fittings, valves, backfill and restoration, and all other appurtenances, as shown on the drawings and as specified, and all other work necessary to complete the work under this item. The lump sum price shall include the pipe between the storage tank and the pump station wetwell to a point two feet off the wetwell wall. "

- Add the following to Section 01020, Paragraph 15.0 immediately following Part C:

" **D. WASTEWATER PUMPING STATION #1 EMERGENCY STORAGE TANK.**

The quantity for Item 15D shall be the number of 8-foot diameter 5000 gallon FRP storage tanks installed complete as shown on the Drawings and accepted by the Engineer at pumping station #2.

The lump sum price for Item 15D shall constitute full compensation for furnishing and installing the tank, complete, as shown on the drawings and as specified. The lump sum price shall include, but not necessarily be limited to, the following: excavation, shoring, installation of the FRP tank, antifoatation slab, piping, fittings, valves, backfill and restoration, and all other appurtenances, as shown on the drawings and as specified, and all other work necessary to complete the work under this item. The lump sum price shall include the pipe between the storage tank and the pump station wetwell to a point two feet off the wetwell wall."

- Delete Section 00300, Bid Schedule A in it's entirety and replace with the following:

"

**Little Neck Wastewater Collection System  
Feoffees of the Grammar School in the Town of Ipswich**

**BID SCHEDULE A**

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	Mobilization/Demobilization (maximum 5%),	LS	1		
2.	Excavation Below Normal Grade	CY	500*		
3.	Rock Excavation and Disposal	CY	500*		
4.	Bank Run Gravel	CY	200*		
5.	Additional Common Fill	CY	200*		
6.	Additional Screened Gravel	CY	200*		
7.	Additional Crushed Stone	CY	200*		

8.	Dewatering	LF	1,000*		
9.	Sheeting Left In Place	SF	2,000*		
10A.	Type A Pipe and Conduit Trench	LF	6,800		
10B.	Type B Pipe and Conduit Trench	LF	910		
10C.	Type C Pipe and Conduit Trench	LF	560		
10D.	Type D Pipe and Conduit Trench	LF	150		
10E.	Type E Pipe and Conduit Trench	LF	140		
10F.	Type F Pipe and Conduit Trench	LF	100		
11A.	6" Diameter PVC House Lateral Connections	LF	6,200		
11B.	8" by 6" Diameter PVC Service Wye or Tee	EA	168		
11C.	6" Sewer Chimney	VF	900		
12A.	4' Diameter Manholes	VF	440		
12B.	5' Diameter Manholes	VF	120		
12C.	Manhole Frames and Covers with Inflow Inserts	EA	56		
12D.	Manhole Frames and Covers with Bolted and Gasketed Covers	EA	10		
12E.	8" Inside Drop Connections	VF	25		
13A.	Gravel Base Course	SY	3,350		
13B.	Bituminous Concrete Binder Course	SY	6,700		
13C.	Bituminous Concrete Surface Course	SY	11,750		
13D.	Pavement Leveling Course	TONS	100*		
13E.	Filter Fabric	SY	500*		
14A.	Removal and Relocation of Existing Cross-Drains	EA	5*		
14B.	Removal and Relocation of Existing, In-Service Electric Conduit	LF	500*		

14C	Removal and Proper Disposal of Existing, Out-Of-Service Electric Conduit	LF	500*		
14D	Removal and Relocation of Existing, In-Service Water Main	LF	500*		
14E	Removal and Proper Disposal of Existing, Out-Of-Service Water Main	LF	500*		
14F	Removal and Relocation of Existing, In-Service Cable/Telephone Conduit	LF	500*		
14G	Removal and Proper Disposal of Existing, Out-Of-Service Cable/Telephone Conduit	LF	500*		
14H	Proper Abandonment of Existing Septic Tanks/Cesspools	EA	200*		
14I	Concrete Encasement of Existing Utilities	LF	500*		
15A	Submersible Wastewater Pumping Station #1	LS	1		
15B	Submersible Wastewater Pumping Station #2	LS	1		
15C	PS #1 Emergency Storage Tanks	LS	1		
15D	PS #2 Emergency Storage Tanks	LS	1		
16	Loaming and Seeding	SY	500*		
17	Test Pit Excavation	CY	100*		
18	Hay Bales and Silt Fence	LF	2,000*		
19	Engineer's Field Office	LS	1		
20	Temporary 1,000 Gallon Tight Tanks	EA	5*		
21	Trench Dams	EA	60		
<b>TOTAL</b>					

\* Indeterminate quantity assumed for comparison of bids

TOTAL (IN WORDS) BID SCHEDULE A:"

Drawings:

- Delete Sheet 7 of the Drawings in its entirety, and replace with the attached Sheet 7. Where discrepancies exist between Plan and Profile sheets with respect to quantity and type of pipe within a given trench, Sheet 7 will govern.

