City of Portsmouth
North Mill Pond

Culvert Replacement Design

&

Tidal Restoration Project

Background

The purpose of this project was to complete an engineered design and permit submittals in order to replace an existing corrugated steel barrel stone arch culvert with a new three barrel pre-cast concrete arched culvert in an historically appropriate manner with the goal of improving ecosystem conditions in the North Mill Pond and enhancing small boat access. This work has been funded by the New Hampshire Department of Environmental Services Coastal Program utilizing Federal saltmarsh restoration funds from the National Oceanic and Atmospheric Administration (NOAA). All of the reports and plans have been gathered here in this report and are found referenced in this document. The design developed herein is intended for the replacement of the exiting culvert at Maplewood Avenue Bridge. The Maplewood Avenue Bridge listed as NH DOT 231/103 was inspected in November of 2008. That report noted that the culvert has a sufficiency rating of 27.5% a National Bridge Inventory (NBI) status of structurally deficient and is also on the Municipal Red List. In addition to the NH DOT bridge inspection, the City conducted an inspection of all of its seawalls in 2007 at which time it was determined that the seawalls supporting the roadway and abutting the culvert at this site are deficient. This project will address the location of the existing sewer line which penetrates the culvert and is exposed as it crosses the flow path of the culvert. This existing situation both creates an environmental risk if the pipe were to fail, as well as creating an obstacle to small boat navigation.

The information generated for this work will be utilized when the project goes out to bid with some updates necessary. The grant for this project was done with a fast turnaround time and as a result there will be some additional work which needs to be competed or revisited before this project goes out to bid for construction. This project has been identified in the 2012 capital plan for construction. As the City develops its budget for 2012 this project will be reviewed and a decision will be made either to undertake this project or postpone construction to a future date.

Two aspects of this project which have begun but will not be complete at the time of submission include:

1) The New Hampshire Department of Environmental Services Standard Dredge Permit Application. This complete application has been submitted and review is underway.

2) Section 106 historic Review consultation process has begun but there will be additional requirements before construction on this project can move ahead.

For those interested in additional information about this project or to get a status update on this project please contact Peter Britz, Environmental Planner at 610-7215 or David Allen, Deputy Public Works Director at 766-1421.

The following page contains a list of all the items submitted with this document as required in the work plan agreed upon between the City of Portsmouth and the NH Coastal Program.

List of Documents

1) Culvert Replacement Alternatives Analysis

2) Engineers' Basis of Design

3) Design Drawings

- Existing Conditions Plan
- Demolition Plan
- Site Plan
- Grading and Drainage Plan
- Exiting Profile Plan
- General Details
- Utilities Plan
- Sewer Plan and Profile
- Sewer Details
- Foundation Plan
- Convert Details
- Wall Details
- Miscellaneous Details

4) Engineers Opinion of Probable Construction Cost

5) Bid Contract Documents

6) Sitework Technical Specifications

7) Permit Documents

- Request for Project Review by NH Division of Historical Resources
- US Coast Guard Bridge Permit Need Request
- Standard Dredge and Fill Permit Application – NHDES
- NH Division of Historical Resources Completed Inventory Form

8) Press Release

Maplewood Ave Culvert Replacement and North Mill Pond Restoration

CULVERT REPLACEMENT ALTERNATIVE ANALYSIS

Project Overview

The project involves the replacement of the existing 28' +/- diameter corrugated metal arch culvert and adjacent seawalls along Maplewood Avenue where it crosses North Mill Pond (tidal) within the Piscataqua River Estuary in Portsmouth, NH.

The primary project goals to be achieved with the replacement of the failed structure include replacing the failed bridge/culvert with a bridge section that is larger than the current culvert to enhance tidal flow into North Mill Pond as well as to improve small boat access. The project also requires the relocation of existing utilities which currently cross the arch, particularly the gravity sewer main that impedes the tidal flow and prevents small boat access. The structures do need to maintain the aesthetic appeal of a historically based stone structure utilizing modern materials which will incorporate as much of the existing granite stone work as possible.

For the historical context a review of City archives was conducted and an archive drawing from an 1896 drawing was located. This drawing shows a previous reconstruction of the Maplewood Avenue crossing where the configuration was changed from a five tidal openings, to a single arch culvert circa 1896. The current project intent is to add back as many of the culvert openings to enhance tidal flow as well as to approach the historical context of multiple culvert openings which existed prior to 1896. However, due to existing land constraints replacing the bridge section with culverts in the same location as existed prior to 1896 is no longer feasible, so this analysis looks at providing as much additional area as possible within the historical context as well as the land area constraints and the proposed wider culverts will be located at the existing culvert location.

In general this project will provide improved tidal flow into and out of North Mill Pond, it will replace the failed structure with an improved modern structure with improved utility services, improved traffic, pedestrian and bicycle access along Maplewood Avenue into the heart of Portsmouth and it will provide for a bridge and culvert system with a historical context.

The Alternatives

The alternatives reviewed are based on input from the City of Portsmouth officials and are largely based on a practical approach to what is feasible, cost effective and can be constructed in a timely manner. To accommodate these parameters a precast concrete replacement structure was used as the basis for the alternative analysis. (Contech Construction Products – CON/SPAN Bridge System.

From data provided by the University of New Hampshire Jackson Lab under separate contract, it does not appear that there is a significant tidal lag from the river side (north) of the existing structure to the North Mill Pond side (south) of the structure (approx. 15 min. time lag and 0.1 ft height lag). We can presume that the volume of water entering and leaving the Pond during a tide cycle will essentially be the same with any size opening. Thus any change in the cross sectional area of the culvert will provide either more or less velocity through the culvert, reduced time lag and a slight increase in tidal prism (volume change).

For the comparison of cross sectional areas, field measurements of the existing culvert were used and information from CON/SPAN available arch culvert dimensions were used for the alternatives reviewed.

Existing condition: a 28' corrugated metal arch span on concrete footings, with an existing cross sectional area of approximately 250 s.f. as measured above approximate mean low. Mean Low as determined by James Verra & Associates Inc. via an on the ground existing conditions survey conducted October 20 through 29, 2009.

Waterfront Engineers has provided measured rates of flow during the tide cycle which will be used to compare the velocities of the flow through each alternative. The rate of flow (velocity) was measured at 3 (three) locations. The rate of flow (velocity) was measured at 3 (three different tide cycles, measured in knots (and converted to feet/second for this analysis).

Each reading was taken at the same location at the south side invert of the culvert:

Data point 1: 10/21/09 outgoing tide at low tide - 3.5 knots (5.9 fps).
Data point 2: 10/23/09 incoming tide at mid-tide - 4.3 knots (7.2 fps).
Data point 3: 10/23/09 outgoing tide at mid-tide - 3.0 knots (5.0 fps).

Do Nothing Alternative

This condition represents the base condition against which the impacts of the proposed project and other alternatives will be assessed. It is represented by the existing conditions on the project site. The bridge and culvert would remain as is in place and no improvements would be made.

Q = VxA
Q = Volume of Flow
V = Velocity of Flow
A = Crossectional area of culvert : 250 s.f.

Existing condition solving for Q;

	Area(s.f.)	Velocity (f.p.s.)	Volume (CFS)
Q1 =	250	5.9	1475
Q2 =	250	7.2	1800
Q3 =	250	5	1250

Cons:

- No repair and the culvert is likely to fail. The culvert is exhibiting significant corrosion of the arch culvert and if it fails it will likely causing a catastrophic failure of the roadway. This roadway is a major truck route into the city
- No remediation of the tidal flow into and out of North Mill Pond
- Does not address objective of providing a historical reproduction

Pros:

- No cost to the City
- No disturbance of the tidal flow
- No disturbance of traffic or utilities

Alternative A

Single span opening of relatively the same size

Replacement with single 28' arch: 300 s.f. open area under the arch

For analysis purposes we are comparing the volume of flow available through each alternative using a constant velocity based on existing flow regime information.

Q = VxA
Q = Volume of Flow
V = Velocity of Flow
A = Crossectional area of culvert : 300 s.f.

Area(s.f.)		Velocity (f.p.s.)	Volume (CFS)
A1 =	300	5.9	1770
A2 =	300	7.2	2160
A3 =	300	5	1500

Cons:

- Replacing the culvert with a culvert of approximately the same size will not increase the tidal flush significantly.
- Does not address objective of providing a historical reproduction

Pros:

- Maintains approximately the same tidal flow

Alternative B

Triple span opening with readily available sizes from CON/SPAN
Replacement with 1- 28' arch and 2 -20' arches

A = Crossectional area of culvert : 800 s.f.

Area(s.f.)		Velocity (f.p.s.)	Volume (CFS
B1 =	800	5.9	4720
B2 =	800	7.2	5760
B3 =	800	5	4000

Cons:

- Cost are greater than do nothing and single span

Pros:

- Maximizes cross sectional area allowing enhanced tidal flush
- Provides for a historical bridge section
- Improves boat access

Alternative C

Single span opening with maximum single span readily available from Con Span with 1- 48' arch. Cross sectional area of culvert: 600 s.f.

	Area(s.f.)	Velocity (f.p.s.)	Volume (CFS
C1 =	600	5.9	3540
C2 =	600	7.2	4320
C3 =	600	5	3000

Cons:

- Does not maximize tidal flush
- Does not provide for a historical bridge section
- The wider single arch requires much larger capacity and radius cranes for handling and installation, thus increasing costs.

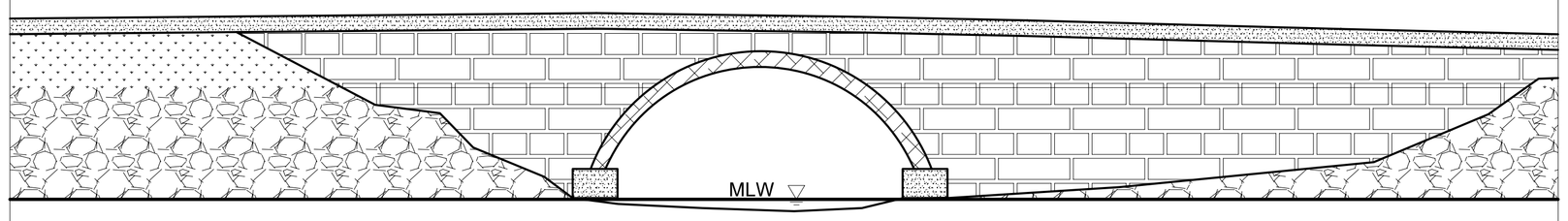
Pros:

- Provides greater tidal flush than existing
- Provides improved boat access

Objectives and Anticipated Benefits

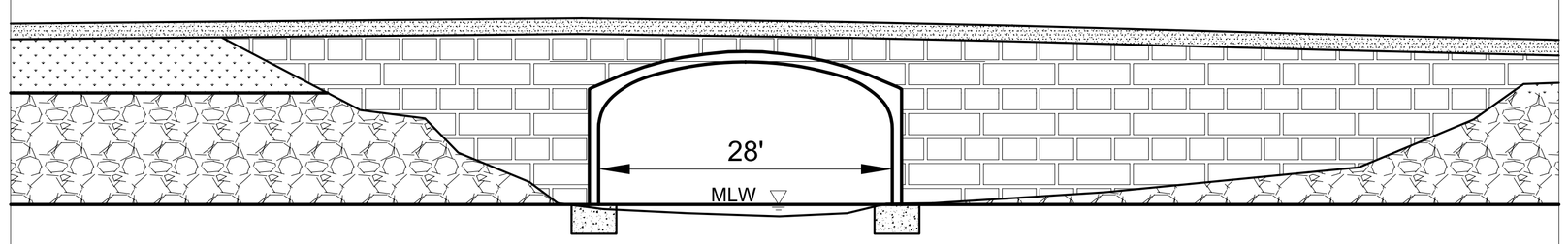
Based on this analysis, alternative B with the three (3) spans would best meet the project objectives and will result in the restoration of the tidal flow into and out of the North Mill Pond, will result in upgrade to the quality of the water way, increased access for small boats and will provide a bridge cross section with a historical context. Among the benefits that will result from the development of this project are the following:

- Improved tidal flush into and out of North Mill Pond;
- Upgrades of existing utilities for present and future conditions;
- Improved bicycle and pedestrian access along Maplewood Avenue;
- Rehabilitation of the granite seawalls and culvert;
- Enhanced aesthetic view of the area and visual appeal
- Small boat access opportunities;
- Improved water quality in North Mill Pond, and
- Traffic and transportation improvements.



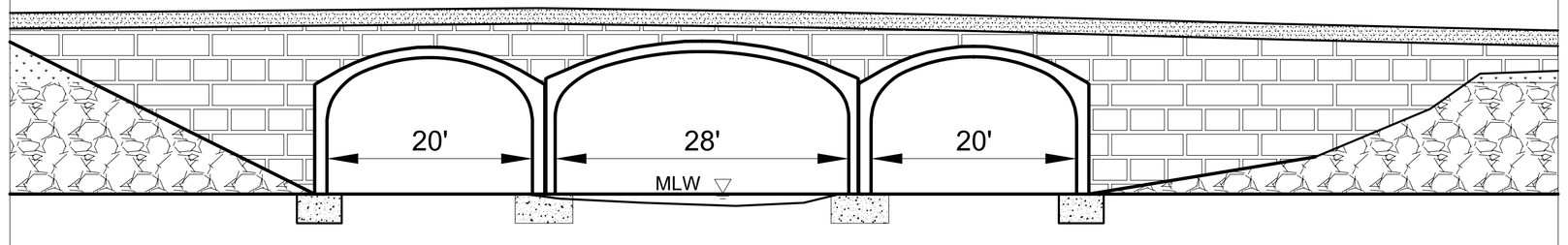
EXISTING CONDITION
(South side looking North)
SCALE: 1" = 10'

AREA MEASURED TO APPROXIMATE MEAN LOW WATER
= 250 SF +/-



ALT 1: REPLACE IN-KIND
(South side looking North)
SCALE: 1" = 10'

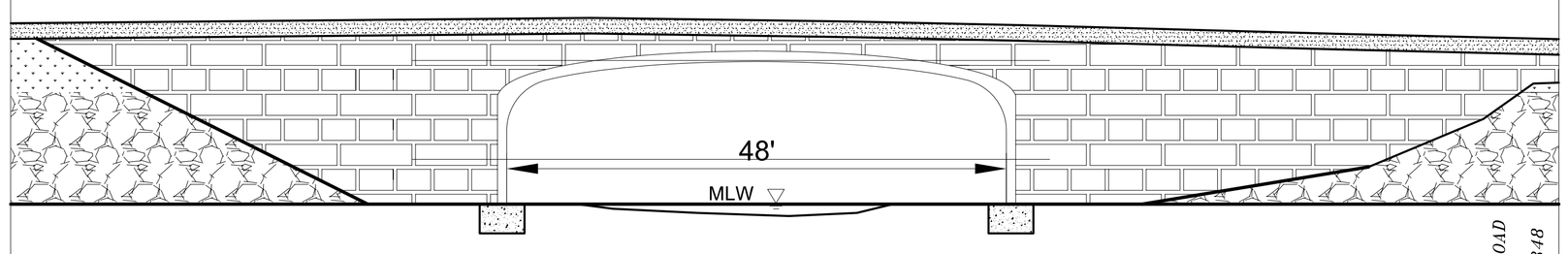
AREA MEASURED TO APPROXIMATE MEAN LOW WATER
= 300 SF +/-



ALT 2: THREE SPANS
(South side looking North)
SCALE: 1" = 10'

AREA MEASURED TO APPROXIMATE MEAN LOW WATER
= 800 SF +/-

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.



ALT 3: SINGLE SPAN
(South side looking North)
SCALE: 1" = 10'

AREA MEASURED TO APPROXIMATE MEAN LOW WATER
= 600 SF +/-

RECONSTRUCTION ALTERNATIVES

No.	Description	Approv.	Date
	DRAWING REVISIONS		

Date: 11/03/09
Scale: As Shown
Designer: SJH

Approved by:
Project No:
File: MAPLEWOOD AVE

MAPLEWOOD AVE RECONSTRUCTION
AT NORTH MILL POND

CITY OF PORTSMOUTH

HAIGHT ENGINEERING, LLC
CIVIL ENGINEERS
P.O. BOX 166, 181 WATSON ROAD
ROLLINSFORD, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

SHEET 1 OF 1

WATERFRONT ENGINEERS LLC

3 Linda Lane
Stratham, NH 03885
603 772-3706
www.waterfrontengineers.com

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

WATERFRONT/STRUCTURAL BASIS OF DESIGN

75% Design Submission
Date: December 30, 2009

STRUCTURAL:

The roadway is intended to carry standard highway loads and the manufactured culverts and the footings designed are based on HS25-44 semi-trailer truck loading (culvert reaction loads provided by ConSpan). The wall reconstruction is based on the same loading with the walls designed based on standard highway practice of adding two feet of effective soil surcharge to represent the highway loading (in this case a 260 psf uniform live load was used).

The poor quality foundation soils found at the site did require the use of foundation piles to carry the wall and culvert loads (vertical and horizontal) down to bedrock. The HP10x57 piles selected are designed to include an allowable 1/8" corrosion loss off web and flanges, and are also limited to an allowable axial stress of 0.33Fy for driven marine piles. In addition to these corrosion, damage and deterioration allowances, all of the piles will be electrically connected and aluminum alloy anodes will be provided for corrosion protection.

The scour protection riprap is designed per FHWA HEC-23 guidelines based on observed tidal current speeds, plus a 120% exceedance factor. The actual tidal currents after culvert replacement should actually be less as the culvert cross sectional area is increasing significantly. The riprap adjacent to the piers is larger and in a greater layer thickness per FHWA HEC-23 guidelines.

Estimates of the tidal conditions at this site were based on site observations and tidal height data provided by the UNH Jackson Lab, as follows.

SITE TIDAL OBSERVATIONS:

As part of the Maplewood Avenue culvert replacement concept study, a limited swim by assessment of the site was performed and periodic tidal current measurements have been performed.

The swim-by assessment found the culvert bed (natural) and north side seabeds are typically a gently sloping broken rock cobble to boulder bottom exposed to significant tidal current and containing a substantial density of marine life, such as Irish moss and sponges. At the south end of the culvert the bottom is also a broken rock cobble bottom, however there is a rapid drop off about 30 feet south of the culvert into a sub tidal pool at least 8 feet deep at low tide. Beyond the scour effects of the tidal acceleration by the culvert, the bottom trends to gravel, sand and mud substrates with significant urban debris, including tires, broken glass and pottery.

The existing culvert is a steel plate arch, likely inserted inside the 1896 arch culvert as a repair. The 1896 drawing indicates the stone arch culvert with a width of 28 feet and height of about 12 feet. The existing steel plate arch has a width of 25.5 feet to the steel and 2 ft by 5 ft concrete footings at each side encroaching into the culvert with about a 20.5 ft clear opening width between footings. The measured height of the culvert at the south end is 10.6 feet and significantly less than the height at the north end (to be confirmed by topo survey).

TIDES:

Limited tidal height data has been collected by the University of New Hampshire Jackson Marine Lab on both the north and south sides of Maplewood Avenue. The tide gauges were installed above low tide level, so the data illustrate only the higher portion of the tidal curves. Low tide water level observed in the morning of October 21, 2009 indicated the low tide on the north side of Maplewood Ave. lagged about 15 minutes behind the predicted low tide at the Atlantic Heights NOAA tide station and had an observed elevation of -3.0 ft NGVD1929 (approximately 0.3 ft above low water level at Atlantic Heights). Low tide water level observed in the morning of October 20, 2009 indicated the low tide on the south (Mill Pond) side of Maplewood Ave. lagged about 1 hour and 15 minutes behind the predicted low tide at the Atlantic Heights NOAA tide station and had an observed elevation of -1.7 ft NGVD1929. The bathymetry at the south end of the culvert and the raised elevation of this portion of seabed controls the low tide level and apparent low tide lag in North Mill Pond.

The UNH tide data was compared to the nearby NOAA tide stations. Four days during the October UNH tide data were selected based on those days having Fort Point tide station observed high tides close to predicted high tides (many of the October days had observed high tides significantly above predicted). For those days, the UNH high tide data was compared to the Fort Point (predicted and observed water levels) and Atlantic Heights (predicted water levels) NOAA tide station water levels. The comparisons, which included data adjustment to NGVD 1929 datum, indicated the high tide on the north side of Maplewood

Avenue lags about 10 minutes behind the Atlantic Heights tide station, with a high tide level about 76% of the Atlantic Heights (variability 69% to 82%). Based on this limited comparison, we estimate Mean High Water (MHW) at about elevation 3.0 ft NGVD1929 and the Highest Observable Tide Line (highest predicted tide) at about elevation 4.3 ft NGVD1929.

The high tide south side of Maplewood Avenue (North Mill Pond) lags about 25 minutes behind the Atlantic Heights tide station, with a high tide level about 74% of the Atlantic Heights (variability 63% to 80%). Based on this limited comparison, we estimate Mean High Water (MHW) at about elevation 2.9 ft NGVD1929 and the Highest Observable Tide Line (highest predicted tide) at about elevation 4.2 ft NGVD1929. These elevations do appear to agree with observed wrack lines and staining on the walls.

Since only four days during the UNH October data collection showed predicted high tides close to observed high tides (based on Fort Point data showing many of the October days had observed high tides significantly above predicted); this comparison is only approximate and might differ significantly if more comparative data were available.

The FEMA 100 year flood elevation is listed for both sides of Maplewood Avenue as elevation 9.0 ft.

CURRENTS:

Limited current measurements have been made in October 2009 while on site for other work as a basic check of tidal current speeds in the culvert. Measurements were taken with a simple hand held Davis Instruments pitot tube. These measurements were taken at a 3 inch water depth and were not corrected for salinity/density variation or tidal range and are only intended as a general check on current speeds.

Low tide ebb flow was measured on Oct. 21 between 0825 and 0845 inside the culvert with a water depth of about 1.5 ft (some irregularity due to cobbles/boulders in culvert bed). The mid channel speed was surging between 3.0 and 3.5 knots (5 to 6 fps) for a width of about 16 feet and edge speed was about 2 knots (3 fps). Observed low tide was at about 0830, compared to a predicted low at Atlantic Heights of 0800, however the Fort Point tide station recorded about an a 12 minute lag between predicted low tide and observed low tide that morning. Low tide slack current in the culvert was observed at 0930 with observable flood flow by 0940.

On October 23 at 1300 the flood tide current was checked with a river tide height of +4.5 ft MLLW based on the predicted Atlantic Heights (National Gypsum dock)

NOAA tide station. Measurements at the south end of the culvert found 3.9 to 4.3 knots (6.6 to 7.1 fps) at 2 feet from the culvert east edge, and 4.0 to 4.3 knots (6.8 to 7.3 fps) at 4 feet from the culvert east edge. A standing wave estimated at 1.5 ft high was observed at the western side of the outflow.

On October 30 at 1200 the ebb tide current was checked with a river tide height of +5.2 ft MLLW based on the predicted Atlantic Heights (National Gypsum dock) NOAA tide station. Measurements at the south end of the culvert found 3.0 knots (5.0 fps) at 5 feet from the culvert west edge, with a water level 10.6 ft below the sidewalk.

On November 9 at 1230 the flood tide current was checked with a river tide height of +3 ft MLLW based on the predicted Atlantic Heights (National Gypsum dock) NOAA tide station. Measurements at the south end of the culvert found 1.0 to 1.2 knots (1.7 to 2 fps) at 4 feet from the culvert east edge and 1.5 knots (2.5 fps) at the culvert center line.