**Little Neck Wastewater Collection System  
Addendum # 2 to Contract Specifications and Drawings, Dated December 28<sup>th</sup> and  
Revised January 10<sup>th</sup>**

**Specifications:**

- Add the following to the end of the Table of Contents:  
"APPENDIX C – IPSWICH CONSERVATION COMMISSION ORDER OF CONDITIONS"
- Add the attached Order of Conditions to the Appendix as Appendix C.

APPENDIX C  
IPSWICH CONSERVATION COMMISSION ORDER OF CONDITIONS



TOWN HALL  
25 GREEN STREET

TOWN OF IPSWICH  
IPSWICH, MASSACHUSETTS 01938

CONSERVATION COMMISSION

(978) 356-6661 OFFICE  
(978) 356-6616 FAX

January 13, 2005

Donald Whiston, Trustee  
Feoffees of the Grammar School  
2 Jeffrey's Neck Road  
Ipswich, MA 01938

Re: Order of Conditions for Feoffees: All of Little Neck, Ipswich (IPS/DEP #36-911)

Dear Mr. Whiston:

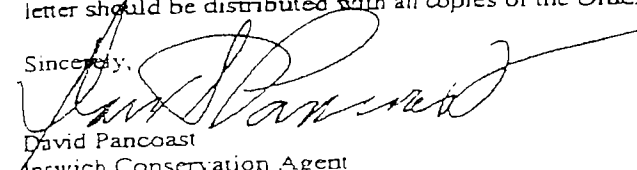
Attached is the Order of Conditions wetlands permit for the above-referenced project. After the 10 day appeal period has expired from the issuance date, but within 30 days of that issuance, this permit must be recorded at the Essex County Southern District Registry of Deeds in Salem, MA. Proof of that recording must be submitted to the Ipswich Conservation Commission within 21 days of recording. No work may begin on the project until proof of recording has been submitted. The Commission reserves the right to revoke any Orders of Conditions which have not been recorded within this time frame. This permit expires three years from the official date of issuance listed on the document.

It is the responsibility and in the best interests of the property owner to make him/herself completely aware of all the conditions and requirements contained in the permit. The approved work has been conditioned to prevent adverse impacts to the functions of wetland resource areas. Noncompliance with the Order of Conditions can result in significant environmental damage and serious legal and financial consequences for the landowner and contractor(s). The Conservation Agent will work together with those involved in the project to help ensure that it is completed successfully in compliance with the permit.

Before commencing work, the Conservation Agent must be notified in writing of the intended commencement date and the name and number of the contact person(s) responsible for compliance on the site. Once work has begun, the landowner and persons responsible for the work on the site should expect periodic site visits by members of the Ipswich Conservation Commission and /or the Conservation Agent to inspect work for compliance with the Order of Conditions.

If you have any questions regarding the enclosed wetlands permit, please do not hesitate to call the Conservation office at (978) 356-6661 for clarification or further information. This cover letter should be distributed with all copies of the Order of Conditions but NOT recorded.

Sincerely,

  
David Pancoast

Ipswich Conservation Agent

cc: File: BOH/Codes Dept.; Town Clerk; DEP/NERO; Lombardo Associates, Inc.

Enclosures: Order of Conditions for IPSWICH/DEP# 36-911



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 - Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP Form Number  
38-911  
Provided by DEP

and Ipswich Wetlands Protection By-law

**A. General Information**

Important:  
When filling  
out forms on  
the computer,  
use only the  
tab key to  
move your  
cursor - do  
not use the  
return key.



From: Ipswich Conservation Commission  
Conservation Commission

This resource is for (check one):

- Order of Conditions
- Amended Order of Conditions

To, Applicant: Teachers of the Grammar School  
c/o Donald Whiston

Property Owner (if different from applicant):  
same  
Name

Name: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
City/Town: Ipswich MA 01938 State Zip Code  
City/Town State Zip Code

1. Project Location:  
Little Neck (an entire, but distinct, area of town) Ipswich  
Street Address: \_\_\_\_\_ City/Town: \_\_\_\_\_  
24C 69 (for entire underlying parcel of Little Neck)  
Assessor's Map/Plot Number Parcel/Lot Number

2. Properly recorded at the Registry of Deeds for:  
Essex South \_\_\_\_\_  
County Book Page

Certificates (if registered land): \_\_\_\_\_

3. Dates:  
11/18/04 12/15/04 1/13/05  
Date Notice of Intent Filed Date Public Hearing Closed Date of Issuance

4. Final Approved Plans and Other Documents (attach additional plan references as needed):  
Little Neck Ipswich, Mass. Wastewater Collection System 12/7/04  
Title Date  
Revision 1 12/14/04

5. Final Plans and Documents Signed and Stamped by:  
Lombardo Associates, Inc.; P.E. Lombardo, P.E.

6. Total Fee: see next page

Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 - Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

OFFICE NUMBER  
PHONE  
FAX NUMBER

\$375.00 State filing fee (plus \$225.00 local Bylaw filing fee)  
(from Appendix B Wetland Fee Transmittal Form)

**B. Findings**

Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act. Check all that apply:

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Public Water Supply           | <input checked="" type="checkbox"/> Land Containing Shellfish | <input checked="" type="checkbox"/> Prevention of Pollution        |
| <input type="checkbox"/> Private Water Supply          | <input checked="" type="checkbox"/> Fisheries                 | <input checked="" type="checkbox"/> Protection of Wildlife Habitat |
| <input checked="" type="checkbox"/> Groundwater Supply | <input checked="" type="checkbox"/> Storm Damage Prevention   | <input checked="" type="checkbox"/> Flood Control                  |

Furthermore, this Commission hereby finds the project, as proposed, is (check one of the following boxes)

Approved subject to:

- the following conditions which are necessary, in accordance with the performance standards set forth in the wetlands regulations, to protect those interests checked above. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

- the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations to protect those interests checked above. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect these interests, and a final Order of Conditions is issued.
- the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).

General Conditions (only applicable to approved projects)

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number  
36-911  
Provided by DEP

**B. Findings (cont.)**

4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
  - a. the work is a maintenance dredging project as provided for in the Act or
  - b. the time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order.
6. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
7. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
8. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to this Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.
9. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,  
"Massachusetts Department of Environmental Protection" (or, "MA DEP")  
"File Number 36-911"
10. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before DEP.
11. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
12. The work shall conform to the plans and special conditions referenced in this order.
13. Any change to the plans identified in Condition #12 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
14. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any

Page 2 of 7

Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 - Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP Form Number  
36-911  
Revised 10/14

**B. Findings (cont.)**

- 15 This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
- 16 Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
- 17 All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls if it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

Special Conditions (use additional paper, if necessary):

See attached conditions made part hereof

**Findings as to municipal bylaw or ordinance**

Furthermore, the Ipswich Conservation Commission heraby finds (check one that applies):  
Conservation Commission

- that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:  
Ipswich Wetlands Protection Bylaw Ipswich General Bylaws Chapter XVIII  
Name Municipal Ordinance or Bylaw

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

- that the following additional conditions are necessary to comply with a municipal ordinance or bylaw, specifically:  
Ipswich Wetlands Protection Bylaw Ipswich General Bylaws Chapter XVIII  
Name Municipal Ordinance or Bylaw

The Commission orders that all work shall be performed in accordance with the said additional conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent.

Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 - Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number  
36-911  
Provided by DEP

B. Findings (cont.)

Additional conditions relating to municipal ordinance or bylaw:

See attached special conditions made part hereof.

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

Date

1/13/05

This Order must be signed by a majority of the Conservation Commission. The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office (see Appendix A) and the property owner (if different from applicant).

Signatures:

David Standley \_\_\_\_\_ Marie Rodgers \_\_\_\_\_  
Barbara S. Berman \_\_\_\_\_

On 12<sup>th</sup>  
Day

Of January, 2005  
Month and Year

before me personally appeared

David Standley, Chair

to me known to be the person described in and who executed the foregoing instrument and acknowledged that he/she executed the same as his/her free act and deed.

Marie Rodgers  
Notary Public

Marie Rodgers

2-21-08  
My Commission Expires

This Order is issued to the applicant as follows:

by hand delivery on

by certified mail, return receipt requested, on

Order of Conditions: IPS/DEP # 36-911  
Special Conditions: Feoffees of the Grammar School: Little Neck Sewerage Project, Phase I, at Little Neck, Ipswich, MA

NOTE: THIS PROJECT HAS BEEN BIFURCATED INTO TWO PARTS WITHIN THIS ONE FILING. THE BIFURCATION WAS APPROVED BY THE COMMISSION DURING THE NOTICE OF INTENT HEARING PROCESS UPON REQUEST OF THE APPLICANT. THE PURPOSE OF THE BIFURCATION IS TO ALLOW THE PROJECT TO BE SPLIT INTO TWO SEPARATE BUT RELATED CONSTRUCTION COMPONENT PHASES, PHASES I AND II. ONLY PHASE I IS PERMITTED HEREIN AND CONSISTS OF COLLECTION SEWER PIPING THROUGHOUT LITTLE NECK AND TWO UNDERGROUND SEWER PUMP STATIONS FOR COLLECTION TRANSFERENCE (TO THE HOLDING TANKS, TO BE CONSIDERED DURING ONGOING PHASE II). PHASE II IS NOT YET APPROVED AND IS CONTINUING AS PART OF THIS FILING.