ALTUS
ENGINEERING, INC.

Civil
Site Planning
Environmental
Engineering

133 Court Street
Portsmouth, NH
03801-4413

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION
PORTSMOUTH, NEW HAMPSHIRE

UTILITIES DESIGN NARRATIVE

Altus Engineering, Inc. (Altus) was commissioned to design the utilities portion of the Maplewood Avenue Culvert Replacement and North Mill Pond Restoration Project. Altus work includes municipal water main relocations, natural gas, sanitary sewage collection design, and electrical and tele-communications relocation coordination.

Municipal water main relocation

The existing municipal water main in the project vicinity is undersized. It is an 8-inch diameter. The City of Portsmouth has identified in their capital improvements plan that the Maplewood Avenue water main will be to be replaced with a 16-inch diameter water main. Our design provides for the installation of the 16-inch diameter main within the project limits and makes allowances for extending the 16-inch later or in conjunction with additional infrastructure projects.

Sanitary Sewer

The existing Maplewood Avenue gravity sewer runs through the existing culvert, which prevents any the navigation of the existing culvert. The proposed inverted siphon that will be located north of the proposed bridge will eliminate the obstacles created by the sewer. Constructing an inverted siphon allows the gravity sewer without pump stations. The projected wastewater flows in the future are undetermined at this time. The City is proposing a new sewerage treatment plant, which may relocate some of the sanitary flows away from the proposed system. As designed, the project peak flow is 376,800 gallons per day. There is limited static head on the system, which compounded with the reduced flows makes the design challenged. The design does not meet the minimum velocity design recommendations of 2.5 to 3.0 feet per second (FPS) and will require routine maintenance to ensure that solids do not accumulate in the inverted siphon structure.

The inverted siphon is designed as a triple barrel structure to accommodate the project low and peak flow rates.

PSNH, Fairpoint, and other utilities

It is the design intent to eliminate the overhead utilities on the bridge crossing area. Altus met with PSNH and Fairpoint to discuss the potential for the relocations. The schematic layout is presented on the plans.

Unitil

Altus has provided a new natural gas main through the site to provide for the continued service of natural gas through the project limits.

Tel: (603) 433-2335 Fax: (603) 433-4194 E-mail: Altus@altus-eng.com

HAIGHT ENGINEERING, PLLC

P.O. BOX 1166, 181 WATSON ROAD
DOVER, NH
TEL: (603) 750-4266, FAX: (603)749-7348

Haight Engineering provided site civil engineering for this project, in association with Waterfront Engineers LLC.

The design followed standard engineering practice with the following criteria, conditions and limitations:

Roadway:
The intent was to raise roadway as much as possible at the North Mill Pond crossing to best accommodate the replacement culverts, buried utilities and with consideration of possible future sea level rise.

- Raised the road as much as possible to accommodate utilities and sea level rise. Limited elevation changes acceptable due to the location of the reconstruction. The section of the roadway is required to blend to existing grades at the limit of the work proposed while maintaining safe driving conditions.
- Road way posted speed limit : 25 mph
- AASHTO design criteria for stopping sight distance K for a crest 20: exceeded
- AASHTO design criteria for stopping sight distance K for a sag 30: exceeded
- Increased cross slope of roadway to 2.5% (typical 2%) to facilitate surface runoff to catch basins
- Re-grade centerline of roadway to direct runoff to catch basins and eliminate puddles on the bridge section

Signage:
Provide required signage per MUTCD

- Discussion with City sign coordinator regarding location and number of signs.
- Per MUTCD … Bicycle lane with pavement marking symbol and arrow
- Since this is a continuation of the route there is only one sign required at each end
- MUTCD parking sign integral with bicycle lane sign to accentuate visual
- Reuse and reset existing bridge rating sign “E-2”

HAIGHT ENGINEERING, PLLC

P.O. BOX 1166, 181 WATSON ROAD
DOVER, NH
TEL: (603) 750-4266, FAX: (603)749-7348

Drainage:

Provide for surface drainage and treatment of runoff in project area, while minimizing changes to existing drainage characteristics and utilizing existing stormwater outfalls, with some improvements through the addition of stormwater treatment units. The existing under sidewalk curb inlet and drainage pipe (a retrofit) at the northwest corner of the project was replaced with a standard catch basin, tied into the new stormwater treatment units.

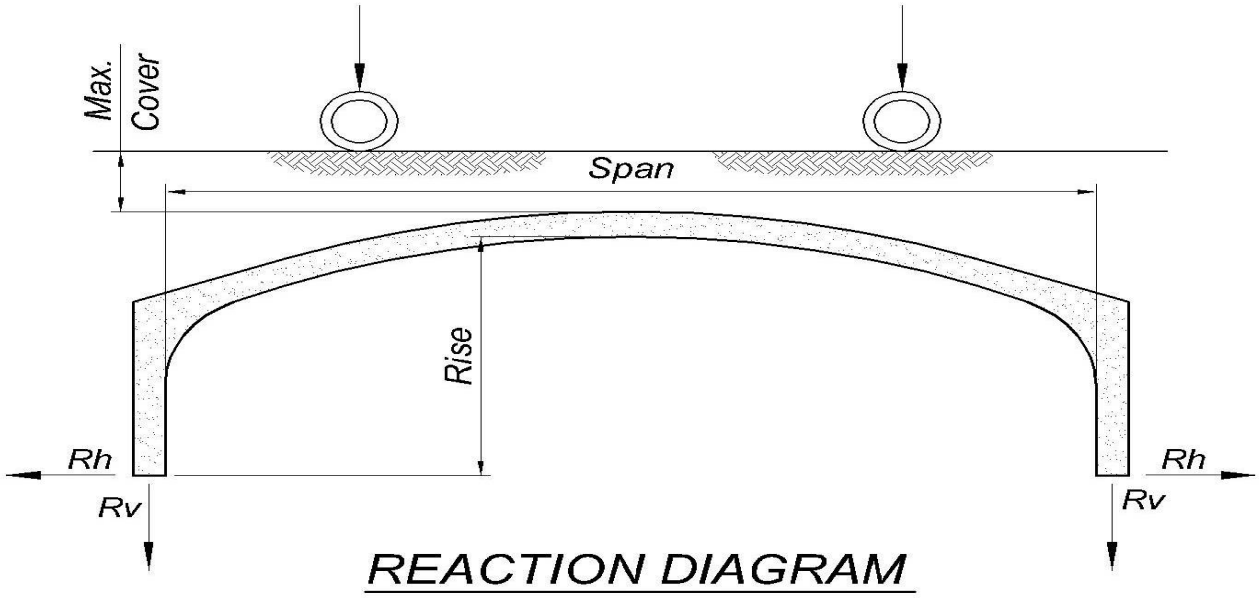
- Replace the old catch basins and drainage pipes in work area with new pre-cast concrete structures
- Upgrade drainage pipes to minimum sizes of 12” to provide for more capacity in the conveyance system
- Provide for storm water treatment of surface runoff within project area where none exists today
- There are no changes in watershed contributing to the catch basins, therefore the storm water treatment consists of a State of NH approved Best Management Practice mechanical treatment system as provided by “Stormceptor”. All discharges will be to North Mill Pond and will be treated prior to release where no treatment existed

BRIDGE REACTIONS

JOB #: 352177
NAME: Maplewood Avenue
DATE: 22-Dec-09
BY: Justin Reardon

LOADS:

cover, at structure center	4.0 ft, max	Vertical load, per leg, R_v (DL Only)	**12.3 k/f**
bridge span	20 ft	Vertical load, per leg, R_v (DL + LL)	**14.6 k/f**
bridge rise	10.0 ft	Horizontal load, per leg, R_h (DL Only)	**0.4 k/f**
live load	HS 25-44	Horizontal load, per leg, R_h (DL+LL)	**0.4 k/f**



REACTION DIAGRAM

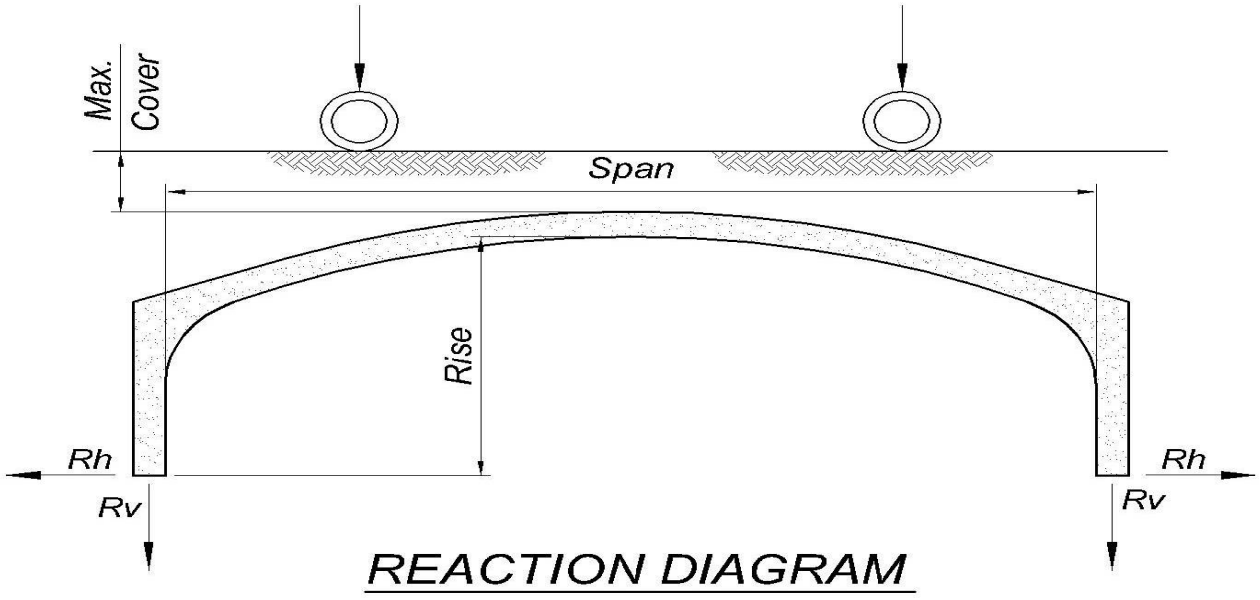
Notes:
1) Axle load positions are varied to produce critical reactions shown here.
2) Reactions are unfactored loads.
3) Impact is not included.
4) Units are kips/ft.
5) Soil Weight = 120 pcf.
6) reactions are based on spread foundations.

BRIDGE REACTIONS

JOB #: 352177
NAME: Maplewood Avenue
DATE: 22-Dec-09
BY: Justin Reardon

LOADS:

cover, at structure center	4.0 ft, max	Vertical load, per leg, R_v (DL Only)	**16.0 k/f**
bridge span	28 ft	Vertical load, per leg, R_v (DL + LL)	**18.4 k/f**
bridge rise	10.0 ft	Horizontal load, per leg, R_h (DL Only)	**2.2 k/f**
live load	HS 25-44	Horizontal load, per leg, R_h (DL+LL)	**3.0 k/f**



REACTION DIAGRAM

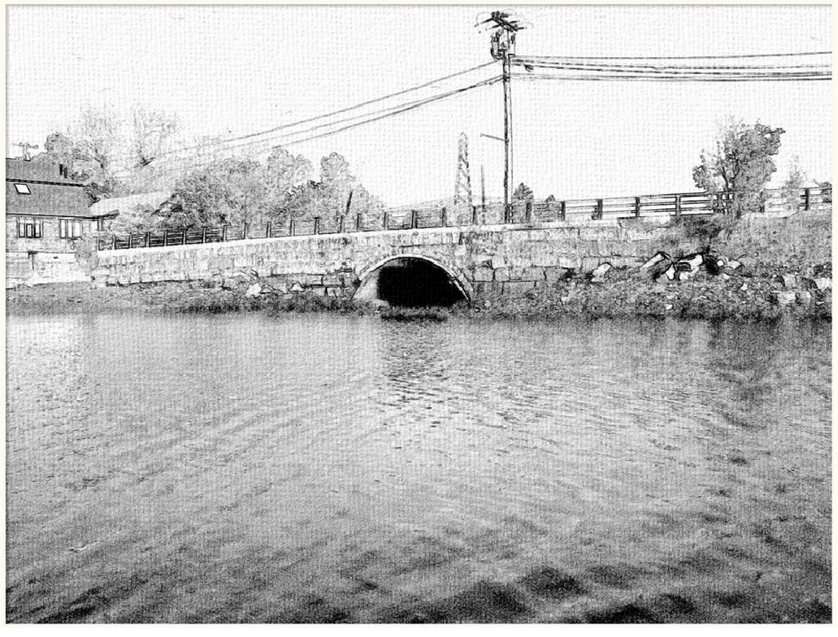
Notes:
1) Axle load positions are varied to produce critical reactions shown here.
2) Reactions are unfactored loads.
3) Impact is not included.
4) Units are kips/ft.
5) Soil Weight = 120 pcf.
6) reactions are based on spread foundations.

MAPLEWOOD AVENUE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION

PORTSMOUTH, NH

DECEMBER 30, 2009

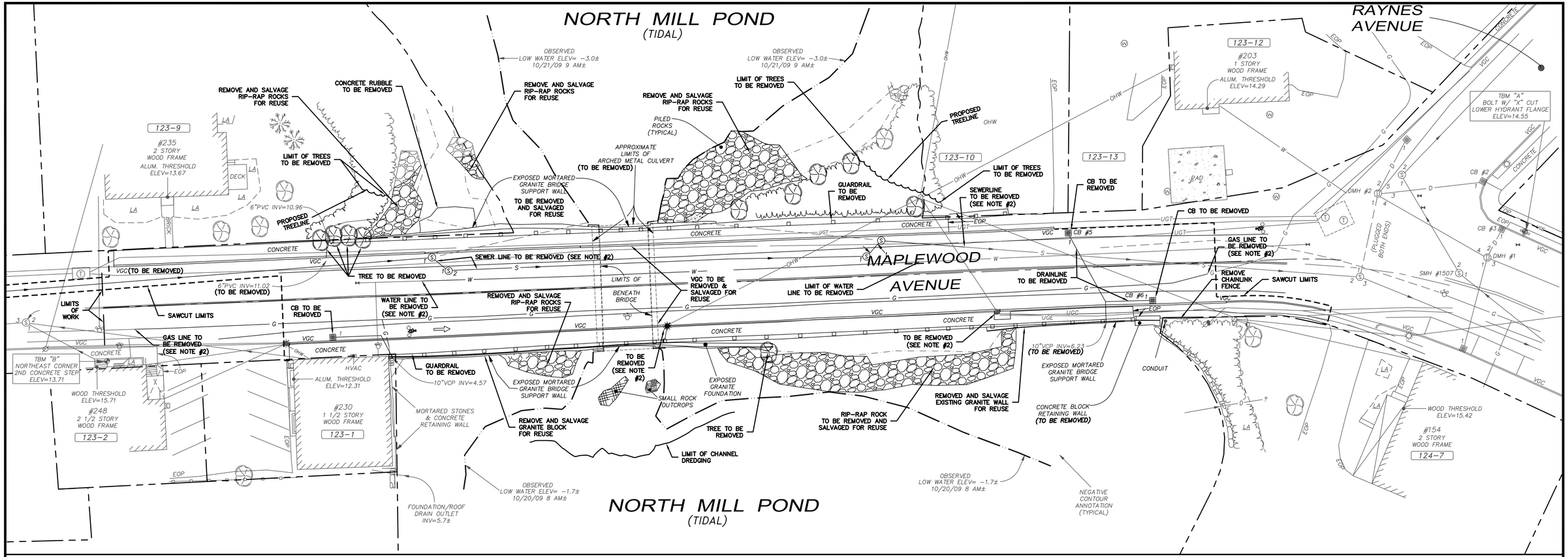
75% DESIGN NOT FOR CONSTRUCTION



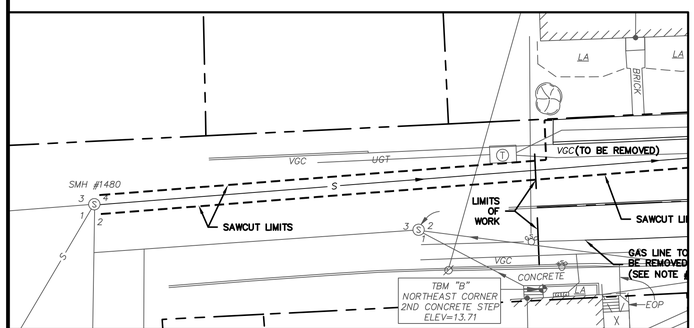
SHEET INDEX	SHEET
EXISTING CONDITION PLAN (JAMES VERRA and ASSOCIATES, INC.)	1
DEMOLITION PLAN	C1
SITE PLAN	C2
GRADING AND DRAINAGE PLAN	C3
EXISTING PROFILE PLAN	C4
PROPOSED PROFILE PLAN	C5
EROSION CONTROL PLAN	C6
GENERAL DETAILS	C7-C10
UTILITIES PLAN	U1
SEWER PLAN & PROFILE	U2
SEWER DETAILS	U3-U5
FOUNDATION PLAN	S1-S3
CULVERT DETAILS	S4-S5
WALL DETAILS	S6
MISCELLANEOUS DETAILS	S6

OWNER	CITY OF PORTSMOUTH 1 JUNKINS AVE PORTSMOUTH, NH
STRUCTURAL ENGINEER	WATER FRONT ENGINEERING, LLC 3 LINDA LANE STRATHAM, NH
SITE CIVIL ENGINEER	HAIGHT ENGINEERING, PLLC 181 WATSON ROAD DOVER, NH
SITE UTILITIES ENGINEER	ALTUS ENGINEERING, LLC 133 COURT STREET PORTSMOUTH, NH
SURVEYOR	JAMES VERRA & ASSOCIATES, INC 101 SHATTUCK WAY, SUITE 8 NEWINGTON, NH

PROJECT FUNDING PROVIDED BY:
THE NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION (NOAA)
RESTORATION CENTER IN CONJUNCTION WITH
THE NEW HAMPSHIRE COASTAL PROGRAM (NHCP) &
THE DEPARTMENT OF ENVIRONMENTAL SERVICE (NHDES)



SITE PLAN
SCALE 1"=20'



PARTIAL SITE PLAN
SCALE 1"=20'

PLAN REFERENCE:

1. EXISTING CONDITIONS PLAN MAPLEWOOD & RAYNES AVENUE, PORTSMOUTH, NEW HAMPSHIRE, FOR WATERFRONT ENGINEERS, LLC.; PREPARED BY JAMES VERRA AND ASSOCIATES, INC., 101 SHATTUCK WAY, SUITE 8, NEWINGTON, N.H., 03801-7876; JOB NO.: 23292; SHEET: 1 OF 1; DATE: 11-5-09.

DEMOLITION NOTES:

1. THE PURPOSE OF THIS PLAN IS TO GENERALLY SHOW THE DEMOLITION NECESSARY FOR THE CONSTRUCTION OF THE BRIDGE AND ROADWAY AREA.
2. REFER TO UTILITY PLAN PREPARED BY ALTUS ENGINEERING AND PART OF THIS PLAN SET FOR SELECTIVE DEMOLITION FOR THE CONSTRUCTION AND RECONSTRUCTION OF SEWER, WATER, GAS, TELEPHONE, ELECTRIC, CABLE AND FIRE.
3. THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE AND THE LOCATION IS NOT GUARANTEED BY THE OWNER OR THE ENGINEER. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES, ANTICIPATE CONFLICTS, REPAIR EXISTING UTILITIES AND RELOCATE EXISTING UTILITIES REQUIRED TO COMPLETE THE WORK AT NO ADDITIONAL COST TO THE OWNER.
4. ALL MATERIALS SCHEDULED TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR UNLESS OTHERWISE SPECIFIED. THE CONTRACTOR SHALL DISPOSE OF ALL MATERIALS OFF-SITE IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS, ORDINANCES AND CODES.
5. COORDINATE REMOVAL, RELOCATION, DISPOSAL OR SALVAGE OF UTILITIES WITH THE OWNER AND APPROPRIATE UTILITY COMPANY.
6. ANY EXISTING WORK OR PROPERTY DAMAGED OR DISRUPTED BY CONSTRUCTION/ DEMOLITION ACTIVITIES SHALL BE REPLACED OR REPAIRED TO MATCH ORIGINAL EXISTING CONDITIONS BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
7. THE CONTRACTOR SHALL NOTIFY "DIG SAFE" PRIOR TO ANY DEMOLITION/ CONSTRUCTION ACTIVITIES.
8. SAWCUT PAVEMENT ALONG LIMIT OF PAVEMENT REMOVAL IN ALL AREAS WHERE PAVEMENT TO BE REMOVED ABUTS EXISTING PAVEMENT OR CONCRETE TO REMAIN.
9. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL EXISTING STRUCTURES, UTILITIES AND PAVEMENT ON THE SITE TO THE LIMITS SHOWN UNLESS SPECIFICALLY IDENTIFIED TO REMAIN. ITEMS TO BE REMOVED INCLUDE BUT ARE NOT LIMITED TO: CONCRETE, PAVEMENT, SIDEWALKS, CURBS, GUARDRAILS, MANHOLES, CATCHBASIN, UNDERGROUND PIPING AND APPURTENANCES, POLES, SIGNS, FENCES, RAMPS, WALLS, AND LANDSCAPING.
10. IT IS THE CONTRACTORS RESPONSIBILITY TO FAMILIARIZE HIMSELF WITH THE CONDITIONS OF ALL OF THE PERMIT APPROVALS.
11. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ADDITIONAL PERMITS, NOTICES AND FEES NECESSARY TO COMPLETE THE WORK.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEMOLITION AND OFF-SITE DISPOSAL OF MATERIALS REQUIRED TO COMPLETE THE WORK, EXCEPT FOR WORK NOTED TO BE COMPLETED BY OTHERS.
13. PAVEMENT REMOVAL LIMITS ARE SHOWN FOR CONTRACTOR'S CONVENIENCE. ADDITIONAL PAVEMENT REMOVAL MAY BE REQUIRED DEPENDING ON THE CONTRACTOR'S OPERATION. CONTRACTOR TO VERIFY FULL LIMITS OF PAVEMENT REMOVAL PRIOR TO BID.

LEGEND:

RETAINING / dry MORTARED WALL	— S — SEWER LINE
GUARD RAIL	— W — WATER LINE
(S) SEWER MANHOLE	—D— DRAIN LINE
(D) DRAIN MANHOLE	— G — GAS LINE
CATCH BASIN	—OHW— OVERHEAD WIRES
(T) TELEPHONE MANHOLE	—OHE— OVERHEAD ELECTRIC
HYDRANT	—OHT— OVERHEAD TELEPHONE
WATER GATE VALVE	—OHC— OVERHEAD CATV/DATA
WATER SHUT OFF VALVE	—UGE— UNDERGROUND ELECTRIC
GAS METER	—UGT— UNDERGROUND TELEPHONE
GAS SHUT OFF VALVE	—UGC— UNDERGROUND CATV/DATA
UTILITY POLE	VGC VERTICAL FACED GRANITE CURB
LIGHT POLE	EOP EDGE OF PAVEMENT
UTILITY POLE W/TRANSFORMER	LAPN TAX SHEET – LOT NUMBER
GUY	DECIDUOUS TREE
ELECTRIC METER	TREE/BRUSH LINE
ELECTRICAL BOX	15x4 SPOT GRADE
ELECTRICAL CONDUIT	

NEW HAMPSHIRE COASTAL PROGRAM

NHDES

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

DIG SAFE
1-888-DIG-SAFE
CALL BEFORE YOU DIG !