PHASE II CONSISTS OF A PROPOSAL FOR MULTIPLE LARGE CAPACITY HOLDING TANKS INTO WHICH THE COLLECTION SYSTEM WILL EMPTY FOR ULTIMATE PUMP-OUT BY THE APPLICANT ON A REGULAR BASIS.

PHASE I IS BEING BUILT FIRST AND IS APPROVED HEREIN. THE NEED TO BIFURCATE IS RELATED TO SIGNIFICANT TIME CONSTRAINTS FOR COMPLETION OF THE OVERALL SYSTEM BY SUMMER OF 2005, WHICH TIME CONSTRAINTS ARE IMPOSED BY THE MASSACHUSETTS DEPT. OF ENVIRONMENTAL PROTECTION IN ITS REGULATORY CAPACITY VIA AN ADMINISTRATIVE CONSENT ORDER ENTERED INTO WITH THE APPLICANT. FOR THE REASON OF THE TIME CONSTRAINTS AND THE FACT THAT THE HOLDING TANK DETAILS ARE NOT YET RESOLVED, PHASE I IS BEING APPROVED TO ALLOW THE APPLICANT TO START THE WORK SOONER, IN ORDER TO MEET THE DEP DEADLINE.

18. This Order of Conditions permits Phase I of this proposed project, consisting of the installation of collection sewers (primarily within existing roadways) on Little Neck for domestic sewage generated by private users of structures located on that property, which Phase I shall consist of common sewers, dwelling connections, two pumping stations, and force mains; and also the abandonment of all or most of the existing on-site subsurface sewage disposal systems as provided in the draft Administrative Consent Order issued by MA DEP on 8/2/04. This project is described as Phase I of a 2-phase project, per above, the second phase of which is the construction of a holding tank and waste transfer facility yet to be permitted. A copy of this Order of Conditions, construction plans, and copies of the documents and reports cited in Condition 12, shall be onsite upon commencement and during any site work for contractors to view and adhere to.

19. The applicant shall notify the Conservation Commission in writing at least 48 hours prior to commencement of activity on the site and shall advise the Commission of the name(s) and phone number(s) of the person(s) responsible on site for compliance with this Order.
20. Work shall halt on the site if a Commission member, Conservation Agent, or DEP representative determines that any of the work is not in compliance with this Order of Conditions. Work shall not resume until the Commission is satisfied that the work will comply, and has so notified the applicant in writing.
21. This Order shall apply to any successor-in-control or successor-in-interest of the property described in the Notice of Intent and accompanying plans. These obligations shall be expressed in covenants in all deeds to succeeding owners of all or portions of the property.
22. The form provided at the end of this Order shall be completed and stamped at the Registry of Deeds after the expiration of the 10-day appeal period and within 30 days of issuance if no request for appeal has been filed with the Department of Environmental Protection. This form shall be returned to the Commission within 21 days of recording and prior to commencement of any activities subject to the Order of Conditions, in accord with the Ipswich Wetlands Protection By-law, Section 5. The Conservation Commission reserves the right to revoke any order not recorded within 30 days of issuance.
23. Prior to any work commencing, a sign shall be displayed showing DEP file No. 36-911, not placed on a living tree.
24. The term "Applicant" as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The Commission shall be notified in writing within 30 days of all transfers of title of any portion of the property that take place prior to issuance of the Certificate of Compliance.
25. With respect to this Order, the Commission designates the Conservation Agent as its agent with powers to act on its behalf in administering and enforcing this Order.
26. This document shall be included in all construction contracts, subcontracts, and specifications dealing with the work proposed and shall supersede any conflicting contract requirements. It is the responsibility of the Applicant, Owners and/or successor(s) to ensure that the project engineer and contractors are provided with a copy of this Order of Conditions and referenced documents before commencement of construction, and that personnel performing the permitted work are fully aware of the permit's terms and conditions. Thereafter, the contractor shall be held jointly liable for any violation of this Order resulting from the failure to comply with its conditions.
27. If any changes are made in the above-described plan(s) which may or will alter an area subject to protection under the Wetlands Protection Act and/or the Town of Ipswich Wetlands Protection By-Law, or any changes in activity subject to regulations under

M.G. L. Ch. 131 Paragraph 40, or the Town of Ipswich Regulations, the applicant shall inquire from this Commission in writing, prior to their implementation in the field, whether the change(s) is significant enough to require the filing of a new Notice of Intent. Any errors in the plans or information submitted by the applicant shall be considered changes and the above procedures shall be followed.