N.H. STATE PLANE COORDINATE SYSTEM OF 1983

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)

	NO.	REVISION	APP'D	DATE
DATE: 12-30-2009				
SCALE: 1"=20'				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY: SJH				
PROJECT NO: 0919				
FILE: SITE.DWG				

CITY OF PORTSMOUTH NEW HAMPSHIRE INCORPORATED 1653

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

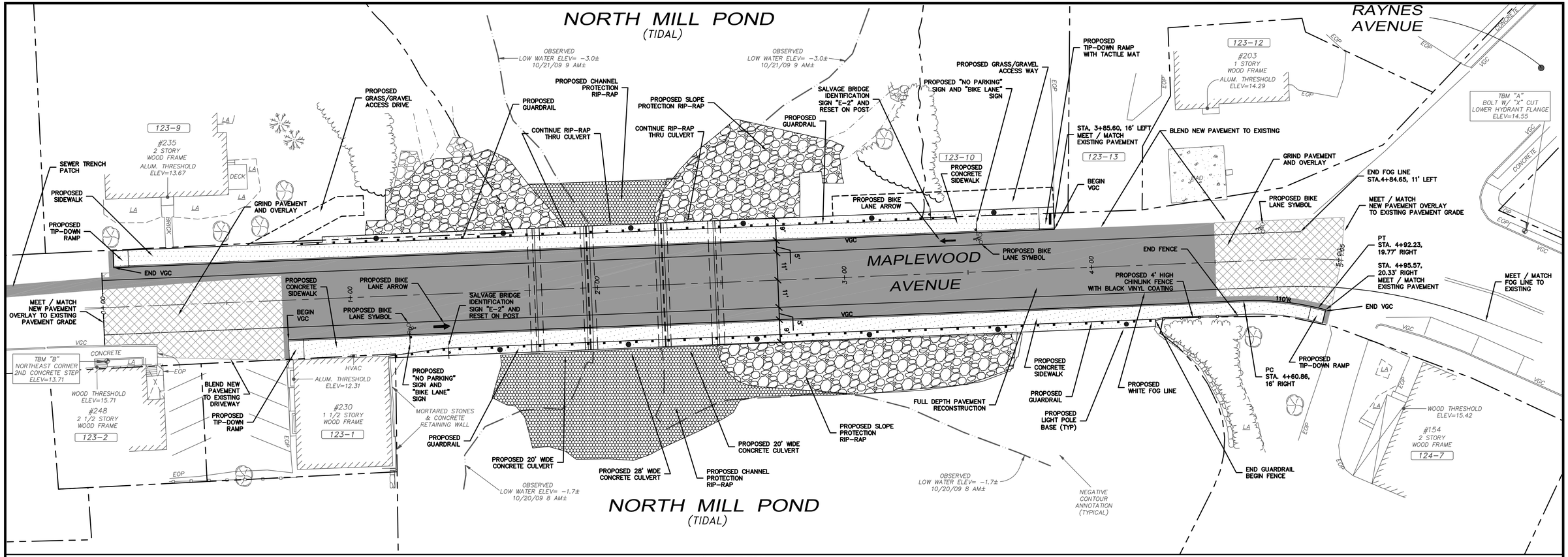
HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

DEMOLITION PLAN

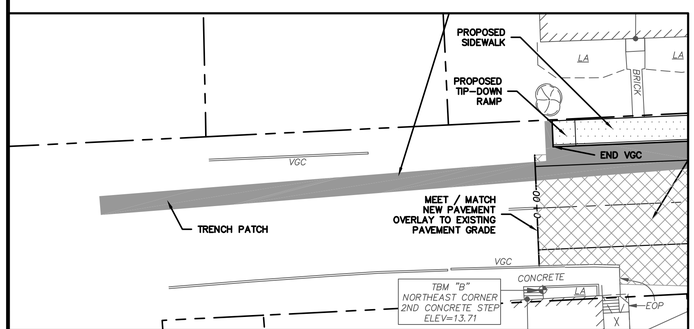
CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-1

75% DESIGN NOT FOR CONSTRUCTION



SITE PLAN
SCALE 1"=20'



PARTIAL SITE PLAN
SCALE 1"=20'

GENERAL NOTES

1. THE PROJECT INVOLVES THE REPLACEMENT OF THE FAILING ARCH CULVERT AND ADJACENT SEAWALLS ALONG MAPLEWOOD AVENUE WHERE IT CROSSES NORTH MILL POND. THE WORK INCLUDES THE DISASSEMBLY AND RECONSTRUCTION OF THE ADJACENT SEAWALLS AND THE REPLACEMENT OF THE EXISTING ARCH CULVERT WITH A THREE BARREL ARCH CULVERT (ONE-28 FT WIDE AND; TWO-20 FT WIDE) PROVIDING SIGNIFICANTLY HIGHER FLOW CAPACITY.
2. THE SEAWALLS WILL BE REPLACED IN APPROXIMATELY THE SAME LOCATION AND WILL BE REBUILT USING AS MUCH OF THE EXISTING EXTERIOR GRANITE HISTORICAL STONE AS IS PRACTICABLE. THE WALLS WILL BE REBUILT TO ALLOW FOR A STANDARD ROAD CROSS SECTION WITH BICYCLE LANES, SIDEWALKS, GUARDRAILS AND DECORATIVE SITE LIGHTING. IT IS PROPOSED THAT FALLEN CUT GRANITE BLOCK STONES AT THE TOE OF THE WALLS IN THE INTERTIDAL ZONE AND WATER WILL BE RETRIEVED FOR REUSE, INCLUDING TWO GRANITE BLOCKS PARTIALLY EMBEDDED IN MORTAR AND BLOCKING LOW TIDE FLOW AT THE SOUTH END OF THE CULVERT.
3. ADDITIONAL STONE AS REQUIRED FOR THE CONSTRUCTION OF THE WALLS AND FOR SLOPE ARMOR SHALL BE APPROVED IN ADVANCE BY THE CITY.
4. THESE DRAWINGS FORM A PART OF THE SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. THE CONTRACTOR SHALL HAVE AND FOLLOW A COPY OF THE OWNERS TERMS AND CONDITIONS, THE CONTRACTOR'S WORK RULES AND SPECIFICATIONS FOR SAFETY, WORKMANSHIP AND CONSTRUCTION PROCEDURES NOT COVERED IN THESE NOTES.
5. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SURVEY CONTROL AT ALL TIMES TO ESTABLISH AND MAINTAIN ALL LINES AND ELEVATIONS.
6. THE EXACT SIZE AND LOCATION OF ALL UTILITIES ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES PRIOR TO STARTING ANY SITE CONSTRUCTION. CARE SHALL BE TAKEN TO PROTECT ALL UTILITIES AND ALL UTILITY CONSTRUCTION SHALL BE COORDINATED WITH THE APPROPRIATE UTILITY COMPANY.

GENERAL NOTES CONT.

7. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE CONSTRUCTION PROCEDURES AND SEQUENCE TO ENSURE THE SAFETY OF THE FACILITIES AND THEIR COMPONENTS DURING DEMOLITION AND CONSTRUCTION UNLESS OTHERWISE DIRECTED BY THE OWNERS REPRESENTATIVE. THIS INCLUDES THE ADDITION OF NECESSARY SHORING, SHEETING, TEMPORARY BRACING, GUYS OR TIE-DOWNS. SUCH MATERIALS SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AT THE COMPLETION OF THE PROJECT.
8. METHODS OF DEMOLITION, CONSTRUCTION AND ERECTION ARE THE CONTRACTOR'S RESPONSIBILITY UNLESS OTHERWISE SPECIFIED. IT IS THE CONTRACTORS' RESPONSIBILITY TO PROVIDE AND MAINTAIN ENVIRONMENTAL CONTROLS AS REQUIRED BY FEDERAL, STATE AND MUNICIPAL REGULATIONS AND PERMITS. ENVIRONMENTAL CONTROLS SHALL INCLUDE BUT SHALL NOT BE LIMITED TO TURBITY AND DUST CONTROL.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE DONE TO STRUCTURES OR UTILITIES OR INJURIES TO THE PUBLIC DURING THE CONSTRUCTION PHASE CAUSED BY HIMSELF, HIS EMPLOYEES, HIS SUBCONTRACTORS OR EMPLOYEES OF SAME. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TEMPORARY FACILITIES FOR THE PROTECTION OF THE WORK, WORKERS AND PUBLIC SAFETY.
10. A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IS REQUIRED AND SHALL BE PREPARED BY THE CONTRACTOR FOR APPROVAL BY THE CITY OF PORTSMOUTH. THE SWPPP SHALL BE PREPARED AND APPROVED PRIOR TO ANY WORK BEGINNING ON SITE. THE SWPPP SHALL INCORPORATE EROSION PREVENTION AND CONTROL BEST MANAGEMENT PRACTICES (BMP'S) THAT THE CONTRACTOR SHALL INCORPORATE INTO HIS PROGRAM FOR SITE AND CULVERT CONSTRUCTION. THE SWPPP IS PART OF THE CONTRACT DOCUMENTS.
11. A MINIMUM OF 14 DAYS PRIOR TO BEGINNING WORK ON SITE THE CONTRACTOR SHALL PREPARE AND FILE A NOTICE OF INTENT (NOI) WITH THE EPA. WORK CANNOT BEGIN ON SITE UNTIL THE CONTRACTOR HAS RECEIVED HIS EPA NPDES PERMIT.
12. ALONG WITH COMPLYING WITH THE REQUIREMENTS OF THE CONTRACT THE CONTRACTOR SHALL ALSO COMPLY WITH ALL THE EROSION PREVENTION AND CONTROL MEASURES STIPULATED ON THE SWPPP AS WELL AS THOSE MEASURES AS DIRECTED BY THE OWNER AND/OR OWNERS' REPRESENTATIVE DURING CONSTRUCTION.
13. UPON COMPLETION OF THE PROJECT, THE CONTRACTOR SHALL FILE A NOTICE OF TERMINATION (NOT) WITH THE EPA.
14. STONE SHALL BE MACHINE PLACED TO FORM A COMPACTED DENSE MASS. THE STONE LAYERS SHALL USE HARD DURABLE ANGULAR STONE WITHIN THE SPECIFIED MINIMUM TO MAXIMUM SIZE RANGE WELL INTERLOCKED WITH CHINKING STONE USED TO FILL THE VOIDS BETWEEN PRIMARY STONES. ROUNDED STONES OR STONES WITH FEATHERED/THIN EDGES ARE NOT ACCEPTABLE. ARMOR STONES SHALL BE GENERALLY RECTANGULAR IN SHAPE, WITH AT LEAST TWO LARGE FLAT SURFACES. ANY STONE CONTAINING A CRACK SHALL BE CONSIDERED AS TWO SEPARATE STONES FOR WEIGHT AND ACCEPTABILITY CRITERIA (TO BE EVALUATED WITH THE STONE INSTALLED IN FINAL LOCATION AFTER ANY HANDLING DAMAGE).
15. THE INTERFACE BETWEEN LAYERS OF DIFFERENT SIZE STONE SHALL BE KEYED TOGETHER WITH STONES EXTENDING ACROSS THE THEORETICAL PLANE BETWEEN LAYERS. STONES SHALL BE PLACED SO AS NOT TO DAMAGE GEOTEXTILE – USE SAND, GRAVEL OR CRUSHED STONE BEDDING (MAXIMUM 6" THICK) TO CUSHION GEOTEXTILE DURING STONE PLACEMENT.
16. ALL CONSTRUCTION & MATERIALS SHALL BE DONE IN ACCORDANCE WITH THE NHDOT – STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION. (LATEST EDITION)
17. THIS PLAN SET, PROJECT SPECIFICATIONS AND NHDOT SPECIFICATIONS CONSTITUTE THE CONTRACT DOCUMENTS. IF A CONFLICT ARISES BETWEEN THE PLANS AND THE SPECIFICATIONS THE MORE STRINGENT APPLIES.

75% DESIGN NOT FOR CONSTRUCTION

PLAN REFERENCE:

1. EXISTING CONDITIONS PLAN MAPLEWOOD & RAYNES AVENUE, PORTSMOUTH, NEW HAMPSHIRE, FOR WATERFRONT ENGINEERS, LLC.; PREPARED BY JAMES VERRA AND ASSOCIATES, INC., 101 SHATTUCK WAY, SUITE 8, NEWINGTON, N.H., 03801-7876; JOB NO.: 23292; SHEET: 1 OF 1; DATE: 11-5-09.

NEW HAMPSHIRE COASTAL PROGRAM

NHDES

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

DIG SAFE 1-888-DIG-SAFE CALL BEFORE YOU DIG !

N.H. STATE PLANE COORDINATE SYSTEM OF 1983

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

LEGEND:

- PROPOSED GUARDRAIL
- EOP.....EDGE OF PAVEMENT
- LAPN.....TAX SHEET – LOT NUMBER
- VGC.....VERTICAL FACED GRANITE CURB
- .....PROPOSED LIGHT POLE BASE
- FULL DEPTH RECONSTRUCTION
- GRIND 2" DEPTH AND REPAVE WEARING COURSE
- .....DECIDUOUS TREE
- .....TREE/BRUSH LINE
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CHANNEL PROTECTION RIP-RAP
- PROPOSED SLOPE PROTECTION RIP-RAP

DATE:12-30-2009				
SCALE: 1"=20'				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO:0919				
FILE: SITE.DWG				
	NO.	REVISION	APP'D	DATE

CITY OF PORTSMOUTH INCORPORATED 1653

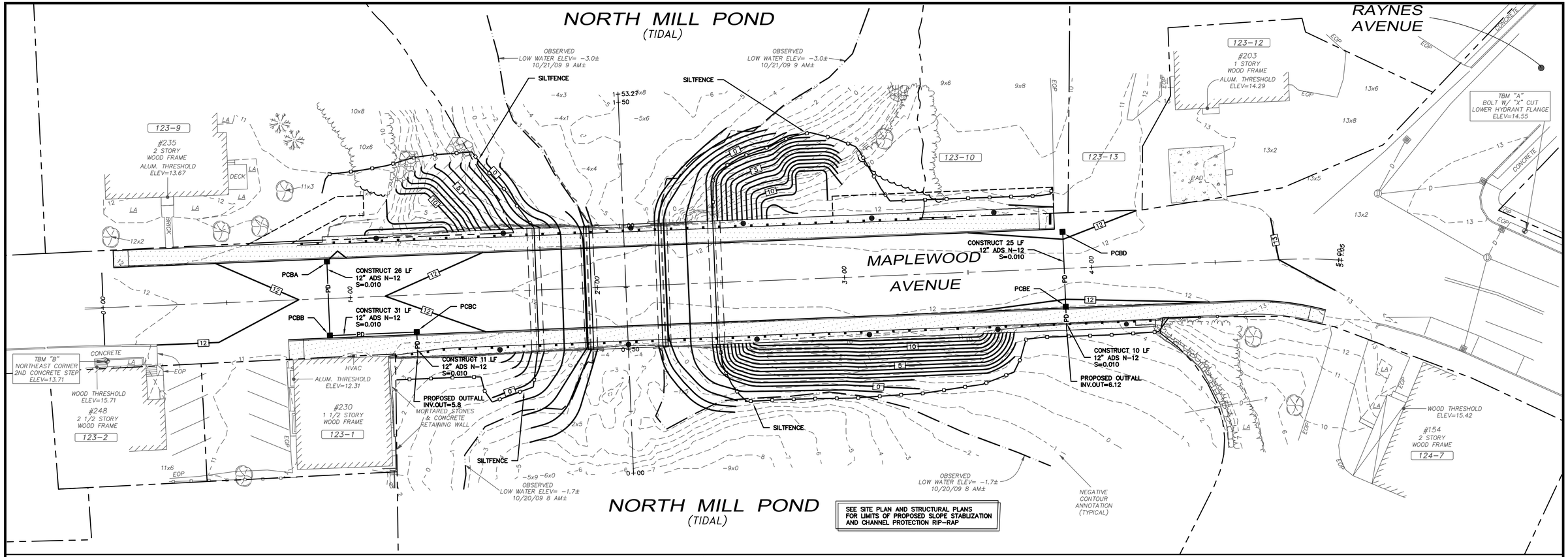
MAPLEWOOD AVE CULVERT REPLACEMENT & NORTH MILL POND RESTORATION PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

SITE PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-2



SITE PLAN
SCALE 1"=20'

GRADING NOTES:

1. ALL DISTURBED AREAS NOT TO BE PAVED OR OTHERWISE TREATED SHALL RECEIVE 4" LOAM, FERTILIZER, SEED AND MULCH OR STONE STABLIZATION TO LIMITS SHOWN.
2. CONTRACTOR SHALL RELOCATE ALL BENCHMARKS AS NECESSARY.
3. SEE DETAIL SHEETS FOR EROSION CONTROL PROCEDURES AND CONSTRUCTION SEQUENCING.
4. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM WITH APPLICABLE TOWN AND STATE CODES AND NHDOT – STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION (LATEST EDITION).
5. CONTRACTOR SHALL PROVIDE A FINISH PAVEMENT SURFACE FREE OF LOW SPOTS AND PONDING AREAS. CRITICAL AREAS INCLUDE BUILDING ENTRANCE AND EXIT RAMPS AND LOADING AREAS ADJACENT TO THE BUILDING.
6. DENSITY REQUIREMENTS:

LOCATION	MINIMUM DENSITY
BELOW PAVED OR CONCRETE AREAS	95%
TRENCH BEDDING MATERIAL AND SAND BLANKET BACKFILL	95%
BELOW LOAM AND SEED AREA	95%

* ALL PERCENTAGES SHALL BE OF THE MAXIMUM DRY DENSITY AT THE OPTIMUM MOISTURE CONTENT AS DETERMINED AND CONTROLLED IN ACCORDANCE WITH AASHTO STANDARD 180, METHOD C. FIELD DENSITY TESTS SHALL BE MADE IN ACCORDANCE WITH AASHTO STANDARD T-191, T-204, OR T-238 AND T-239.

EROSION CONTROL NOTES:

1. SEE GENERAL EROSION CONTROL NOTES ON DETAIL SHEET.
2. PROVIDE INLET PROTECTION BARRIERS AROUND ALL EXISTING AND PROPOSED STORM DRAINAGE INLETS WITHIN THE WORK LIMITS AND AS SHOWN ON PLAN. MAINTAIN FOR THE DURATION OF THE PROJECT UNTIL PAVEMENT HAS BEEN INSTALLED AND UPSTREAM AREAS HAVE BEEN STABILIZED.
3. INSPECT SILT FENCES AFTER EACH RAIN STORM OF 1/2 INCH OR GREATER. REPAIR/MODIFY PROTECTION AS NECESSARY TO MAXIMIZE EFFICIENCY FILTER. REPLACE ALL FILTERS WHEN SEDIMENT IS 1/3 THE STRUCTURE HEIGHT.

PLAN REFERENCE:

1. EXISTING CONDITIONS PLAN MAPLEWOOD & RAYNES AVENUE, PORTSMOUTH, NEW HAMPSHIRE, FOR WATERFRONT ENGINEERS, LLC.; PREPARED BY JAMES VERRA AND ASSOCIATES, INC., 101 SHATTUCK WAY, SUITE 8, NEWINGTON, N.H., 03801-7876; JOB NO.: 23292; SHEET: 1 OF 1; DATE: 11-5-09.

75% DESIGN NOT FOR CONSTRUCTION

PROPOSED DRAINAGE CHART

PCBA
RIM=11.35
INV.OUT=6.85

PCBB
RIM=11.35
INV.IN=6.55
INV.OUT=6.45

PCBC (STORMCEPTOR)
RIM=11.60
INV.IN=6.11
INV.OUT=6.01

PCBD
RIM=11.96
INV.OUT=6.75

PCBE (STORMCEPTOR)
RIM=11.96
INV.IN=6.47
INV.OUT=6.22

LEGEND:

- ⓓ ..... *DRAIN MANHOLE*
- ▦ ..... *EXISTING CATCH BASIN*
- ■ ..... *PROPOSED CATCH BASIN*
- *PROPOSED SIDEWALK*
- *PROPOSED CHANNEL PROTECTION RIP-RAP*
- *PROPOSED SLOPE PROTECTION RIP-RAP*
- *EXISTING CONTOUR*
- 12 *PROPOSED FINISH GRADE*
- *PROPOSED GUARDRAIL*
- —D— ..... *DRAIN LINE*
- —PD— ..... *PROPOSED DRAIN LINE*
- EOP ..... *EDGE OF PAVEMENT*
- LAPN ..... *TAX SHEET – LOT NUMBER*
- ..... *DECIDUOUS TREE*
- ..... *TREE/BRUSH LINE*
- 15x4 ..... *SPOT GRADE*

NEW HAMPSHIRE COASTAL PROGRAM

NHDES

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

DIG SAFE
1-888-DIG-SAFE
CALL BEFORE YOU DIG !

N.H. STATE PLANE COORDINATE SYSTEM OF 1983

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)

DATE:12-30-2009				
SCALE: 1"=20'				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO:0919				
FILE: SITE.DWG				
	NO.	REVISION	APP'D	DATE

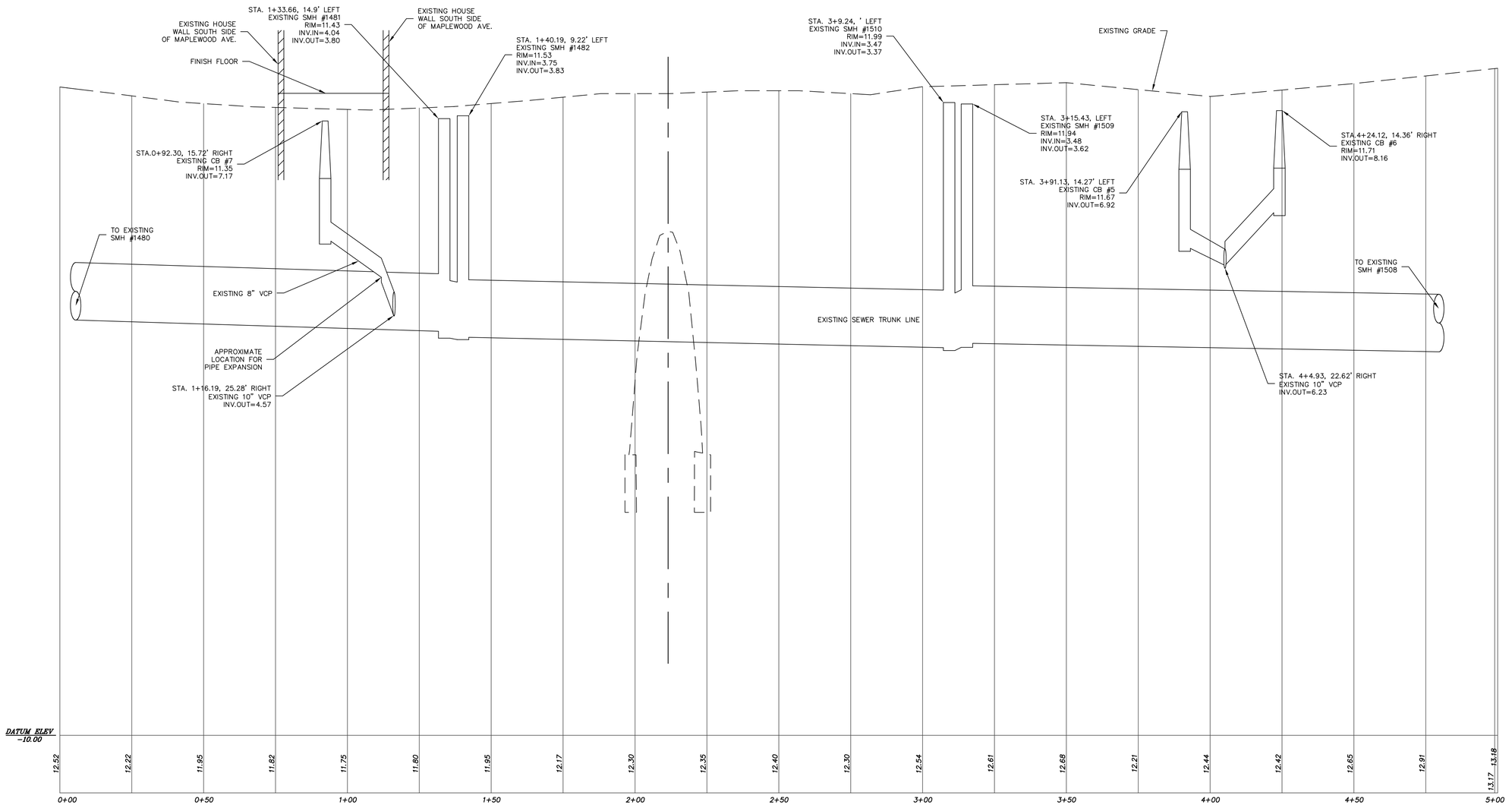
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

GRADING & DRAINAGE PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-3



MAPLEWOOD AVENUE
EXISTING CENTERLINE PROFILE
SCALE: HORIZONTAL = 1"=20'
VERTICAL = 1"=2'

PLAN REFERENCE:
1. EXISTING CONDITIONS PLAN MAPLEWOOD & RAYNES AVENUE, PORTSMOUTH, NEW HAMPSHIRE, FOR WATERFRONT ENGINEERS, LLC.; PREPARED BY JAMES VERRA AND ASSOCIATES, INC., 101 SHATTUCK WAY, SUITE 8, NEWINGTON, N.H., 03801–7876; JOB NO.: 23292; SHEET: 1 OF 1; DATE: 11–5–09.