28. If unforeseen problems occur during construction which may affect the statutory interests of the Wetlands Protection Act or the Town of Ipswich's Wetland Protection By-law, upon discovery by either the Conservation Commission, its agent, or the applicant, the Commission shall immediately be notified, and an immediate meeting shall be held between the Commission or its agent, the applicant, and other concerned parties to determine the correct measures to be employed. The applicant shall then act to correct the problems using the corrective measures agreed upon. Subsequent to resolution, the activity and resulting actions shall be documented in writing.
29. The owners of the project and their successors-in-title, in the event they proceed to alter areas subject to the Commission's jurisdiction under the Order, agree that the Order does not in itself impose upon the Town any responsibility to maintain any project component or any proposed drainage system and that the Town of Ipswich shall not be liable for any damage in the event of failure, error or problems. By acceptance of this Order, the owners agree to indemnify and hold harmless the Town of Ipswich and its residents for any damages attributable to alterations undertaken on this property pursuant to the Order. Issuance of the Order does not imply or certify that the site or downstream areas will not be subject to flooding, storm damage, or any other form of water damage. Maintenance of the drainage system, if accepted by the Town of Ipswich as part of a public way at any time in the future, becomes the responsibility of the Town of Ipswich only at that time.
30. Upon completion of this project, the applicant shall submit the following to the Conservation Commission to receive a Certificate of Compliance:
  - a. A letter from the applicant requesting a Certificate of Compliance.
  - b. A written statement from a registered professional engineer of the Commonwealth certifying that the work has been conducted as shown on the plan(s)/documents referenced above, and as conditioned by the Commission. Any deviation from the referenced plans and documents must be detailed in this statement.
  - c. An "as-built" plan prepared and signed and stamped by a registered professional engineer or land surveyor of the Commonwealth, for the public record.
31. Conditions numbered 53 and 58 shall continue in force beyond the Certificate of Compliance, in perpetuity, and shall be referred to in all future deeds to this property.
32. The Commission reserves the right to amend this Order of Conditions after a legally advertised public hearing if plans or circumstances are changed or if new conditions or information so warrant.



33. After the completion of Phase I of the project, the applicant may request in writing from the Commission a partial Certificate of Compliance. At that time, the Commission will conduct a final inspection of this phase to be sure that all conditions have been met.
34. It is the responsibility of the applicant to procure all other applicable federal, state and local permits and approvals associated with this project. (No such federal or state permit requirements are known to the Commission at this time with respect to this project.)
35. Prior to any work onsite, a revised plan shall be submitted to the Commission showing all changes described in these Special Conditions (if any).
36. Prior to any work on site the applicant shall submit to the Conservation Commission for approval a sequencing plan for construction and erosion and sedimentation control with supporting plans and details as appropriate. Prior to any work commencing on site, the applicant shall submit to the Commission for approval, a detailed sequence of construction, including the construction of compensation and retention areas, and re-vegetation to be completed before other work begins on site.
37. Any other work within 100 feet of wetland resource areas or 200 feet from the river or 150 feet from the ACEC shall require that a new Notice of Intent or Request for Determination of Applicability be filed with the Commission.
38. Prior to the start of any excavation or construction, (and ideally following the installation of erosion control measures), a pre-construction conference shall be held on the site, involving the contractor conducting the work, the site engineer, the applicant, the wetland scientist and members or agent of the Conservation Commission, to ensure that the requirements of this Order are understood by all parties. A reasonable period of time shall be provided as notice of the pre-construction meeting (e.g. 72 hours).
39. Prior to any work onsite, the proposed limits of work shall be clearly marked with stakes or flags and shall be confirmed by the Conservation Commission. Such markers shall be checked and replaced as necessary and shall be maintained until all construction is complete. Workers shall be informed that no use of machinery, storage of machinery or materials, stockpiling of soil, or construction activity is to occur beyond this line at any time.
40. Prior to commencement of construction on site, the limits of wetland resource areas closest to construction activities shall be flagged with surveyor's tape and shall remain in place during construction. The limits of areas to be impacted and the limits of work in the replication area(s) shall be clearly flagged.
41. Prior to the commencement of construction on the site, adequate erosion and sedimentation control measures shall be implemented and maintained in effect throughout the entire construction phase, and until the site has been stabilized.