NOTE:
1. EXISTING CONDITIONS INFORMATION SHOWN HEREON TAKEN FROM EXISTING CONDITIONS PLAN PROVIDED BY JAMES VERRA ASSOCIATES, INC. SEE PLAN REFERENCE #1.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NOAA U.S. DEPARTMENT OF COMMERCE

NEW HAMPSHIRE COASTAL PROGRAM

NHDES

DIG SAFE 1-888-DIG-SAFE CALL BEFORE YOU DIG !

75% DESIGN NOT FOR CONSTRUCTION

DATE:12–30–2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO:0919				
FILE: SITE.DWG				
	NO.	REVISION	APP'D	DATE

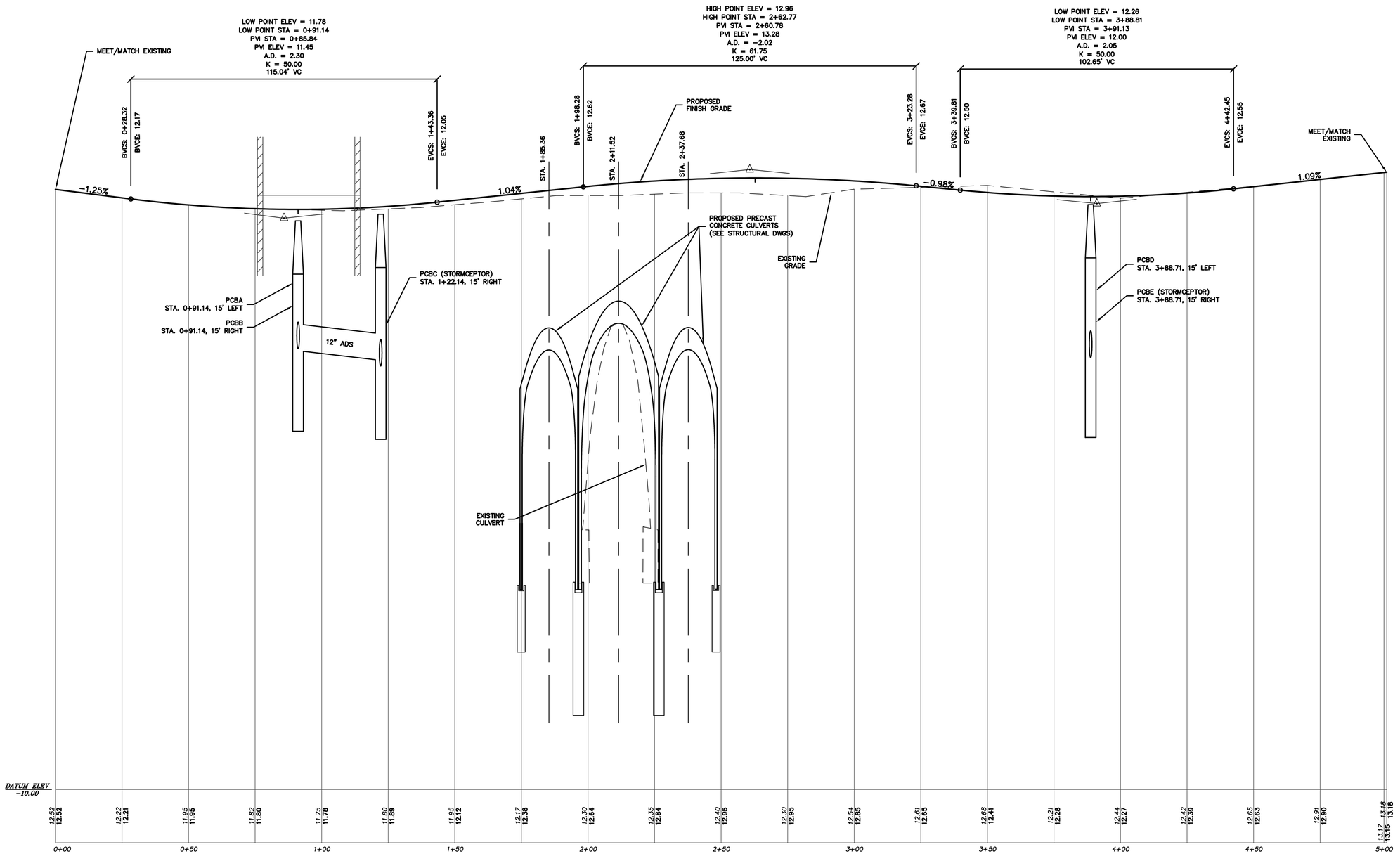
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

EXISTING PROFILE PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C–4



MAPLEWOOD AVENUE
PROPOSED CENTERLINE PROFILE
SCALE: HORIZONTAL = 1"=20'
VERTICAL = 1"=2'

PLAN REFERENCE:

1. EXISTING CONDITIONS PLAN MAPLEWOOD & RAYNES AVENUE, PORTSMOUTH, NEW HAMPSHIRE, FOR WATERFRONT ENGINEERS, LLC.; PREPARED BY JAMES VERRA AND ASSOCIATES, INC., 101 SHATTUCK WAY, SUITE 8, NEWINGTON, N.H., 03801-7876; JOB NO.: 23292; SHEET: 1 OF 1; DATE: 11-5-09.

NOTE:

1. THE PURPOSE OF THIS PROFILE SHEET IS TO SHOWN THE PROPOSED CENTERLINE GRADE OF THE ROADWAY AND THE PROPOSED DRAINAGE STRUCTURES AFTER RECONSTRUCTION OF THE CULVERT.
2. THE EXISTING UNDERGROUND UTILITIES ARE ALSO BEING RELOCATED AS PART OF THE WORK. REFER TO THE UTILITY PLAN AND DETAILS FOR SPECIFIC LOCATIONS.
3. THE PRECAST CONCRETE CULVERTS ARE SHOWN FOR REFERENCE, FOR INSTALLATION ELEVATIONS AND STRUCTURAL COMPONENTS REFER TO THE STRUCTURAL PLAN AND DETAILS.

75% DESIGN NOT FOR CONSTRUCTION

DATE:12-30-2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO:0919				
FILE: SITE.DWG				
	NO.	REVISION	APP'D	DATE

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

PROPOSED PROFILE PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-5

DESCRIPTION

The project involves the replacement of the failing arch culvert and adjacent seawalls along maplewood avenue where it crosses north mill pond. The work includes the replacement of the existing arch culvert with a three barrel arch culvert (one–28 ft wide and; two–20 ft wide) with significantly higher flow capacity as well as the disassembly and reconstruction of the adjacent seawalls.

PROJECT NAME AND LOCATION

Maplewood Avenue Improvements Portsmouth, NH

LATITUDE N43°04'46"
LONGITUDE W70°45'55"

NAME OF RECEIVING WATERS

Piscataqua River

SOIL CHARACTERISTICS

Urban developed condition

DISTURBED AREA

±37,500 square feet

SEQUENCE OF MAJOR ACTIVITIES

1. Place all temporary erosion and sediment control BMP's
2. Clear and grub the wooded areas within the project limits
3. Selective demolition for sewer line installation
4. Installation of sewer line and appurtances
5. Selective demolition for drainage, utility and culvert replacement
6. Selective demolition and salvage of granite blocks for reuse
7. Rough grade for roadway, drainage, utility and culvert installation including slopes, footings, grade beams and walls
8. Install precast concrete culverts complete
9. Install granite walls
10. Install drainage systems complete including the stormwater treatment units
11. Install underground utilities along the proposed road
12. Finish grade and install base course gravels
13. Install sidewalks, guardrails, signage and site lighting
14. When all site work is complete and all disturbed areas are stabilized remove all temporary erosion control measures

DEFINITIONS

An area shall be considered stable of one of the following has occurred.
1. Base course gravels have been installed in areas to be paved
2. A minimum of 85% vegetated growth has been established
3. A minimum of 3" of non–erosive material such as stone or rip–rap has been installed; or
4. Erosion control blankets have been properly installed

INSTALLATION, MAINTENANCE AND INSPECTION PROCEDURES OF EROSION AND SEDIMENT CONTROLS

A. GENERAL

These are the general inspection and maintenance practices that will be used to implement the plan.

- o All ditches and swales shall be stabilized prior to directing runoff to them.
- o The smallest practical portion of the site will be denuded at one time.
- o All control measures will be inspected at least once each week and following any storm event of 1/2 inch or greater.
- o All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
- o Built up sediment will be removed from silt fence or check dams when it has reached one third the height of the fence or dam.
- o All diversion dikes will be inspected and any breaches promptly repaired.
- o Temporary seeding and planting will be inspected for bare spots, washouts, and unhealthy growth.
- o A maintenance inspection report will be made after each inspection.
- o A representative of the owner, will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance report.
- o All areas shall be stabilized within 72 hours of achieving finish grade

B. FILTERS

1. Silt Fence

a. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the following requirements:

Physical Property	Test	Requirements
Filtering Efficiency	VTM–51	75% minimum
Tensile Strength at 20% Maximum Elongation* Standard Strength 30 lb/lin in (min)	VTM–52	Extra Strength 50 lb/lin in (min)
Flow Rate	VTM–51	0.3 gal/sf/min (min)

* Requirements reduced by 50 percent after six (6) months of installation.

Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six (6) months of expected usable construction life at a temperature range of 0 degrees F to 120 Degrees F.

b. The height of a silt fence shall not exceed thirty–six (36) inches.

c. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be spliced together only at support post, with a minimum six (6) inch overlap, and securely sealed.

d. Posts shall be spaced a maximum of ten (10) feet apart at the barrier location and driven securely into the ground (minimum of 16 inches). When extra strength fabric is used without the wire support fence, post spacing shall not exceed 6 feet.

e. Posts for silt fences shall be 2–inch diameter wood with a minimum length of 5 feet.

f. Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

g. A trench shall be excavated approximately four (4) inches wide and four (4) inches deep along the line of posts and upslope from the barrier.

h. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least one (1) inch long, tie wires or hog rings. The wire shall extend no more than 36 inches above the original ground surfaces.

i. The "standard strength" filter fabric shall be stapled or wired to the fence, and eight (8) inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.

j. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of item (i) applying.

k. The trench shall be backfilled and the soil compacted over the filter fabric.

l. Silt fences shall be removed when they have served their useful purpose, but not before the upslope areas has been permanently stabilized.

2. Sequence of Installation

Sediment barriers shall be installed prior to any soil disturbance of the contributing drainage area above them.

3. Maintenance

a. Check dams and silt fence barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. They shall be repaired if there are any signs of erosion or sedimentation below them. Any required repairs shall be made immediately. If there are signs of undercutting at the center or the edges, or impounding of large volumes of water behind them, sediment barriers shall be replaced with a temporary check dam.

b. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier still is necessary, the fabric shall be replaced promptly.

c. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one third (1/3) the height of the barrier.

d. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

C. MULCHING

1. Timing

In order for mulch to be effective, it must be in place prior to major storm events. There are two (2) types of standards which shall be used to assure this.

a. Apply mulch prior to any storm event. It will be necessary to closely monitor weather predictions, usually by contacting the National Weather Service in Concord, to have adequate warning of significant storms.

b. Required Mulching within a specified time period. The time period can range from 14 to 21 days of inactivity on a area, the length of time varying with site conditions. Professional judgement shall be used to evaluate the interaction of site conditions (soil erodibility, season of year, extent of disturbance, proximity to sensitive resources, etc.) and the potential impact of erosion on adjacent areas to choose an appropriate time restriction.

2. Application Rate

Mulch shall be applied at a rate of between 1.5 to 2 tons per acre, or 90 to 100 pounds per 1000 square feet.

3. Guidelines for Winter Mulch Application. When mulch is applied to provide protection over winter (past the growing season) it shall be at a rate of 6,000 pounds of hay or straw per acre. A tackifier may be added to the mulch.

4. Maintenance All mulches must be inspected periodically, in particular after rainstorms, to check for rill erosion. If less than 90% of the soil surface is covered by mulch, additional mulch shall be immediately applied.

5. Excelsior Matting Excelsior Matting shall be used in place of mulch on all slopes steeper than 3:1.

D. TEMPORARY GRASS COVER

1. Seedbed Preparation

Apply fertilizer at the rate of 600 pounds per acre of 10–10–10. Apply limestone (equivalent to 50 percent calcium plus magnesium oxide) at a rate of three (3) tons per acre.

2. Seeding

a. Utilize annual rye grass at a rate of 40 lbs/acre.

b. Where the soil has been compacted by construction operations, loosen soil to a depth of two (2) inches before applying fertilizer, lime and seed.

c. Apply seed uniformly by hand, cyclone seeder, or hydroseeder (slurry including seed and fertilizer). Hydroseedings, which include mulch, may be left on soil surface. Seeding rates must be increased 10% when hydroseeding.

3. Maintenance

Temporary seedings shall be periodically inspected. At a minimum, 95% of the soil surface should be covered by vegetation. If any evidence of erosion or sedimentation is apparent, repairs shall be made and other temporary measures used in the interim (mulch, filter barriers, check dams, etc.).

E. PERMANENT SEEDING

1. Bedding – stones larger than 1 ½ ", trash, roots, and other debris interfere with seeding and future maintenance of the area should be removed. Where feasible, the soil should be tilled to a depth of 4" to prepare a seedbed and mix fertilizer into the soil.

2. Fertilizer – lime and fertilizer should be applied evenly over the area prior to or at the time of seeding and incorporated into the soil. Kinds and amounts of lime and fertilizer should be based on an evaluation of soil tests. When a soil test is not available, the following minimum amounts should be applied:

Agricultural Limestone @ 100 lbs. per 1,000 s.f.
10–20–20 fertilizer @ 12 lbs. per 1,000 s.f.

3. Seed Mixture (recommended)

Rate:

Type	LBS. per Acre	LBS. per 1,000 s.f.
Tall Fescue	20	0.45
Creeping Red Fescue	20	0.45
Birdsfoot Trefoil	8	0.20
Total	48	1.10

4. Sodding – sodding is done where it is desirable to rapidly establish cover on a disturbed area. Sodding an area may be substituted for permanent seeding procedures anywhere on site. Bed preparation, fertilizing, and placement of sod shall be performed according to the S.C.S. Handbook.

Sodding is recommended for steep sloped areas, areas immediately adjacent to sensitive water courses, easily erodible soils (fine sand/silt) etc.

5. Provide a minimum of 4 inches (5 inches loose) of topsoil to all areas to be seeded.

F. STORM DRAIN INLET PROTECTION

1. Straw/Hay Bale Inlet Structure

a. Bales shall be either wire bound or string tied with the bindings oriented around the sides rather than over and under the bales.

b. Bales shall be placed lengthwise in a single row surrounding the inlet, with the ends of adjacent bales pressed together.

c. The filter barrier shall be entrenched and backfilled. A trench shall be excavated around the inlet the width of bale to a minimum depth of four (4) inches. After the bales are staked, the excavated soil shall be backfilled and compacted against the filter barrier.

d. Each bale shall be securely anchored and held in place by at least two (2) stakes or rebars driven through the bale.

e. Loose straw/hay shall be wedged between bales to prevent water from entering between bales.

f. All structures should be inspected after every rainstorm and repairs made as necessary.

g. Sediment should be removed from the devices after the sediment has reached a maximum of one–third the depth of the trap.

h. Haybales should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

TIMING OF CONTROLS/MEASURES

As indicated in the sequence of Major Activities the silt fences shall be installed prior to commencing any clearing or grading of the site. Structural controls shall be installed concurrently with the applicable activity. Areas where construction activity temporarily ceases for more than twenty one (21) days will be stabilized with a temporary seed and mulch within fourteen (14) days of the last disturbance. Once construction activity ceases permanently in an area, silt fences and any earth/dikes will be removed once permanent measures are established. All areas shall be stabilized within 72 hours of achieving finish grade.

WASTE DISPOSAL

A. WASTE MATERIALS

All waste materials will be collected and stored in securely lidded receptacles. All trash and construction debris from the site will be deposited in a dumpster. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedure for waste disposal by the superintendent.

B. HAZARDOUS WASTE

All hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Site personnel will be instructed in these practices by the superintendent.

C. SANITARY WASTE

All sanitary waste will be collected from the portable units a minimum of once per week by a licensed sanitary waste management contractor.

SPILL PREVENTION

A. MATERIAL MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances during construction to stormwater runoff:

Good Housekeeping:

The following good housekeeping practices will be followed on site during the construction project:

- o Adequate effort will be made to store only sufficient amounts of products to do the job.
- o All materials stored on site will be stored in a neat, orderly manner in their proper (original if possible) containers and, if possible, under a roof or other enclosure.
- o Manufacturer's recommendations for proper use and disposal will be followed.
- o The site superintendent will inspect daily to ensure proper use and disposal of materials.
- o Substances will not be mixed with one another unless recommended by the manufacturer.
- o Whenever possible all of a product will be used up before disposing of the container.

Hazardous Products:

The following practices will be used to reduce the risks associated with hazardous materials:

- o Products will be kept in their original containers unless they are not resealable.
- o Original labels and material safety data will be retained for important product information.
- o Surplus product that must be disposed of will be discarded according to the manufacturer's recommended methods of disposal.

B. PRODUCT SPECIFICATION PRACTICES

The following product specific practices will be followed on site:

Petroleum Products:

All on site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt based substances used on site will be applied according to the manufacturer's recommendations.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts directed by the specifications. Once applied fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered shed or enclosed trailers. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be disposed of properly according to manufacturer's instructions or state and local regulations.

Concrete Trucks:

Concrete trucks will discharge and wash out surplus concrete or drum wash water in a contained area on site.

C. SPILL CONTROL PRACTICES

In addition to good housekeeping and material management practices discussed in the previous section the following practices will be followed for spill prevention and cleanup:

- o Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- o Materials and equipment necessary for spill cleanup will be kept in the material storage area on site. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust and plastic or metal trash containers specifically for this purpose.
- o All spills will be cleaned up immediately after discovery.
- o The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- o Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size.
- o The spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring and how to cleanup the spill if it recurs. A description of the spill, its cause, and the cleanup measures will be included.
- o The site superintendent responsible for day–to–day site operations will be the spill prevention and cleanup coordinator.

MAINTENANCE OF STORMWATER MANAGEMENT FACILITIES

The project proponent is responsible for the maintenance of roadway and of all stormwater facilities until such time as the Town accepts the work.

CATCH BASINS & STORMWATER TREATMENT STRUCTURES

1. Catch basins & Stormwater treatment structures should be inspected on a monthly basis and/or after a major rainfall event to assure that debris or sediments do not reduce the effectiveness of the system.

WINTER CONSTRUCTION NOTES

1. All proposed post–development vegetated areas which do not exhibit a minimum of 85 % vegetative growth by October 15th, or which are disturbed after October 15th, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The placement of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt.
2. All slopes which do not exhibit a minimum of 85% vegetative growth by October 15th, or which are disturbed after October 15th shall be stabilized with stone or erosion control blankets.
3. After October 15th, incomplete road surfaces shall be protected with a minimum of 3–inches of crushed gravel per NHDOT Item 403.3, or if construction is to continue through the winter season be cleared of any accumulated snow after each storm event.

75% DESIGN NOT FOR CONSTRUCTION

	NO.	REVISION	APP'D	DATE
DATE:12–30–2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO:0919				
FILE: DETAILS.DWG				

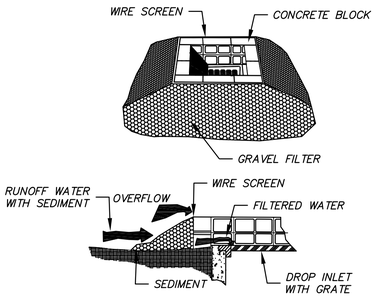
MAPLEWOOD AVE CULVERT REPLACEMENT & NORTH MILL POND RESTORATION PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

EROSION CONTROL PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

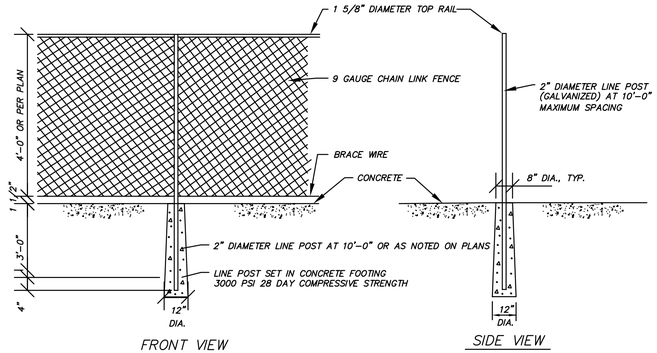
C–6



NORMAL USE AROUND CATCH BASINS

TEMPORARY EROSION CONTROL

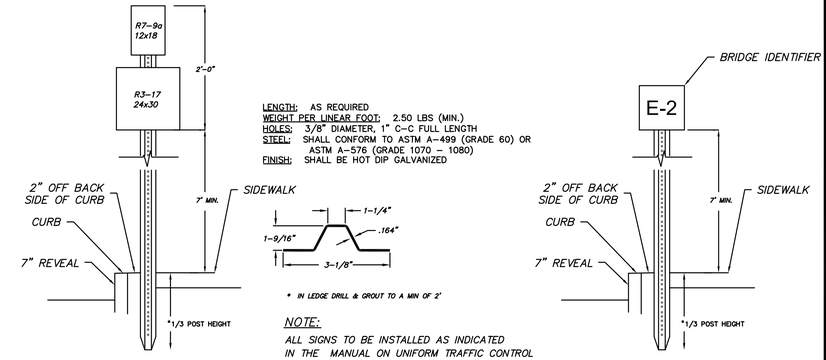
NOT TO SCALE



FRONT VIEW SIDE VIEW

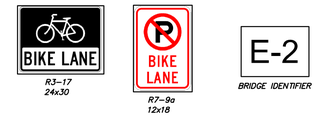
CHAIN LINK FENCE DETAIL

NOT TO SCALE



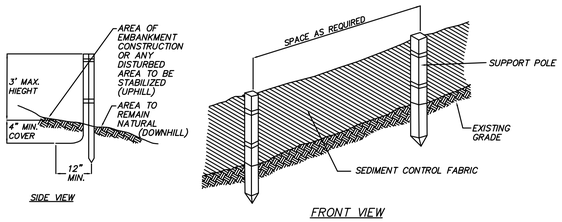
LENGTH: AS REQUIRED
WEIGHT PER LINEAR FOOT: 2.50 LBS (MIN.)
HOLES: 3/8" DIAMETER, 1" C-C FULL LENGTH
STEEL: SHALL CONFORM TO ASTM A-499 (GRADE 60) OR ASTM A-576 (GRADE 1070 - 1080)
FINISH: SHALL BE HOT DIP GALVANIZED

NOTE:
ALL SIGNS TO BE INSTALLED AS INDICATED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.



SIGN LEGEND & SIGN POST

NOT TO SCALE



SILT FENCE CONSTRUCTION SPECIFICATION

1. THE GEOTEXTILE FABRIC SHALL MEET THE DESIGN CRITERIA FOR SILT FENCES.
2. THE FABRIC SHALL BE EMBEDDED A MINIMUM OF 8" IN THE GROUND AND THE SOIL COMPACTED OVER THE EMBEDDED FABRIC.
3. WOVEN WIRE FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES OR STAPLES.
4. FILTER CLOTH SHALL BE FASTENED SECURELY TO THE WOVEN WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP, MID SECTION, & BOTTOM.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6", FOLDED, AND STAPLED.
6. FENCE POSTS SHALL BE A MINIMUM OF 36" LONG AND DRIVEN A MINIMUM OF 16" INTO THE GROUND. WOOD POSTS SHALL BE OF SOUND QUALITY HARDWOOD AND SHALL HAVE A MINIMUM CROSS SECTIONAL AREA OF 3 SQUARE INCHES.
7. MAINTENANCE SHALL BE PERFORMED AS NEEDED TO PREVENT BULGES IN THE SILT FENCE DUE TO DEPOSITION OF SEDIMENT.

MAINTENANCE

1. SILT FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REPAIRS THAT ARE REQUIRED SHALL BE MADE IMMEDIATELY.
2. IF THE FABRIC ON A SILT FENCE SHOULD DECOMPOSE OR BECOME INEFFECTIVE DURING THE EXPECTED LIFE OF THE FENCE, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SEDIMENT DEPOSITS SHOULD BE INSPECTED AFTER EVERY STORM EVENT. THE DEPOSITS SHOULD BE REMOVED WHEN THEY REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER.
4. SEDIMENT DEPOSITS THAT ARE REMOVED OR LEFT IN PLACE AFTER THE FABRIC HAS BEEN REMOVED SHALL BE GRADED TO CONFORM WITH THE EXISTING TOPOGRAPHY AND VEGETATED.

SEE PAGE 7-162 & 7-163 OF NHDES STORMWATER MANAGEMENT FOR FURTHER INSTALLATION INSTRUCTIONS

SILT FENCE

NOT TO SCALE

75% DESIGN NOT FOR CONSTRUCTION

DATE:12-30-2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO: 0919				
FILE: DETAIL.DWG				
	NO.	REVISION	APP'D	DATE

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

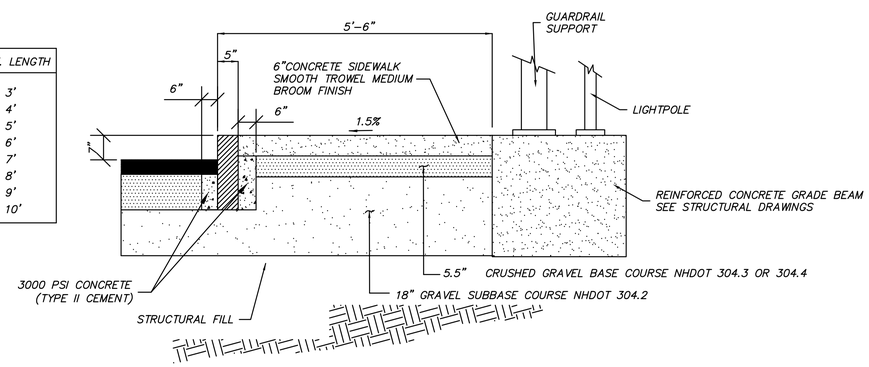
HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

GENERAL DETAIL SHEET

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-7

RADIUS	MAX. LENGTH
21'	3'
22'–28'	4'
29'–35'	5'
36'–42'	6'
43'–49'	7'
50'–56'	8'
57'–60'	9'
OVER 60'	10'

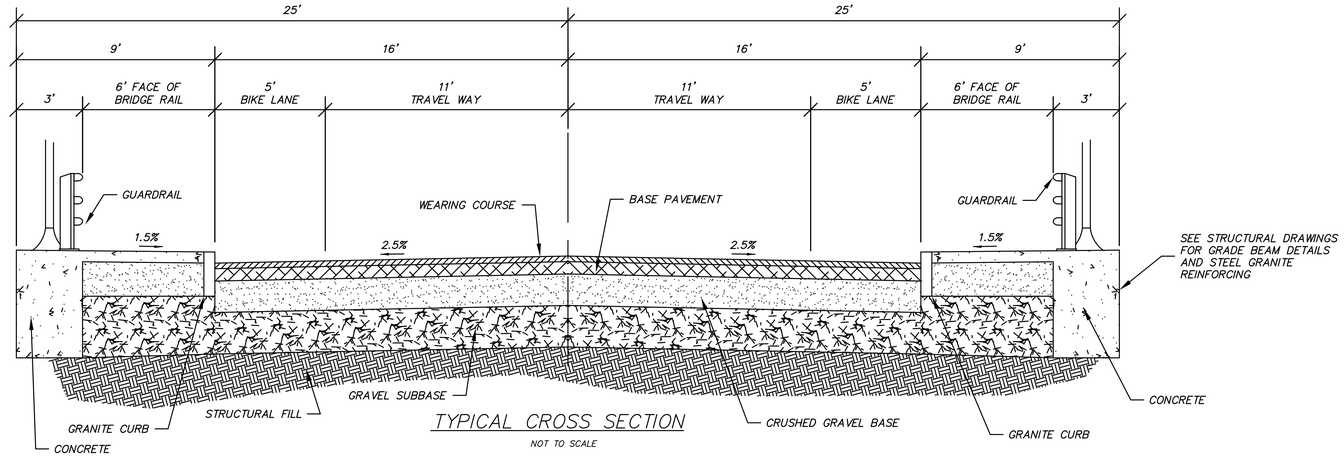


NOTES

1. SEE SITE PLAN FOR LIMITS OF CURBING.
2. ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATELY THE SAME LENGTH.
3. MINIMUM LENGTH OF CURB STONES = 3'
4. MAXIMUM LENGTH OF CURB STONES = 10'
5. MAXIMUM LENGTH OF STRAIGHT CURB STONES LAID ON CURVES (SEE CHART)
6. ALL RADII 20 FEET AND SMALLER TO BE CONSTRUCTED USING CURVED SECTIONS.

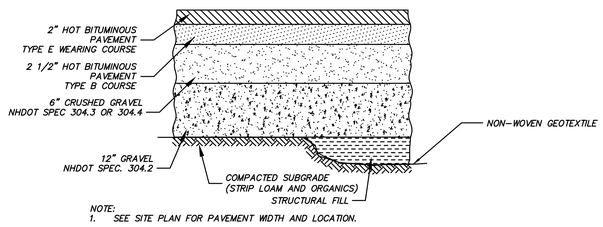
PORTLAND CEMENT CONCRETE SIDEWALK WITH VERTICAL GRANITE CURB

NOT TO SCALE



TYPICAL CROSS SECTION

NOT TO SCALE

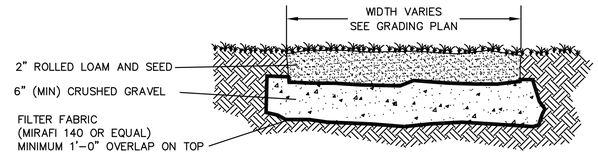


NOTE:

1. SEE SITE PLAN FOR PAVEMENT WIDTH AND LOCATION.
2. SEE GRADING, DRAINAGE AND EROSION CONTROL PLAN FOR PAVEMENT SLOPE AND CROSS-SLOPE.
3. NON WOVEN GEOTEXTILE TO BE PLACED AT THE INTERFACE BETWEEN IN-SITU SOILS AND MATERIALS PLACED.

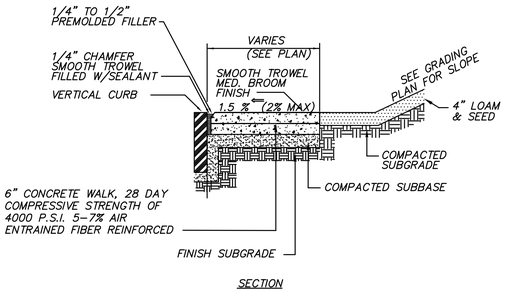
TYPICAL PAVEMENT SECTION

NOT TO SCALE

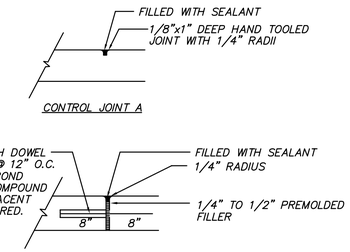


EARTH REINFORCED ACCESS DRIVE DETAIL

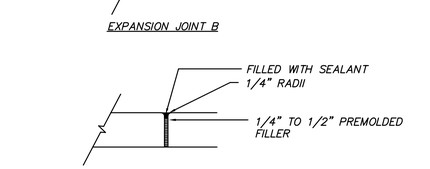
NOT TO SCALE



SECTION

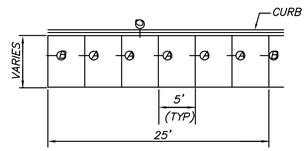


CONTROL JOINT A



EXPANSION JOINT B

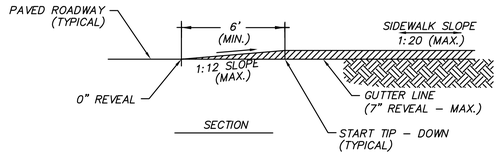
ISOLATION JOINT C



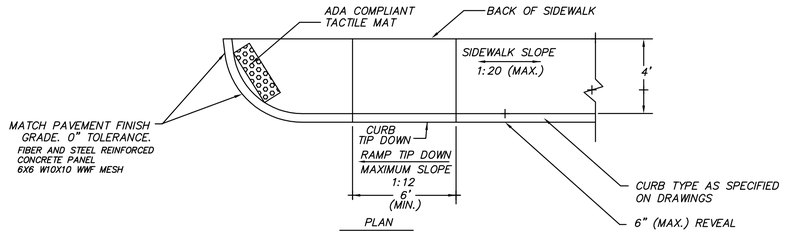
PLAN

CONCRETE SIDEWALK

NOT TO SCALE



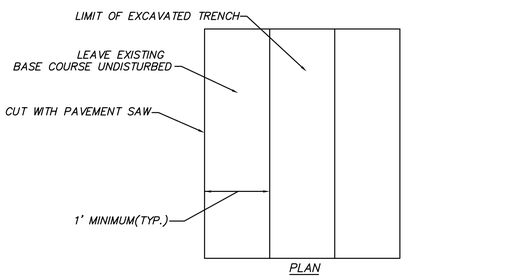
SECTION



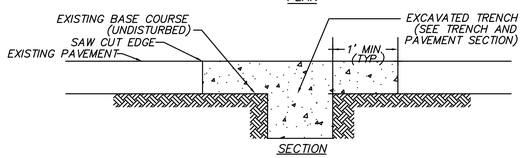
PLAN

SIDEWALK TIP DOWN RAMP

NOT TO SCALE



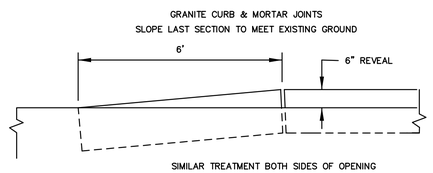
PLAN



SECTION

TRENCH PATCH

NOT TO SCALE



SIMILAR TREATMENT BOTH SIDES OF OPENING

"TIP-DOWN" CURB DETAIL

NOT TO SCALE

75% DESIGN NOT FOR CONSTRUCTION

	NO.	REVISION	APP'D	DATE
DATE:12–30–2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO: 0919				
FILE: DETAIL.DWG				

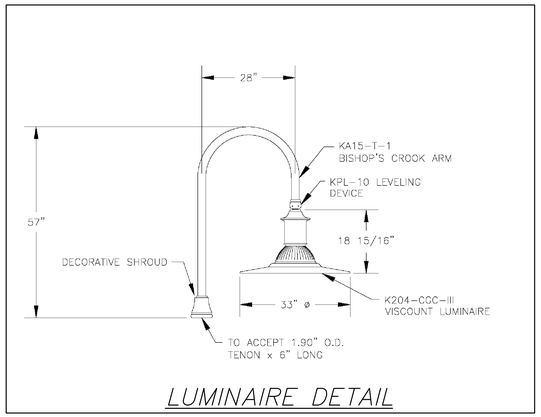
MAPLEWOOD AVE CULVERT REPLACEMENT & NORTH MILL POND RESTORATION PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

GENERAL DETAIL SHEET

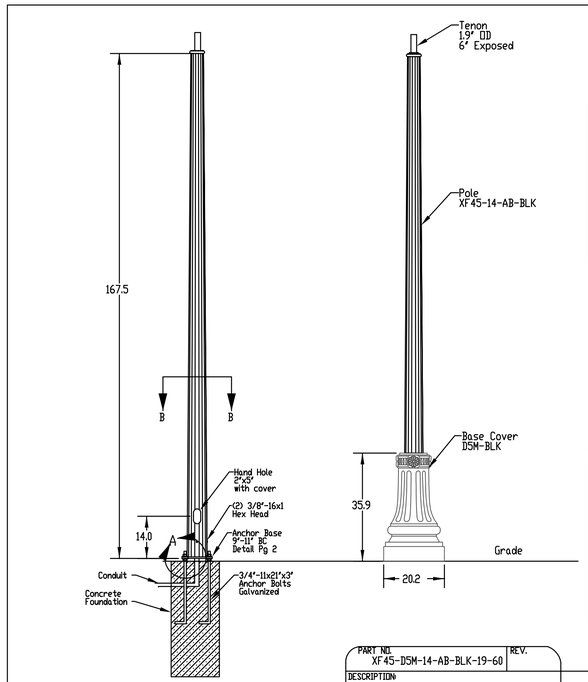
CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

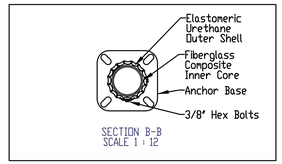
C–8



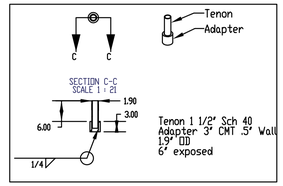
LUMINAIRE DETAIL

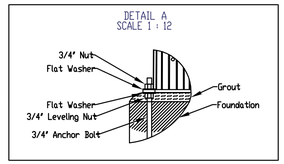
NOT TO SCALE





SECTION B-B
SCALE 1 : 12





Note: Top Dia: 4.5"
Taper: .2"/ft
Construction: Wound Fiberglass composit inner core Elastomeric urethane outer shell Wall .28" min
Anchor Base: Plate 9"-11" BC 1/2" HRS Tube 6" OD CMT
Tenon: 1.9" OD .145" wall CMT
Paint: UV and Cleaning chemical resistant
Color: Black
Weight: 82 lbs
E.P.A. @ 90 mph 11.8
Base Cover: DSM
Construction: Elastomeric Urethane
Color: Black

3550 Odessa Way, Suite A
Aurora, CO 80011
phone: (877) 959-7678
Fax: (303) 286-7272
web: www.whatley.com

REV	DESCRIPTION	DATE

Actual foundation construction may vary according to soil conditions, wind loading and local building codes.

PART NO:	XF45-D5M-14-AB-BLK-19-60
REV:	
DESCRIPTION:	Pole Assembly
Date:	12-21-09
SIZE:	B
DRAWING #	
MATERIAL:	

DOCUMENTATION	INITIAL	DATE
DRAWN	JTC	12/21/9
QUOTE REQUEST		
TOOLING REQUEST		
FIRST ARTICLE REQUEST		
FIRST ARTICLE INSPECTION		
PRODUCTION RELEASE		

UNLESS OTHERWISE NOTED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
DECIMAL .XX ± .03
DECIMAL .XXX ± .010
ANGLE ± 1/2

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF WHATLEY, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF WHATLEY, INC. IS PROHIBITED.
DO NOT SCALE DRAWING

NOTE: SEE STRUCTURAL DRAWINGS FOR POLE FOUNDATION DETAILS

75% DESIGN NOT FOR CONSTRUCTION

DATE:12-30-2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO: 0919				
FILE: DETAIL.DWG				
	NO.	REVISION	APP'D	DATE

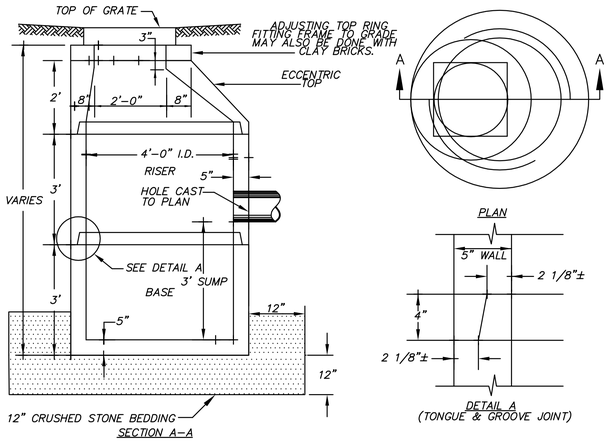
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

GENERAL DETAIL SHEET

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-9

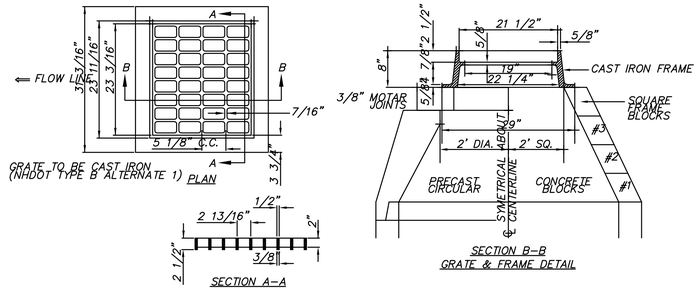


NOTES:

1. ALL SECTIONS SHALL BE CONCRETE CLASS AA(4000 psi).
2. CIRCUMFERENTIAL REINFORCEMENT SHALL BE 0.12 SQ.IN. PER LINEAR FT. IN ALL SECTIONS AND SHALL BE PLACED IN THE CENTER THIRD OF THE WALL.
3. THE TONGUE OR GROOVE OF THE JOINT SHALL CONTAIN ONE LINE OF CIRCUMFERENTTIAL REINFORCEMENT EQUAL TO 0.12 SQ. IN. PER LINEAR FT.
4. RISERS OF 1', 2', 3' & 4' CAN BE USED TO REACH DESIRED DEPTH.
5. THE STRUCTURES SHALL BE DESIGNED FOR H20 LOADING.

CATCHBASIN

NOT TO SCALE



CATCHBASIN FRAME & GRATE

NOT TO SCALE

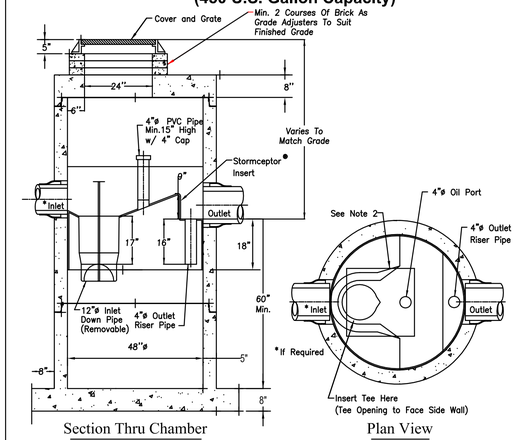
SPECIFICATIONS

1. All construction shall conform with the State of New Hampshire Department of Transportation (NHDOT), "Standard Specifications for Road and Bridge Construction"; hereinafter referred to as the "Standard Specifications".
2. Catch basins and manholes shall be pre-cast reinforced concrete designed by an engineer registered in New Hampshire, and able to withstand loadings of 8 tons (H20 Loading).
3. Manholes shall have cast iron frames and covers with 30" inside diameter openings. A 3-inch (minimum) letter "D" for drain shall be plainly cast into the center of each cover.
4. Catch basins and manholes shall be adjusted to grade with courses of brick. Maximum adjustment to grade shall be 12 inches. Frames shall be set on a full bed of mortar, true to grade and concentric with the masonry. All voids between the top of the structure and the bottom flange of the frame shall be completely filled to make a watertight fit. A ring of mortar at least one inch thick and pitched to shed water away from the frame, shall be placed over and around the outside of the bottom flange. The mortar shall extend to the outer edge of the masonry all around its circumference and shall be finished smooth. No visible leakage will be permitted.
5. Invert channels of sewer manholes shall be formed smoothly to the largest pipe radius. Changes in grade shall be formed smoothly and evenly. The floor of the structure outside the channels shall be sloped towards the channels at approximately 1/2 inch per foot. The floor at the channel shall match the crown of the largest pipe.
6. Trench construction will conform with Section 603.3.1 of the Standard Specifications (1974).
7. Wood sheeting or a suitable trench box shall be used to support the trench as necessary. If wood sheeting is used, it shall be driven at a distance of 1 foot from the outside diameter of the pipe to a depth 6 inches below the invert of the pipe. Wood sheeting shall be cut off and left in place to an elevation not less than 1 foot above the top of the pipe, but not greater than 3 feet below the finished grade.
8. Bedding shall conform with Section 603.3.2 of the Standard Specifications (1974).
9. Backfill material will conform with Section 603.3.5 of the Standard Specifications (1974) and, in addition, shall exclude debris, pieces of pavement, organic matter, top soil, all wet or soft muck, peat or clay, all excavated ledge material, frozen material, all rocks over 6 inches in largest dimension, or any material which, as determined by the Engineer, will not provide sufficient support or maintain the completed construction in a stable condition. Backfill shall not be placed on frozen or previously frozen material.
10. All backfill and bedding compaction shall meet the requirements of AASHTO 99 Method C. Density shall be 95 percent. Compaction shall be 6 inch lifts for bedding and backfill to a plane 1 foot above the pipe and in 12 inch lifts thereafter by an approved mechanical compactor.
11. Should frozen material be encountered, it shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed as required before new backfill is placed.
12. The Contractor shall be responsible for any damage to frames and grates during and from the time of removal from the existing structure to and during the time of resetting, and shall replace in kind any damaged frames or grates at no additional compensation.
13. All trenches will be covered and debris, including any rejected materials, shall be removed daily. Strict safety precautions shall be maintained at all times.
14. Location of utilities shown on the plans are approximate.
    a) the Contractor shall, 48 hours prior to construction, notify the utility companies and have all utilities in the vicinity of the construction marked in the field.
    b) after the utilities have been located and prior to construction, the Contractor with the Engineer, shall layout the proposed drainage system in the field and rectify any utility conflicts which may be found.
    c) Any conflicts with utilities found during construction by the Contractor shall be immediately brought to the attention of the Engineer and the Utility Company and properly rectified.
    d) The Contractor is responsible for the cost of repair for any utilities damaged during construction. The Contractor shall contact the Utility Company to repair any damages, however, the Contractor may make appropriate repairs with the Utility Company's permission.
15. Complete shop drawings for pipe, manholes, catch basins, frames, grates and covers shall be submitted in triplicate for approval by the Engineer prior to the start of construction. Each shop drawing shall be checked and initialized by the Contractor to indicate approval before it is submitted to the Engineer.
16. Shop drawings for flat concrete covers shall be stamped prior to submission for approval by a New Hampshire Registered Professional Engineer.
17. Brick masonry for setting frames and brick and mortar plugs shall conform to the Standard Specification Section 604.2.4.