42. All flags used for the above purposes shall be a color different from other flagging used on the site.
43. Appropriate erosion control devices shall be in place prior to the beginning of any phases of construction, and shall be maintained during construction in the wetland areas and buffer zone. The erosion control specification provided in the Notice of Intent and the erosion control provision in the Order will be the minimum standards for this project; the Commission may require additional measures. The location of these barriers shall be as shown on the approved plan(s) or as specified in this order. These barriers shall further define the limit of disturbance and shall be maintained in good repair until all disturbed areas have been stabilized with vegetation or other means, or until the Commission determines the control measures are no longer necessary. Trench erosion control shall be as shown on plan titled "Little Neck Wastewater Collection System Erosion and Sedimentation Control Details" received by the Commission on 11/24/04.
44. Staked hay bales and silt fence will be placed downgrade between the construction area and the existing resource area, as depicted on the referenced plans, prior to construction. Hay bales will be tied with twine and will be placed with ends tightly abutting and anchored in place by wooden stakes. The first stake in each bale will be angled toward previously laid bales in order to force bales together. Silt fence will be trenched into the ground and placed in front of the bales. Erosion control will be inspected daily and repaired or replaced as necessary and shall remain in place until the area has become stable and re-vegetated.
45. No activity shall take place beyond the depicted hay bale line. Any future work proposed beyond the depicted hay bale line will require the filing of a new Notice of Intent.
46. Under no condition shall operation of equipment, storage of materials, stockpiling of soil, or other site disturbance take place on the wetland side of the limit of work line. All debris, fill and excavated material shall be stockpiled at a location far enough away from wetland resource areas to prevent sediment from entering wetland resource areas.
47. Placement of erosion controls shall be directed at the site by the Design engineer in order to ensure that no sedimentation will reach wetland resource areas and the erosion and sedimentation controls achieve the specifications specified as part of the Notice of Intent and these Orders of Conditions. Choice of suitable silt fence materials should be based on the design specifications listed by various manufacturers.
- a) A row of filter fabric fencing, backed by one row of staked hay bales placed end to end, shall be placed up-gradient of all resource areas along the limit of activity between all disturbed areas and the wetland or within 100 feet of wetland resource areas.
  - b) Filter fabric fencing shall be set and staked every 18-36 inches. Filter fabric shall be no less than 15 inches high.

De-watering activities shall be conducted as shown on the approved plans and shall be monitored daily to ensure that sediment-laden water is appropriately settled prior discharge toward the wetland resource areas. No discharge of water is allowed directly into an area subject to jurisdiction of the Wetlands Protection Act or the Town of Ipswich By Law. If emergency de-watering requirements arise, the applicant shall submit a contingency plan to the Commission for approval which provides for the pumped water to be contained in a settling basin, to reduce turbidity prior to discharge into a resource area. A sedimentation basin shall be constructed at (location) shown on the plans to entrap any soils that may be eroded during construction.

48. The applicant shall designate an erosion control monitor to oversee any emergency placement of controls and regular inspection or replacement of erosion and sedimentation control devices. The name and phone number of the monitor must be provided to the Commission in the event that this person has to be contacted, due to an emergency at the site, during any 24-hour period, including weekends. This person shall be given authority to stop construction for erosion control purposes. The erosion control monitor will be required to inspect all such devices and oversee cleaning and the proper disposal of waste products. Cleaning shall include removal of any entrapped silt.
49. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair or replace silt fences, hay bales, erosion control blankets, stone rip-rap, filter beams or any other devices planned for use during construction.
50. The Commission reserves the right to impose additional conditions on portions of this project to mitigate any impacts which could result from site erosion, or any noticeable degradation of surface water quality discharging from the site. For example, installation of erosion control measures may be required in areas not shown on the plan(s) referenced in this Order of Conditions. Should the Commission require such installation, they shall be installed within 48 hours of the Commission's request.
51. The areas of construction shall remain in a stable condition at the close of each construction day. Erosion controls should be inspected at this time and repaired, reinforced or replaced as necessary. These devices shall also be inspected to assure that maximum control has been provided after any rainfall.
52. All erosion control devices shall be inspected, cleaned and/or replaced as necessary during construction and shall remain in place until such time as stabilization of all areas that may impact resource areas is permanent.
53. Within thirty days of completion of construction on any given portion of the project, all disturbed areas in the completed portion of the site shall be permanently stabilized with rapidly growing vegetative cover, using sufficient top soil to assure long-term stabilization of disturbed areas. Continued maintenance of this area, in a manner that assures permanent stabilization and precludes any soil erosion, shall be the responsibility

of the applicant. This condition will not expire with the issuance of a Certificate of Compliance.

54. Subsequent to seeding, disturbed areas will be covered with hay mulch, erosion control blanket or netting or other suitable material in order to provide an adequate surface protection until seed germination. Preference should be given to erosion control netting with biodegradable stitching.
55. If soils are to be disturbed for longer than two months, a temporary cover of rye or other grass should be established to prevent erosion and sedimentation. If the season is not appropriate for plant growth, exposed surfaces shall be stabilized by other appropriate erosion control measures, firmly anchored, to prevent soils from being washed by rain or flooding.
56. The applicant shall notify the Conservation Commission in writing at least 48 hours prior to commencement of activity on the site and shall advise the Commission of the name(s) and telephone number(s) of the person(s) responsible on site for compliance with this Order.
57. The applicant shall secure a Professional Engineer to act as a Clerk of the Works to be approved or designated by the Commission. The Engineer will supervise the contractor and will inspect the site regularly whenever construction in or within 100 feet of wetland resource area is in progress. The Engineer will provide weekly inspection notes to the Commission, and be on site during and after storm events so as to take responsibility for the proper functioning of drainage and erosion control systems for the project. The applicant shall provide that person's phone number for the Commission.
56. All equipment shall be operated, parked, and maintained so as to limit alterations of wetlands and buffer zone to those areas clearly identified on the plans and demarcated in the field by the flagging and construction barriers installed pursuant to Conditions 40 through 43. No equipment is to enter into or cross wetland resource areas at any time unless the location of disturbance is marked on the plans referenced in this Order and flagged in the field. Most work which is subjected to this Order is within Riverfront Protection Area to the Ipswich River and within the Parker River/Essex Bay Area of Critical Environmental Concern (ACEC). This Order contemplates and approves the permitted work within those areas as defined in the plans and limited to those plans. This paragraph is meant to prohibit entry into adjacent saltmarsh and bank areas and any other jurisdictional areas which are outside the work areas approved herein per the cited plans.
57. All waste products, grubbed stumps, slash, construction materials, etc. shall be deposited at least 100 feet from wetland resource areas, 150 feet from the ACEC, and 200 feet from rivers.
58. No fuel, oil, or other pollutants shall be stored in any resource area or the buffer zone thereto, unless specified in this Order of Conditions.