Rinker MATERIALS

Concrete Pipe Division

STC 450i Precast Concrete Stormceptor®
(450 U.S. Gallon Capacity)



Notes:

1. The Use Of Flexible Connection is Recommended at The Inlet and Outlet Where Applicable.
2. The Cover Should be Positioned Over The Inlet Drop Pipe and The Oil Port.
3. The Stormceptor System is protected by one or more of the following U.S. Patents: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, #6371690.
4. Contact a Concrete Pipe Division representative for further details not listed on this drawing.

Maintenance:

1. The Stormceptor System shall be inspected every six months for sediment and oil accumulation.
2. The Stormceptor System shall be cleaned annually (each spring) and when sediment accumulation reaches 15% of total storage volume.
3. The Stormceptor System shall be inspected following a spill event and all oil captured shall be removed immediately.
4. Refer to the Stormceptor System Owner's Manual for procedures, schedules, and maintenance requirements.

Rinker 027

STORMCEPTOR DETAIL

NOT TO SCALE

CATCHBASIN'S "C" & "E"

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

HAIGHT ENGINEERING, PLLC
CIVIL ENGINEERS
P.O. BOX 1166, 181 WATSON ROAD
DOVER, NEW HAMPSHIRE
603.750.4266. FAX 603.749.7348

DATE:12-30-2009				
SCALE: AS NOTED				
DRAWN BY: SRD				
DESIGN BY: SRD				
APPROVED BY:SJH				
PROJECT NO:0915				
FILE: DETAILS.DWG				
	NO.	REVISION	APP'D	DATE

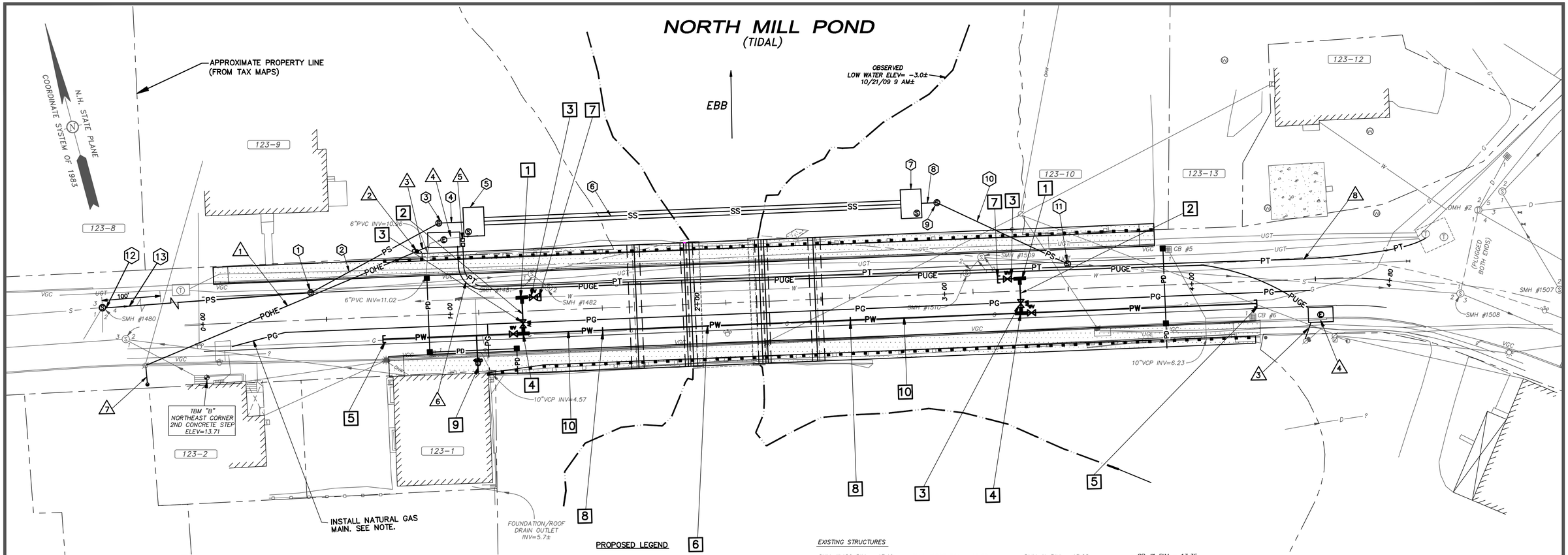
GENERAL DETAIL SHEET

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

C-10

75% DESIGN NOT FOR CONSTRUCTION

NORTH MILL POND
(TIDAL)



PROPOSED WATER STRUCTURES

1. INSTALL 8" x 8" TEE
2. INSTALL 8" D.I. CLASS 52 WATER LINE
3. INSTALL 8" GATE VALVE
4. INSTALL 8" x 16" TEE
5. MECHANICAL JOINT END CAP
6. INSTALL 16" D.I. CLASS 350 WATER LINE IN SLEEVE. SEE DETAIL. SEE PROFILE FOR ADDITIONAL INFORMATION.
7. INSTALL MECHANICAL JOINT END CAP UPON ACTIVATING 16" WATER MAIN.
8. LIMITS OF SLEEVE
9. INSTALL NEW 3/4" WATER SERVICE WITH CORPORATION & NEW CURB STOP
10. INSTALL 16" D.I. CLASS 350 WATER LINE

SEE SHEET U-4 FOR UTILITY CONSTRUCTION NOTES.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

PROPOSED SANITARY SEWER STRUCTURES

1. SMH P1
STA 0+44, 11.0' LT (CENTER STATION)
RIM=12.1 (VIF – MATCH TO FG)
INV. IN=4.72
INV. OUT=4.67

2. 24" PVC, SDR 35, S=0.0008

3. SMH P2
STA 0+97, 37.0' LT
RIM=11.9
INV. IN=4.63
INV. OUT=4.58

4. 24" PVC, SDR 35, S=0.0008

5. SEWER SIPHON INLET STRUCTURE
STA 1+07 – 1+17, 37.0' LT
RIM=11.7
SEE DETAIL.

6. TRIPLE BARREL INVERTED SIPHON
SEE DETAIL.

7. SEWER SIPHON OUTLET STRUCTURE
STA 2+82 – 2+92, 37.0' LT
RIM=10.0
SEE DETAIL.

8. 24" PVC, SDR 35, S=0.0008

9. SMH P3
STA 2+98, 37.0' LT
RIM=10.5
INV. IN=3.59
INV. OUT=3.54

10. 24" PVC, SDR 35, S=0.0008

11. SMH P4
STA 3+50, 10.2' LT
RIM=11.9 (VIF – MATCH TO FG)
INV. IN=3.49
INV. OUT=3.44 (VIF – MATCH EXISTING)

12. REPLACE EXISTING SMH #1480
STA. –1+16.8, 5.5' LT
MATCH TO EXISTING INVERTS IN CONSTRUCT
NEW INVERT OUT=4.85

13. 24" PVC, SDR 35, S=0.0008

PROPOSED ELECTRIC STRUCTURES –
PRELIMINARY DESIGN CONCEPT.
FINAL ELECTRIC UTILITY DESIGN BY PSNH

1. OVERHEAD ELECTRIC, CABLE & FIRE ALARM
2. UTILITY POLE
3. UNDERGROUND ELECTRIC, CABLE & FIRE ALARM CONDUIT BANK
4. ELECTRIC MANHOLE
5. CABLE & FIRE ALARM PULL BOXES
6. UNDERGROUND ELECTRIC, CABLE & FIRE ALARM CONDUIT BANK WITH SWEEP
7. SIDEWALK GUY WIRE
8. NEW UNDERGROUND TELE–COMMUNICATIONS CONDUITS

PROPOSED LEGEND

PS	PROPOSED SEWER LINE
SS	PROPOSED SEWER SIPHON
PW	PROPOSED WATER LINE
PG	PROPOSED GAS LINE
POHE	PROPOSED OVERHEAD ELECTRIC, CABLE & FIRE ALARM
PUGE	PROPOSED UNDERGROUND ELECTRIC, CABLE & FIRE ALARM
PT	PROPOSED UNDERGROUND TELE–COMMUNICATIONS CONDUIT

EXISTING STRUCTURES

SMH #1480 RIM = 13.19
(1) 6"PVC = 9.80
(2) 8"PVC = 5.25
(3) 24"RCP = 4.92
(4) 24"RCP = 4.76

SMH #2370 RIM = 12.72
(1) 6"VCP = 7.28
(2) 8"VCP = 7.38
(3) 8"VCP = 7.12

SMH #1481 RIM = 11.43
(1) 24"RCP = 4.04
(2) 21–24"ACP = 3.80

SMH #1482 RIM = 11.53
(1) 21–24"ACP = 3.75
(2) 21–24"RCP = 3.83

SMH #1507 RIM = 13.37
(1) 8"ACP = 5.20
(2) 6"ACP = 5.15

SMH #1508 RIM = 13.23
(1) 12"RCP = 4.53 (PLUGGED)
(2) 21"RCP = 3.29
(3) 21"RCP = 3.22

SMH #1509 RIM = 11.94
(1) 21"ACP = 3.48
(2) 21"RCP = 3.55

SMH #1510 RIM = 11.99
(1) 21"RCP = 3.47
(2) 22"ACP = 3.37

SMH #1512 RIM = 13.33
(1) 6"ACP = 5.13
(2) 6"ACP = 5.02

DMH #1 RIM = 13.28
(1) 12"RCP = 9.68
(2) 12"RCP = 9.69
(3) 12"RCP = 7.03
(4) 12"RCP = 7.03

DMH #2 RIM = 13.39
(1) 12"RCP = 5.64 (PLUGGED)
(2) 12"RCP = 10.92
(3) 12"RCP = 9.78
(4) 12"RCP = 5.69
(5) 12"RCP = 5.55

CB #1 RIM = 13.35
(1) 12"RCP = 11.07

CB #2 RIM = 12.61
(1) 12"RCP = 9.98

CB #3 RIM = 12.90
(1) 12"RCP = 10.04

CB #4 RIM = 12.98
(1) 12"RCP = 10.33

CB #5 RIM = 11.67
(1) 8"VCP = 6.72

CB #6 RIM = 11.71
(1) 10"VCP = 8.16

CB #7 RIM = 11.35
(1) 8"VCP = 7.17

EXISTING LEGEND:

- RETAINING / dry MORTARED WALL
- GUARD RAIL
- SEWER MANHOLE
- DRAIN MANHOLE
- CATCH BASIN
- TELEPHONE MANHOLE
- HYDRANT
- WATER GATE VALVE
- WATER SHUT OFF VALVE
- GAS METER
- GAS SHUT OFF VALVE
- UTILITY POLE
- LIGHT POLE
- UTILITY POLE W/TRANSFORMER
- GUY
- ELECTRIC METER
- ELECTRICAL BOX
- ELECTRICAL CONDUIT
- — S — SEWER LINE
- — W — WATER LINE
- — D — DRAIN LINE
- — G — GAS LINE
- —OHW— OVERHEAD WIRES
- —OHE— OVERHEAD ELECTRIC
- —OHT— OVERHEAD TELEPHONE
- —OHC— OVERHEAD CATV/DATA
- —UGE— UNDERGROUND ELECTRIC
- —UGT— UNDERGROUND TELEPHONE
- —UGC— UNDERGROUND CATV/DATA
- VGC VERTICAL FACED GRANITE CURB
- EOP EDGE OF PAVEMENT
- 123-1 TAX SHEET – LOT NUMBER
- DECIDUOUS TREE
- TREE/BRUSH LINE
- 15x4 SPOT GRADE

NEW HAMPSHIRE COASTAL PROGRAM

NHDES

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

75% DESIGN NOT FOR CONSTRUCTION

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

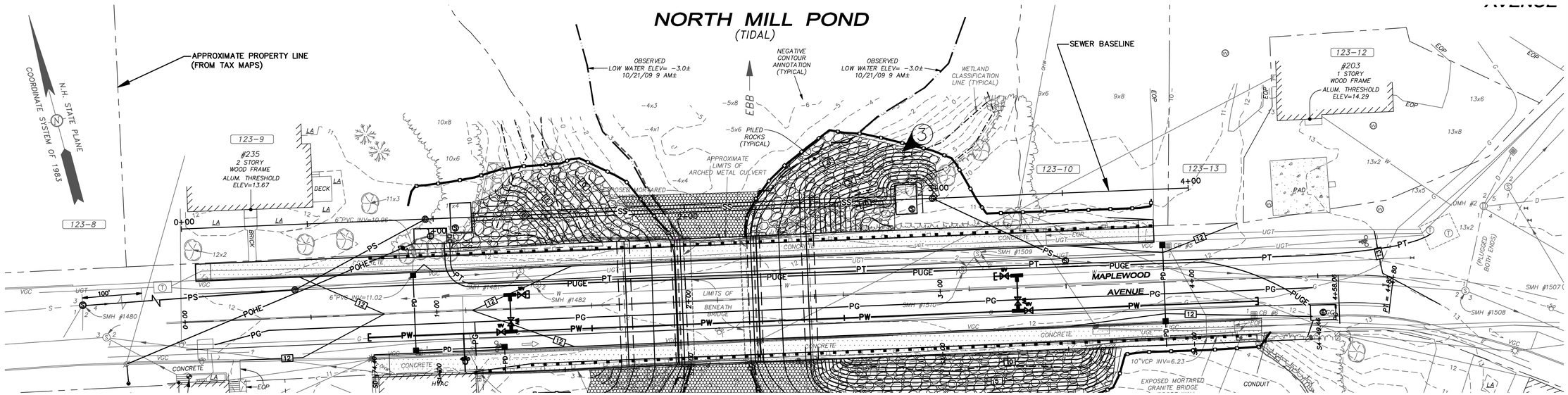
DATE: 12/30/2009				
SCALE: 1"=20'				
DRAWN BY: RLH				
DESIGN BY: EDW				
APPROVED BY: EDW				
PROJECT NO: 4217				
FILE: 4217.DWG				
	NO.	REVISION	APP'D	DATE

CITY OF PORTSMOUTH, N.H. INCORPORATED 1849

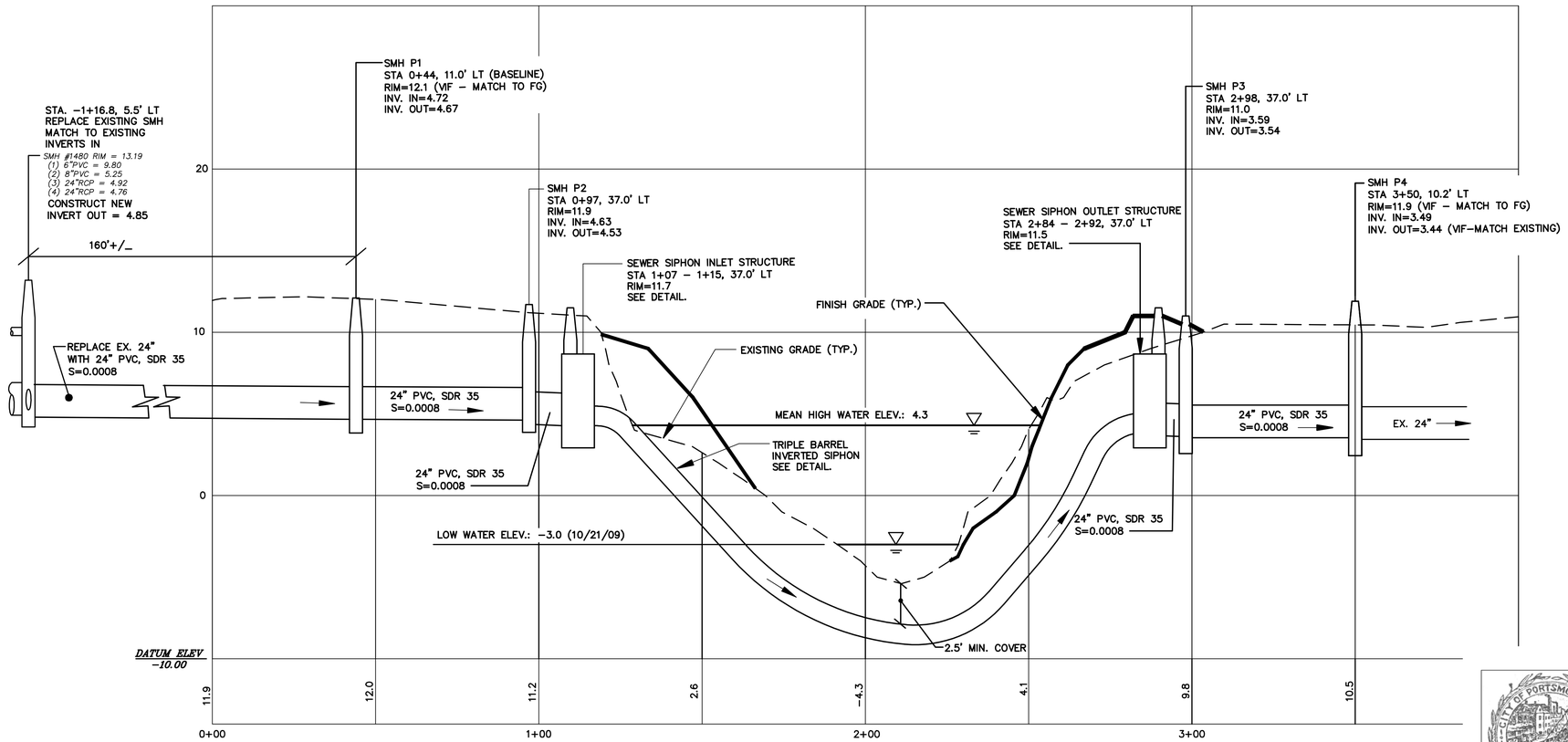
UTILITIES PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

U–1



PLAN: 1" = 20'



SEWER BASELINE (37' LEFT OF ROADWAY BASELINE)
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 4'

PROPOSED LEGEND

PS	PROPOSED SEWER LINE
SS	PROPOSED SEWER SIPHON
PW	PROPOSED WATER LINE
PG	PROPOSED GAS LINE
VIF	VERIFY IN FIELD

NEW HAMPSHIRE COASTAL PROGRAM

NHDES

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

DATE: 12/30/2009				
SCALE: 1"=20'				
DRAWN BY: RLH				
DESIGN BY: EDW				
APPROVED BY: EDW				
PROJECT NO: 4217				
FILE: 4217.DWG				
	NO.	REVISION	APP'D	DATE

75% DESIGN NOT FOR CONSTRUCTION

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

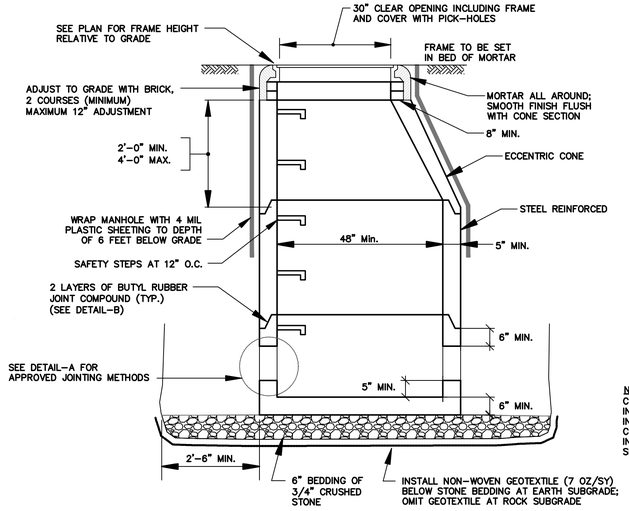
ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

CITY OF PORTSMOUTH, N.H. INCORPORATED 1849

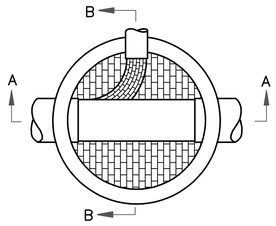
SEWER PLAN & PROFILE

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

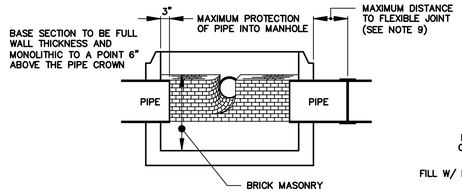
U-2



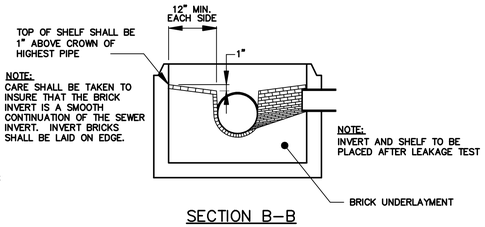
TYPICAL SECTION



PLAN



SECTION A-A



SECTION B-B

MANHOLE NOTES:

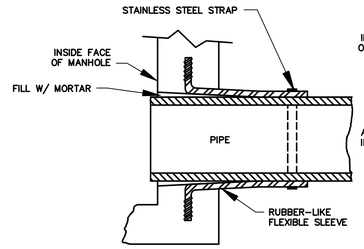
1. IT IS THE INTENTION OF THE NHDES THAT THE MANHOLE, INCLUDING ALL COMPONENT PARTS, HAVE ADEQUATE SPACE, STRENGTH AND LEAKPROOF QUALITIES CONSIDERED NECESSARY BY THE DEPARTMENT FOR THE INTENDED SERVICE. SPACE REQUIREMENTS AND CONFIGURATIONS, SHALL BE AS SHOWN ON THE DRAWING. MANHOLES MAY BE AN ASSEMBLY OF PRECAST SECTIONS, WITH OR WITHOUT STEEL REINFORCEMENT, WITH ADEQUATE JOINTING, OR CONCRETE CAST MONOLITHICALLY IN PLACE WITH OR WITHOUT REINFORCEMENT IN ANY APPROVED MANHOLE. THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND LOADS OF 8 TONS (H-20 LOADING) WITHOUT FAILURE AND PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MAN-HOLE CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE, A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.
2. BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED.
3. PRECAST CONCRETE BARREL SECTIONS, CONES AND BASES SHALL CONFORM TO ASTM C478.
4. LEAKAGE TEST SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS.
5. INVERTS AND SHELVES MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW AT CHANGES IN DIRECTION. THE INVERTS SHALL BE LAID OUT IN CURVES, OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO THE ELEVATION OF THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY.
6. FRAMES AND COVERS MANHOLE FRAMES AND COVERS SHALL BE OF HEAVY DUTY DESIGN AND PROVIDE A 30-INCH CLEAR OPENING. A 3-INCH (MINIMUM HEIGHT) LETTER "S" FOR SEWERS OR "D" FOR DRAINS SHALL BE PLAINLY CAST INTO THE CENTER OF EACH COVER.
7. BEDDING SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33.

100% PASSING 1 INCH SCREEN	0-10% PASSING #4 SIEVE
90-100% PASSING 3/4 INCH SCREEN	0-5% PASSING #8 SIEVE
20-55% PASSING 3/8 INCH SCREEN	

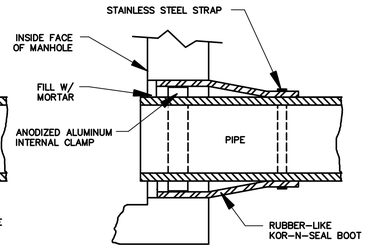
   WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE, SCREENED GRAVEL OR CRUSHED STONE 1-1/2" TO 1/2" SHALL BE USED.
8. CONCRETE FOR DROP SUPPORT SHALL CONFORM TO THE REQUIREMENT FOR CLASS A (3000 LBS.) CONCRETE OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AS FOLLOWS:

   CEMENT 6.0 BAGS PER CUBIC YARD
   WATER 5.75 GALLONS PER BAG CEMENT
   MAXIMUM SIZE OF AGGREGATE 1 INCH
9. FLEXIBLE JOINT A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:

   RCP & CI PIPE - ALL SIZES - 48"
   AC & VC PIPE - UP THROUGH 12" DIAMETER - 18"
   AC & VC PIPE - LARGER THAN 12" DIAMETER - 36"
10. SHALLOW MANHOLE IN LIEU OF A CONE SECTION, WHEN MANHOLE DEPTH IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER MAY BE USED HAVING AN ECCENTRIC ENTRANCE OPENING AND CAPABLE OF SUPPORTING H-20 LOADS.
11. MANHOLE STEPS SHALL BE MANUFACTURED OF 5/8 ROUND STAINLESS STEEL OR PLASTIC. THEY SHALL BE SHAPED SO THAT THEY CANNOT BE PULLED OUT OF THE CONCRETE WALL IN WHICH THEY ARE EMBEDDED. THE STEPS SHALL BE EMBEDDED IN THE CONCRETE BY THE MANUFACTURER DURING MANUFACTURE OR IMMEDIATELY FOLLOWING REMOVAL OF THE FORMS. SECURING THE STEPS WITH MORTAR IN DRILLED OR CAST HOLES WILL NOT BE ACCEPTABLE. THE STEPS SHALL BE OF THE DROP TYPE WITH A DEPRESSED SECTION FOR MANHOLE, APPROXIMATELY 14" X 10" IN DIMENSION.



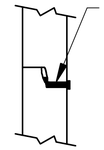
LOCK-JOINT FLEXIBLE MANHOLE SLEEVE
(OR EQUAL)



KOR-N-SEAL JOINT SLEEVE
(OR EQUAL)

NOTE: ALL GASKETS, SEALANTS, MORTAR, ETC. SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.

DETAIL-A

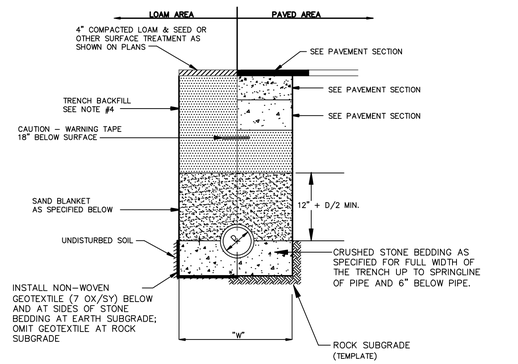


BITUMASTIC

NOTE: ALL GASKETS, SEALANTS, MORTAR, ETC. SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.

DETAIL-B
(APPROVED MANHOLE SECTION JOINTING METHODS)

SEWER MANHOLE DETAILS
NOT TO SCALE



BACKFILL MATERIAL BELOW PAVED OR CONCRETE AREAS, BEDDING MATERIAL, AND SAND BLANKET SHALL BE COMPACTED TO NOT LESS THAN 95% OF AASHTO T 99, METHOD C. SUITABLE BACKFILL MATERIAL BELOW LOAM AREAS SHALL BE COMPACTED TO NOT LESS THAN 90% OF AASHTO T 99, METHOD C.

SAND BLANKET		CRUSHED STONE BEDDING *	
SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% PASSING BY WEIGHT
1/2"	90 - 100	1"	100
200	0 - 15	3/4"	90 - 100
		3/8"	20 - 55
		# 4	0 - 10
		# 8	0 - 5

* EQUIVALENT TO STANDARD STONE SIZE #67 - SECTION 703 OF NHDOT STANDARD SPECIFICATIONS

GRAVITY SEWER SECTION
NOT TO SCALE

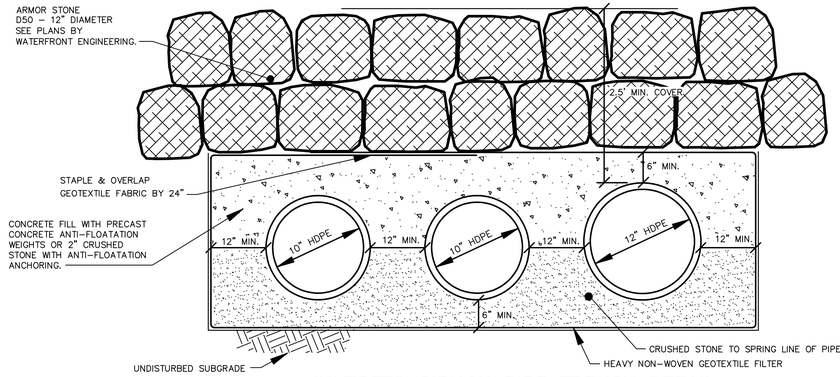
STANDARD TRENCH NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE: BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN OF THE DRAWING.
2. BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33, STONE SIZE NO. 67.

SAND BLANKET		CRUSHED STONE BEDDING	
SIEVE SIZE	% FINER BY WEIGHT	SIEVE SIZE	% PASSING BY WEIGHT
1/2"	90-100	1"	100
200	0-15	3/4"	90-100
		3/8"	20-55
		#4	0-10
		#8	0-5

   WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE, SCREENED GRAVEL OR CRUSHED STONE 1-1/2 INCH TO 1/2 INCH SHALL BE USED.
3. SAND BLANKET MAY BE OMITTED FOR CAST-IRON, DUCTILE IRON, AND REINFORCED CONCRETE PIPE PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.
4. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION.

   IN CROSS COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE SEWER, FOR MAINTENANCE AND POSSIBLE RECONSTRUCTION, WILL BE PRESERVED.
5. BASE COURSE AND PAVEMENT SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES - DIVISIONS 300 AND 400 RESPECTIVELY.
6. WOOD SHEETING, IF REQUIRED: WHERE SHEETING IS PLACED ALONG SIDE THE PIPE AND EXTENDS BELOW MID-DIAMETER, IT SHALL BE CUT OFF AND LEFT IN PLACE TO AN ELEVATION 1 FOOT ABOVE THE TOP OF PIPE. WHERE SHEETING IS ORDERED BY THE ENGINEER TO BE LEFT IN PLACE, IT SHALL BE CUT OFF AT LEAST 3 FEET BELOW FINISHED GRADE, BUT NOT LESS THAT 1 FOOT ABOVE THE TOP OF THE PIPE.
7. W = MAXIMUM ALLOWABLE TRENCH WIDTH TO A PLANE 12 INCHES ABOVE THE PIPE. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.) ALSO, W SHALL BE THE PAYMENT WIDTH FOR LEDGE EXCAVATION AND FOR ORDERED EXCAVATION BELOW GRADE.
8. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDED TO A HEIGHT OF 3 INCHES ABOVE THE ORIGINAL GROUND SURFACE AT UPLAND AREAS AND MATCH ORIGINAL GROUND SURFACE IN WETLAND AREAS.
9. CONCRETE FOR ENCASEMENT SHALL CONFORM TO THE NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS STANDARD SPECIFICATION REQUIREMENTS FOR CLASS A (3000#) CONCRETE AS FOLLOWS:
   CEMENT: 6.0 BAGS PER CUBIC YARD
   WATER: 5.75 GALLONS PER BAG CEMENT
   MAXIMUM SIZE OF AGGREGATE: 1 INCH
10. CONCRETE FULL ENCASEMENT: IF FULL ENCASEMENT IS UTILIZED, DEPTH OF CONCRETE BELOW PIPE SHALL BE 1/4 I.D. (4" MINIMUM). BLOCK SUPPORT SHALL BE SOLID CONCRETE BLOCKS.
11. NON-WOVEN GEOTEXTILE SHALL CONFORM TO NHDOT STANDARD SPECIFICATION, SECTION 593, CLASS 3; AOS = 0.43 MAXIMUM.



INVERTED SIPHON PIPE TRENCH DETAIL
NOT TO SCALE

75% DESIGN NOT FOR CONSTRUCTION

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

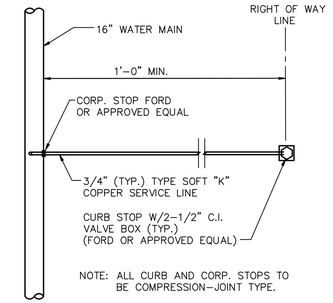
ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

DATE: 12/30/2009				
SCALE: N.T.S.				
DRAWN BY: RLH				
DESIGN BY: EDW				
APPROVED BY: EDW				
PROJECT NO: 4217				
FILE: 4217.DWG				
	NO.	REVISION	APP'D	DATE

DETAIL SHEET

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

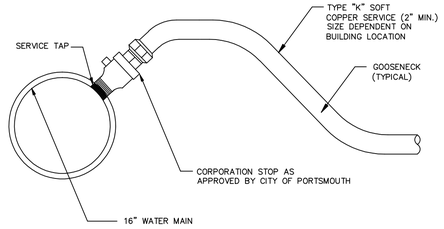
U-3



NOTE: ALL MATERIALS AND SPECIFICATIONS SHALL CONFORM TO CITY OF PORTSMOUTH WATER DEPARTMENT STANDARDS AND REQUIREMENTS. VERIFY PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES.

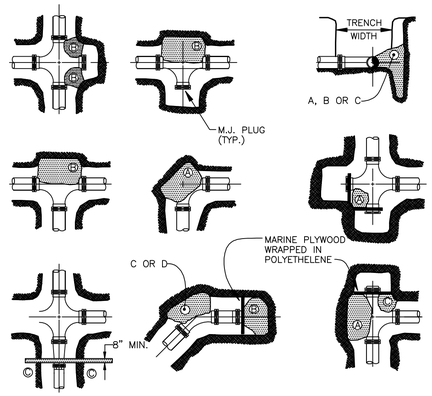
WATER SERVICE CONNECTION TYPICAL

NOT TO SCALE

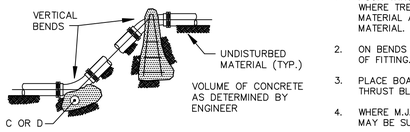


SERVICE CONNECTION DETAIL

NOT TO SCALE



TEST PRESSURE = 200psi	SQUARE FEET OF CONCRETE THRUST BLOCKING BEARING ON UNDISTURBED MATERIAL			
	REACTION TYPE	PIPE SIZE		
		8"	16"	
	A 90°	3.82	25.86	
	B 180°	2.78	18.00	
	C 45°	2.12	14.00	
	D 22-1/2°	1.06	7.11	
	E 11-1/4°	0.54	3.57	



NOTES:

1. POUR THRUST BLOCKS AGAINST UNDISTURBED MATERIAL, WHERE TRENCH WALL HAS BEEN DISTURBED, EXCAVATE LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL. NO JOINTS SHALL BE COVERED WITH CONCRETE.
2. ON BENDS AND TEES, EXTEND THRUST BLOCKS FULL LENGTH OF FITTING.
3. PLACE BOARD IN FRONT OF ALL PLUGS BEFORE POURING THRUST BLOCKS.
4. WHERE M.J. PIPE IS USED, M.J. PLUG WITH RETAINER GLAND MAY BE SUBSTITUTED FOR END BLOCKINGS.

THRUST BLOCKING DETAIL

(n.t.s.)

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, SUNDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE OWNER PRIOR TO EXCAVATION.

2. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. THE LOCATIONS ARE NOT GUARANTEED BY THE ENGINEER, SURVEYOR OR OWNER. ALL CONTRACTORS AND SUB-CONTRACTORS SHALL NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE. IT IS THE SITE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES, ANTICIPATE CONFLICTS, AND REPAIR EXISTING UTILITIES AT NO ADDITIONAL COST TO THE OWNER.

3. TEST PITS TO LOCATE EXISTING UTILITIES MAY BE ORDERED BY THE ENGINEER AT NO ADDITIONAL COST TO OWNER.

4. FENCES, MAIL BOXES, SIGNS, CURBS, LIGHT POLES, ETC., SHALL BE REMOVED AND REPLACED AS NECESSARY TO PERFORM THE WORK. UNLESS OTHERWISE INDICATED, ALL SUCH WORK SHALL BE INCIDENTAL TO CONSTRUCTION OF THE PROJECT.

5. PRIOR TO CONSTRUCTION, FIELD VERIFY JUNCTION AND LOCATION OF ALL EXISTING UTILITIES LINES. PRESERVE AND PROTECT LINES TO BE RETAINED.

6. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND PAY LIMITS SHALL BE RESTORED AT NO ADDITIONAL COST TO THE OWNER.

7. SEWER TRENCHES MAY BE EXCAVATED WIDER THAN THE 'LIMIT OF EXCAVATION AND PAYMENT FOR EARTH EXCAVATION' ABOVE THE 'LINE OF NARROW TRENCH LIMIT.' ANY SUCH ADDITIONAL EXCAVATION SHALL BE AT THE CONTRACTOR'S EXPENSE AND SHALL NOT BE MEASURED FOR PAYMENT.

8. FORM BRICK INVERTS IN MANHOLES & SIPHON STRUCTURES WITH BRICK ON EDGE TO A DEPTH OF 0.8 INSIDE DIAMETER OF PIPE AND FORM A 1 INCH SLOPED BENCH WITH BRICK FLAT. INVERT SHALL BE SLOPED UNIFORMLY BETWEEN INLET AND OUTLET PIPE AND SHALL BE FORMED AND FILLED AS REQUIRED TO DIRECT THE FLOW AS INDICATED AND TO PREVENT DEPOSITION OF SOLIDS.

9. IN PAVED AREAS THE TOP OF THE MANHOLE COVERS & GATE BOXES SHALL BE SET FLUSH WITH THE PAVED SURFACE.

10. COORDINATE ALL WORK ON OR IN VICINITY OF NATURAL GAS WITH UNITIL CORPORATION. UNITIL SHALL BE RESPONSIBLE FOR GAS MAIN RELOCATIONS, EXCAVATIONS, TEMPORARY MAIN RELOCATIONS IF NECESSARY, AND ALL TRENCHING, BACKFILL, & COMPACTION.

11. EXISTING UTILITIES INFORMATION BASED ON CITY OF PORTSMOUTH RECORDS, UTILITY COMPANY RECORDS & FIELD SURVEY BY JAMES VERRA & ASSOCIATES, INC..

12. SEE GRADING PLANS BY HAIGHT ENGINEERING FOR DETAILS OF PROPOSED DRAINAGE IMPROVEMENTS.

13. COORDINATE RELOCATION OF UNDERGROUND TELE-COMMUNICATIONS CONDUITS WITH FAIRPOINT COMMUNICATIONS & BAYRING.

14. COORDINATE RELOCATION OF UNDERGROUND CONDUITS & OVERHEAD ELECTRIC WITH PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE (PSNH).

15. COORDINATE CABLE RELOCATION WITH COMCAST.

16. COORDINATE FIRE ALARM CONDUIT RELOCATION WITH PORTSMOUTH FIRE DEPARTMENT.

17. DO NOT BEGIN CONSTRUCTION UNTIL ALL STATE AND LOCAL PERMITS HAVE BEEN APPLIED FOR AND RECEIVED.

18. SITE CONSTRUCTION SHALL COMPLY WITH THE RULES AND REGULATIONS OF THE AMERICANS WITH DISABILITIES ACT (ADA) AS PUBLISHED IN THE FEDERAL REGISTER, VOL. 56, NO. 144, DATED JULY 26, 1991, AS AMENDED.

19. ALL CONSTRUCTION SHALL MEET THE MINIMUM CONSTRUCTION STANDARDS OF THE CITY OF PORTSMOUTH, N.H.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE, NHDES STANDARDS OF DESIGN & CONSTRUCTION FOR SEWERAGE AND WASTWATER TREATMENT FACILITIES, LATEST EDITIONS. THE MORE STRINGENT SPECIFICATION SHALL GOVERN.

20. CONTRACTOR SHALL REMOVE AND LEGALLY DISPOSE OF DEMOLITION DEBRIS.

21. IF THE EARTHWORK IS PERFORMED DURING FREEZING WEATHER, EXPOSED SUBGRADES ARE SUSCEPTIBLE TO FROST. NO FILL OR UTILITIES SHALL BE PLACED ON FROZEN GROUND. THIS WILL LIKELY REQUIRE REMOVAL OF A FROZEN SOIL CRUST AT THE COMMENCEMENT OF EACH DAY'S OPERATION. THE FINAL SUBGRADE ELEVATION WILL ALSO REQUIRE AN APPROPRIATE DEGREE OF INSULATION AGAINST FREEZING.

22. EXCAVATED MATERIALS SHALL BE PLACED AS FILL MATERIALS WITHIN UPLAND AREAS ONLY.

23. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING ON-SITE STRUCTURES, BITUMINOUS CONCRETE, DEBRIS, AND CONSTRUCTION WASTE PRODUCTS WHICH ARE NOT AUTHORIZED TO BE REUSED AS PART OF CONSTRUCTION.

24. PLACEMENT OF BORROW MATERIALS SHALL BE PERFORMED IN A MANNER THAT PREVENTS LONG TERM DIFFERENTIAL SETTLEMENT. EXCESSIVELY WET MATERIALS SHALL BE STOCKPILED AND ALLOWED TO DRAIN BEFORE PLACEMENT. FROZEN MATERIAL SHALL NOT BE USED FOR CONSTRUCTION. VOIDS BETWEEN STONES AND CLUMPS OF MATERIAL SHALL BE FILLED WITH FINE MATERIALS.

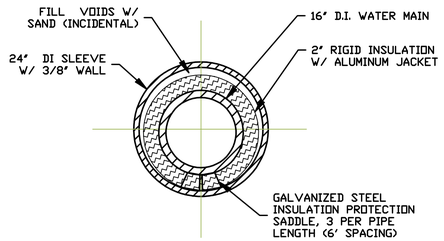
25. PROTECTION OF SUBGRADE: THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN STABLE, DEWATERED SUBGRADES FOR FOUNDATIONS, PAVEMENT AREAS, UTILITY TRENCHES, AND OTHER AREAS DURING CONSTRUCTION. SUBGRADE DISTURBANCE MAY BE INFLUENCED BY EXCAVATION METHODS, MOISTURE, PRECIPITATION, GROUNDWATER CONTROL, AND CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PREVENT SUBGRADE DISTURBANCE. SUCH PRECAUTIONS MAY INCLUDE DIVERTING STORMWATER RUNOFF AWAY FROM CONSTRUCTION AREAS, REDUCING TRAFFIC IN SENSITIVE AREAS, AND MAINTAINING AN EFFECTIVE DEWATERING PROGRAM. SOILS EXHIBITING HEAVING OR INSTABILITY SHALL BE OVER EXCAVATED TO MORE COMPETENT BEARING SOIL AND REPLACED WITH FREE DRAINING STRUCTURAL FILL.

26. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH THE DESIGN STANDARDS AND SPECIFICATIONS SET FORTH IN THE "NEW HAMPSHIRE STORM WATER MANUALS, VOLUMES 1 - 3" AS ADOPTED BY THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).

27. CONTRACTOR TO PERFORM SURVEY LAYOUT.

28. CONTRACTOR SHALL BE RESPONSIBLE FOR THE TRENCH EXCAVATION, BEDDING MATERIALS, CONDUIT INSTALLATION, BACKFILL & COMPACTION OF ALL PSNH, FAIRPOINT, COMCAST & OTHER UTILITY COMPANY STRUCTURES & CONDUIT BANKS. UTILITY COMPANIES SHALL BE RESPONSIBLE FOR ALL CONDUITS INSTALLATIONS.

- * MANDRILL SHALL BE RUN THROUGH ALL PSNH CONDUITS.
- * ALL CONDUITS SHALL HAVE NYLON PULL STRING WITH 200 LB. PULLING STRENGTH.
- * CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING ALL UTILITIES FOR NECESSARY INSTALLATION INSPECTIONS.
- * CONCRETE CONDUIT BANK SHALL BE STEEL (REBAR) REINFORCED AT ALL UTILITY CROSSINGS WHERE OTHER UTILITIES ARE BELOW PSNH CONDUITS.

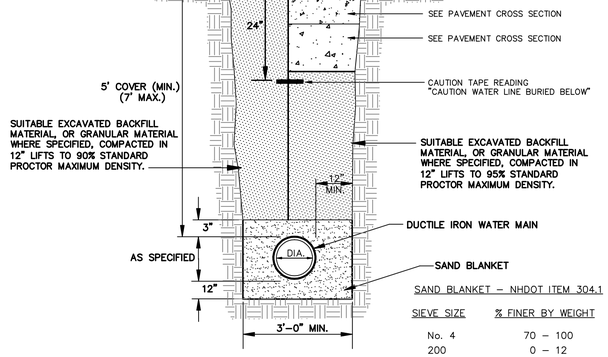


NOTES FOR DUCTILE IRON SLEEVE

1. CONTRACTOR SHALL SUBMIT PROPOSED METHODS AND MATERIALS FOR INSTALLATION OF PIPE.

DUCTILE IRON SLEEVE DETAIL (WATER)

NOT TO SCALE



SAND BLANKET - NHDOT ITEM 304.1

SIEVE SIZE	% FINER BY WEIGHT
No. 4	70 - 100
200	0 - 12

NOTE:

INSTALLATIONS WITH LESS THAN 5'-0" OF COVER (ABOVE OR BELOW) SHALL REQUIRE 2" THICK RIGID BOARD INSULATION. INSTALLATIONS AT CULVERT CROSSING SHALL BE INSULATED AND SLEEVED IN DUCTILE IRON CONDUIT.