59. There shall be no sedimentation into wetlands or water bodies from discharge pipes or surface run-off leaving the site.
60. No vehicular traffic shall enter into the inter-tidal areas seaward of the work area or other wetland resource areas.
61. Equipment for fuel storage and refueling operations shall be located in an upland area greater than 100 feet from the limits of wetland resource areas.
62. No trash dumpsters will be allowed within 100 feet of areas subject to protection under the Massachusetts Wetlands protection Act or the Town of Ipswich By-Law.

END

Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number  
35,911  
Prepared by: 10/1

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### C. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Appendix E - Request of Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

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### D. Recording Information

This Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on Page 7 of Form 5 shall be submitted to the Conservation Commission listed below.

Ipswich Conservation Commission  
Conservation Commission

Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 - Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

36-911  
Provided by DEP

**D. Recording Information (cont.)**

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Ipswich Conservation Commission  
Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Entire area of Little Neck, Ipswich, MA      36-911  
Project Location      DEP File Number

Has been recorded at the Registry of Deeds of:

Essex South      \_\_\_\_\_      \_\_\_\_\_  
County      Book      Page


for:

Feesees of the Grammar School c/o Donald Whiston  
Property Owner

and has been noted in the chain of title of the affected property in:

\_\_\_\_\_      \_\_\_\_\_  
Book      Page

In accordance with the Order of Conditions issued on:

 11/13/05  
Date

If recorded land, the instrument number identifying this transaction is:

\_\_\_\_\_   
Instrument Number

If registered land, the document number identifying this transaction is:

\_\_\_\_\_   
Document Number

\_\_\_\_\_  
Signature of Applicant

**ADDENDUM # 3**  
**Little Neck Wastewater Collection System**  
**Contract Specifications and Drawings, Dated January 10<sup>th</sup>, 2005**

**Specifications:**

- Section 16000 Paragraph 2.5 A 1

Delete the following:

“(per “E” below)”, and Replace with “(per “D” below).”

- Delete Section 16000 Paragraph 2.23 in its entirety.

**Drawings:**

- Sheet 9 House at 27 Bay Road:

DELETE sewer service connection and ADD 10-foot section of lateral piping connected to the main line, capped and ready for future connection. Do not abandon onsite system as directed in the Drawings and Specifications for this property.

- Sheet 15, House at 5 Cove Road:

DELETE sewer service connection and ADD 10-foot section of lateral piping connected to the main line, capped and ready for future connection. Do not abandon onsite system as directed in the Drawings and Specifications for this property.

- Sheet 16, House at 25 Baycrest Road:

DELETE sewer service connection and ADD 10-foot section of lateral piping connected to the main line, capped and ready for future connection. Do not abandon onsite system as directed in the Drawings and Specifications for this property.

- Sheet 18, House at 21 Plum Sound Road:

DELETE sewer service connection and ADD 10-foot section of lateral piping connected to the main line, capped and ready for future connection. Do not abandon onsite system as directed in the Drawings and Specifications for this property.

- Sheet 18, House at 13 Plum Sound Road:

DELETE sewer service connection and ADD 10-foot section of lateral piping connected to the main line, capped and ready for future connection. Do not abandon onsite system as directed in the Drawings and Specifications for this property.

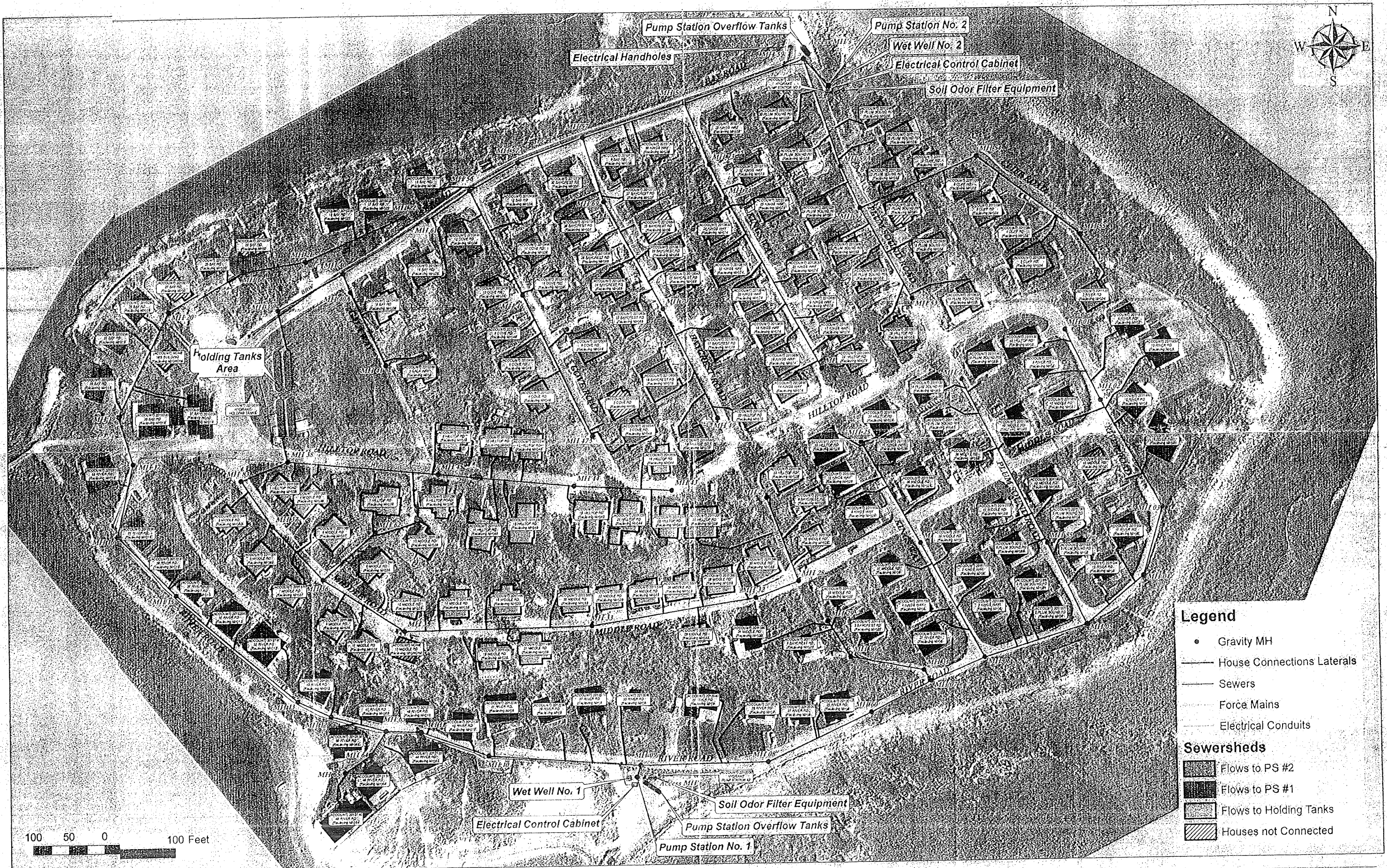
- Sheet 11, River Road East Plan and Profile:

REPLACE slopes on the section between STA 10+50 and STA 11+50 with “S = 0.147”.



### Clarifications:

- It is acknowledged that electrical work performed after December 21<sup>st</sup> that interferes with the work of this contract shall be a changed condition that may be a basis for a change order with respect to relocation of existing utilities.
- The detail for sewer chimneys on Sheet 27 shows a 90° elbow. Replace the 90° elbow with two 45° elbows. It is preferred that the use of sewer chimney systems be avoided. Contractor may substitute service lateral connections coming off the main line at a 45° angle at his discretion.
- On Sheets 21 and 22, signal wires shall be connected directly to the holding tank site, through the conduit labeled as "spare". No telephone service connection shall be provided.
- On Sheet 7, where Electrical conduits are listed for each trench type, half of number of conduits called for are to be conduits for signal wires, as specified in Section 16000. The number and type of signal wires to be pulled will be specified in a subsequent Change Order.
- In Specification Section 02601, Paragraph 3.4 C1, the acceptable test for precast concrete manholes and structures is the vacuum test specified in Section 02069.
- In Specification Section 02069, certification from the manufacturer for the vacuum test to 11.5 mm Hg that is specified is required for acceptance by the Engineer.



June 2006

# Little Neck Wastewater Collection System

Environmental Engineers/Consultants

**LOMBARDO ASSOCIATES, INC.**