WATER MAIN TRENCH DETAIL

NOT TO SCALE

75% DESIGN NOT FOR CONSTRUCTION

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

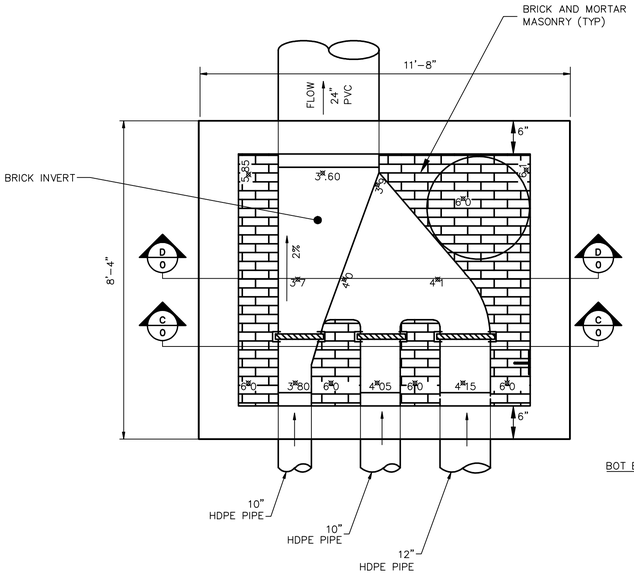
ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

DATE: 12/30/2009				
SCALE: N.T.S.				
DRAWN BY: RLH				
DESIGN BY: EDW				
APPROVED BY: EDW				
PROJECT NO: 4217				
FILE: 4217.DWG				
	NO.	REVISION	APP'D	DATE

DETAIL SHEET

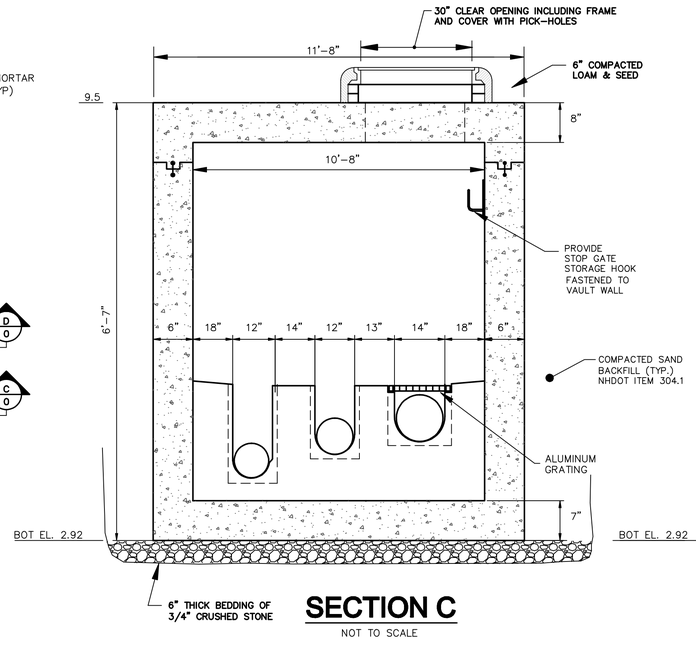
CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

U-4



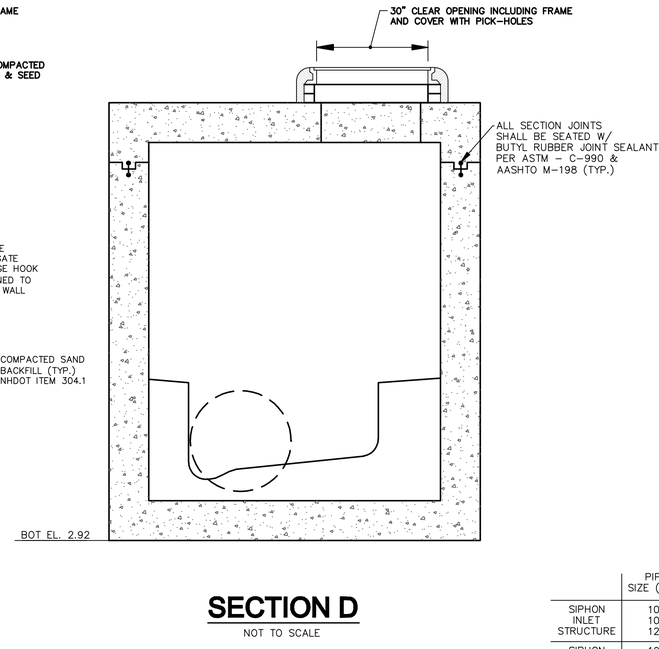
OUTLET STRUCTURE PLAN VIEW

NOT TO SCALE



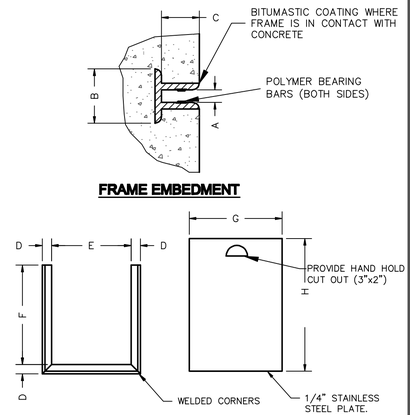
SECTION C

NOT TO SCALE



SECTION D

NOT TO SCALE



NOTE: EACH STOP GATE SHALL BE LABELED WITH A WELD INDICATING INLET CHANNEL 1, 2 AND 3 AND OUTLET CHANNEL 1, 2, AND 3.

FRAME EMBEDMENT

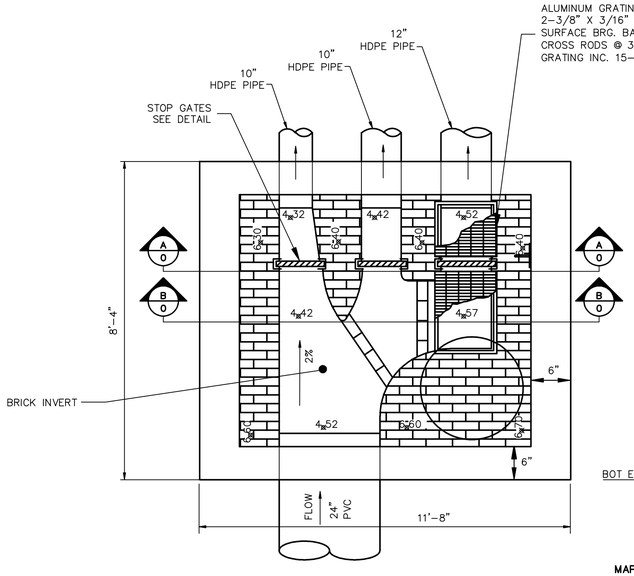
CHANNEL FRAME AND STOP GATE

	PIPE SIZE (inch)	A	B	C	D	E	F	G	H	LABEL
SIPHON INLET STRUCTURE	10"	7/16"	1-9/16"	1-1/8"	1-3/8"	1'-13/16"	2'-5 1/2"	1'-2 3/8"	2'-10 5/8"	I1
	10"	7/16"	1-9/16"	1-1/8"	1-3/8"	1'-13/16"	2'-5 1/2"	1'-2 3/8"	2'-10 5/8"	I2
	12"	7/16"	1-9/16"	1-1/8"	1-3/8"	1'-13/16"	2'-1 9/16"	1'-4 3/8"	2'-8 1/2"	I3
SIPHON OUTLET STRUCTURE	10"	7/16"	1-9/16"	1-1/8"	1-3/8"	1'-13/16"	2'-5 1/2"	1'-2 3/8"	2'-10 5/8"	O1
	10"	7/16"	1-9/16"	1-1/8"	1-3/8"	1'-13/16"	2'-5 1/2"	1'-2 3/8"	2'-10 5/8"	O2
	12"	7/16"	1-9/16"	1-1/8"	1-3/8"	1'-13/16"	2'-1 9/16"	1'-4 3/8"	2'-8 1/2"	O3

STOP GATE SCHEDULE

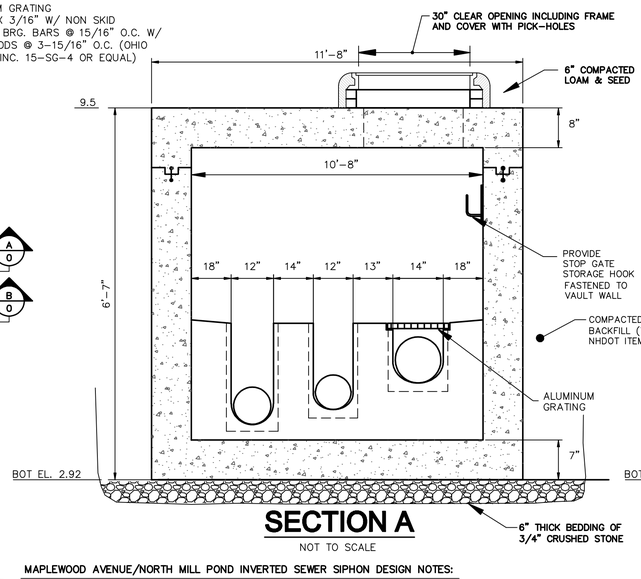
ALUMINUM STOP GATE

NOT TO SCALE



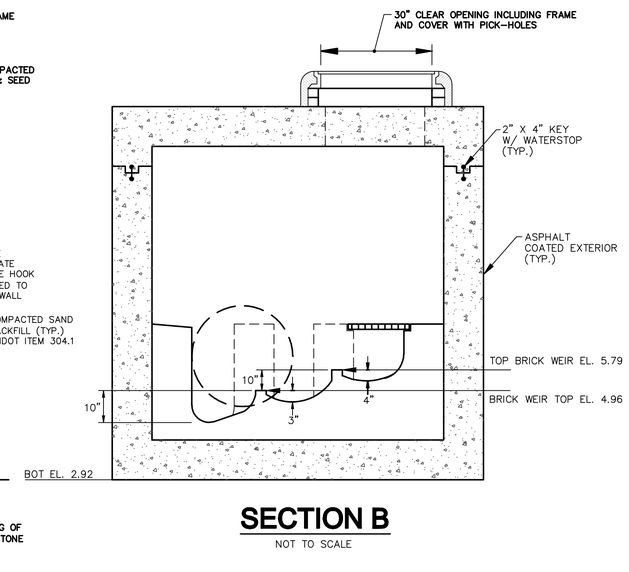
INLET STRUCTURE PLAN VIEW

NOT TO SCALE



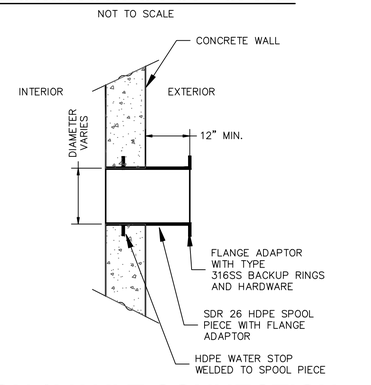
SECTION A

NOT TO SCALE



SECTION B

NOT TO SCALE



SIPHON / VAULT CONNECTION DETAIL

NOT TO SCALE

MAPLEWOOD AVENUE/NORTH MILL POND INVERTED SEWER SIPHON DESIGN NOTES:

HDPE SEWER PIPE BELOW MEAN HIGH WATER ELEVATION SHALL BE PROTECTED FOR FLOATATION. CONTRACTOR HAS THE OPTION TO USE "SADDLE BAG ANCHOR WEIGHTS" OR APPROVED EQUAL. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR METHOD AND MATERIAL FOR ANTI-FLOATATION PROTECTION.

BASE FLOW DATA OBTAINED FROM 201 FACILITIES PLAN UPDATE CITY OF PORTSMOUTH FINAL DRAFT DATED NOVEMBER 19, 2009 BY UNDERWOOD ENGINEERS. ESTIMATED FLOW MAPLEWOOD AVENUE SEWER BASIN: 377,826 GPD.

INDUSTRY DESIGN STANDARDS RECOMMEND MINIMUM CLEANSING VELOCITY BASED ON AVERAGE DAILY FLOW FROM 2.5 TO 4.0 FEET PER SECOND (FPS). NHDES REQUIRES A MINIMUM OF 3.0 FPS AS MINIMUM DESIGN VELOCITY. THIS DESIGN WILL NOT MEET THE MINIMUM DESIGN VELOCITY REQUIREMENTS. ESTIMATED DESIGN VELOCITY IS 2.1 FPS.

IT IS UNDERSTOOD THAT THE CITY OF PORTSMOUTH IS COMPLETING A STUDY TO DETERMINE THE LOCATION OF A NEW SEWAGE TREATMENT PLANT. THERE IS A DISTINCT POSSIBILITY THAT THE FUTURE SANITARY FLOW AT THIS DESIGN LOCATION MAY DECREASE. REDUCTION IN FLOW WILL FURTHER EXASPERATE THE MINIMUM CLEANSING VELOCITY ISSUES. IT IS RECOMMENDED THAT 6-MONTHS PRIOR TO CONSTRUCTION THAT THE FLOW IN THE EXISTING SEWER BE FLOW MONITORED AND THAT DESIGN MODIFICATION BE MADE IF NECESSARY.

SINCE THE DESIGN DOES NOT MEET THE MINIMUM RECOMMENDED DESIGN STANDARDS, THE INVERTED SEWER SIPHON WILL REQUIRE REGULAR FLUSHING AND MAINTENANCE TO MINIMIZE POTENTIAL FOR BLOCKAGE.

75% DESIGN NOT FOR CONSTRUCTION

	NO.	REVISION	APP'D	DATE
DATE: 12/30/2009				
SCALE: N.T.S.				
DRAWN BY: RLH				
DESIGN BY: EDW				
APPROVED BY: EDW				
PROJECT NO: 4217				
FILE: 4217.DWG				

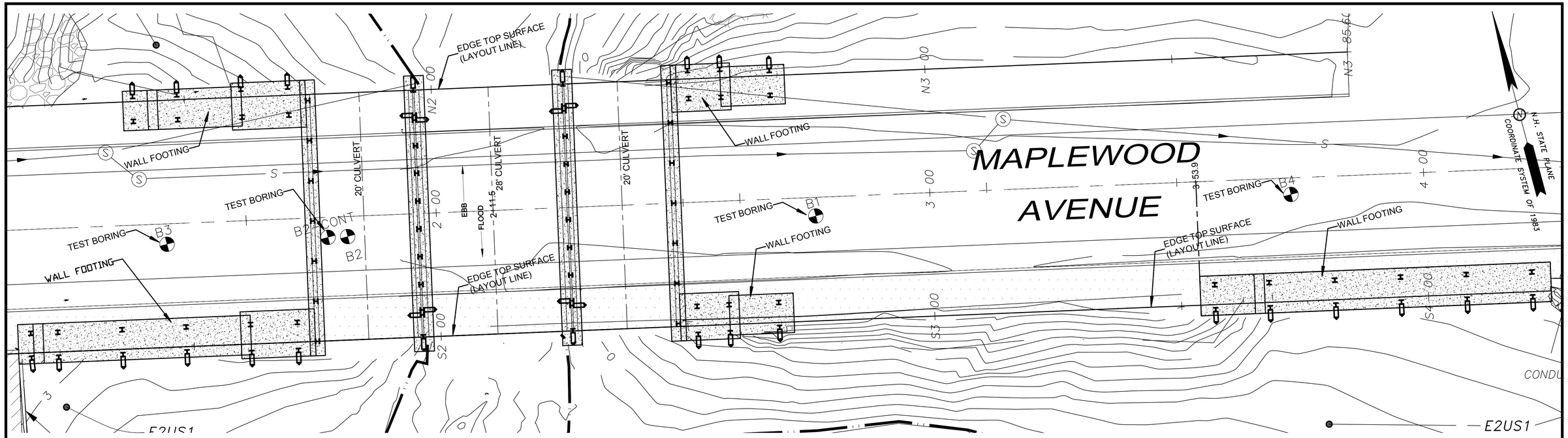
MAPLEWOOD AVE CULVERT REPLACEMENT & NORTH MILL POND RESTORATION PORTSMOUTH, NH

ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

DETAIL SHEET

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

U-5



FOOTING PLAN

10 0 10 20 30
(FEET)

PILE NOTES:

1. H-PILES AND COFFERDAM SHEET PILES WILL BE PROVIDED BY THE CONTRACTOR. COFFERDAM SHEET PILES SHALL BE HOT ROLLED SHEETS IN GOOD CONDITION. USED SHEETS WITH UNDAMAGED INTERLOCKS AND NO CORROSION PITTING MAY BE ACCEPTABLE.

2. H-PILES SHALL HAVE CAST STEEL DRIVING SHOES SUITABLE FOR END BEARING ON BEDROCK, WELD CONNECTED PER THE MANUFACTURERS REQUIREMENTS.

3. DRIVE H-PILES TO 100 TON WORKING CAPACITY IN THE LOCATION AND ORIENTATION INDICATED.

4. BATTER PILES SHALL BE INSTALLED AT A 4:12 BATTER ANGLE WITH DIRECTION AS INDICATED.

5. INSTALL COFFERDAM SHEETS AS REQUIRED TO ESTABLISH WATER TIGHT COFFERDAMS. THE CONTRACTOR IS RESPONSIBLE FOR DESIGNING AND INSTALLING ANY NECESSARY COFFERDAM BRACING.

6. THE REFUSAL PROFILE AND PILE LENGTHS SHOWN ARE SCHEMATIC ONLY INTERPOLATED FROM TEST BORING DATA. THE CONTRACTOR SHALL REVIEW THE TEST BORING DATA, PILE LAYOUT AND ALLOW FOR PILE LENGTH VARIATION FOR VARYING REFUSAL DEPTHS SUGGESTED BY THE TEST BORING DATA.

CORROSION PROTECTION NOTES:

1. PROVIDE ALUMINUM ANODES TO MIL-A-24779(SH) SPECIFICATION FOR PILE AND COFFERDAM CORROSION PROTECTION. ANODES SHALL BE 6"X6"X6" CAST ALUMINUM ALLOY WITH EITHER A BOLT HOLE FOR BOLTED CONNECTION OR AN EMBEDDED STEEL STRAP FOR BOLTED OR WELDED CONNECTION. PROVIDE THREE OF THESE ANODES FOR EACH COMMON PIER, FASTEN INTO THE COFFERDAM WEB POCKETS NEAR LOW WATER LEVEL EQUALLY SPACED ALONG THE FOOTINGS. PROVIDE ONE OF THESE ANODES PER END FOOTING AT THE RIPRAP SURFACE, ELECTRICALLY CONNECTED TO THE FOOTING PILES BY THREADED ROD OR STEEL BAR.

2. ALL ADJACENT CULVERT FOOTING AND WALL FOUNDATION PILES (EXCLUDING THE SE WALL) SHALL BE ELECTRICALLY CONNECTED BY WELDING #4 REBAR OR EQUAL BETWEEN PILES (EMBEDDED IN CONCRETE) WITH A STEEL ELECTRICAL CONNECTION TO EITHER THE ANODES (END FOOTINGS) OR STEEL COFFERDAM (MID FOOTINGS). PROVIDE 3/4" OF WELD AT EACH INTERLOCK TO ELECTRICALLY CONNECT EACH COFFERDAM SHEET PILE (AFTER SHEET CUT OFF).

STRUCTURAL CONCRETE NOTES:

1. FOOTING CONCRETE SHALL CONFORM TO NHDOTSS SECTION 520 CLASS AA CONCRETE WITH A 4000 PSI MINIMUM COMPRESSIVE STRENGTH, MAXIMUM WATER/CEMENT RATIO OF 0.400, USING HIGH RANGE WATER REDUCING ADMIXTURE AND CONTAINING FROM 5 TO 9 PERCENT ENTRAINED AIR.

2. WALL CONCRETE SHALL CONFORM TO NHDOTSS SECTION 520 CLASS AAA CONCRETE WITH A 5000 PSI MINIMUM COMPRESSIVE STRENGTH, MAXIMUM WATER/CEMENT RATIO OF 0.400, USING HIGH RANGE WATER REDUCING ADMIXTURE AND CONTAINING FROM 5 TO 9 PERCENT ENTRAINED AIR.

3. REINFORCING BARS SHALL CONFORM TO ASTM A615, GRADE 60. BARS TO BE WELDED SHALL ALSO CONFORM TO ASTM A706.

4. CLEARANCES FOR STIRRUP REINFORCEMENT SHALL BE 2.5" OF CLEAR COVER AT ALL EXPOSED SURFACES UNLESS OTHERWISE NOTED. CLEAR COVER ADJACENT TO SOIL OR SEDIMENT SHALL BE 4". MAIN BARS SHALL HAVE 3" OF CLEAR COVER AT ALL EXPOSED SURFACES OR ADJACENT TO SOIL OR OTHER FORMING SURFACES, UNLESS OTHERWISE NOTED.

4. CONTROL AND CONSTRUCTION JOINTS SHALL ONLY BE USED AS SHOWN, UNLESS APPROVED OTHERWISE. CONTROL JOINTS SHALL HAVE FULL DEPTH SELF LEVELLING URETHANE SEALANT (GRAY).

5. ALL REINFORCING SHALL BE FULLY SUPPORTED ON PLASTIC COATED STEEL CHAIRS, TIES OR STANDEES. REINFORCING SHALL NOT BE DIRECTLY SUPPORTED ON TIMBER BLOCKS, BRICKS, CONCRETE BLOCKS, ETC. WITHIN THE CLEAR COVER DISTANCES.

6. ALL CONCRETE (EXCEPT TREMIE SEALS) SHALL BE PLACED IN DEWATERED CONDITIONS (CAN BE GRADUALLY FLOODED AS TIDE RISES) AT TEMPERATURES MAINTAINED ABOVE 50 DEG. F, FOR AT LEAST 3 DAYS.

7. MOIST CURING OF CAST-IN-PLACE CONCRETE IS TO BEGIN WITHIN 60 MINUTES AFTER CONCRETE FINAL SET.

8. ALL FORMWORK FOR CIP CONCRETE SHALL BE LEFT IN PLACE AND CONCRETE SURFACES SHALL BE COVERED AND KEPT MOIST FOR A PERIOD OF NOT LESS THAN SEVEN (7) FULL DAYS AFTER CONCRETE PLACEMENTS.

9. CONTRACTOR MAY FIELD BEND (COLD) AND WELD REINFORCING STEEL, HOWEVER ADJACENT ITEMS VULNERABLE TO BURNS SHALL BE COVERED WITH A WELDING BLANKET PRIOR TO WELDING OR CUTTING TO PREVENT DAMAGE. SUFFICIENT FIRE FIGHTING EQUIPMENT SHALL BE READY AND WITHIN 50 FEET OF ANY WELDING.

STRUCTURAL CONCRETE NOTES: (CONT.)

10. REFER TO STRUCTURAL AND VENDOR DRAWINGS FOR LOCATION AND SIZE OF EMBEDDED ITEMS OR INTERFERENCES.

11. ALL EXPOSED TEMPORARY FERROUS METAL HANDLING/LIFTING DEVICES AND EXISTING EMBEDDED METALS/ANCHORS NO LONGER IN USE SHALL BE RECESSED OR REMOVED TO A DEPTH OF ONE INCH BELOW THE SURFACE OF THE CONCRETE AND PATCHED WITH AN APPROVED POLYMER-MODIFIED CEMENTITIOUS MORTAR.

12. PRECAST CONCRETE SHALL BE CURED (MAX. 150 DEGREES F) TO AT LEAST 4000 PSI PRIOR TO HANDLING AND CRACKS IN DELIVERED PRECAST MAY BE CAUSE FOR REJECTION.

13. EXPOSED STRUCTURAL CONCRETE TOP SURFACES SHALL BE BULL FLOAT FINISHED, FOLLOWED BY A MEDIUM BROOM FINISH.

14. WEEP PIPES SHALL BE 1.5" DIAMETER SCHEDULE 40 GRAY PVC INSTALLED AS INDICATED WITH EXPOSED ENDS FIT INTO STONE JOINTS FLUSH OR RECESSED. THE INNER END OF EACH WEEP PIPE SHALL BE CAPPED WITH A PVC END CAP AND THE CAP AND ADJACENT PIPE END SHALL BE DRILLED WITH AT LEAST (10) 1/2" DIA. EVENLY SPACED DRILL HOLES (FOR WATER FLOW).

15. ALL CONCRETE, MORTAR AND GROUT SHALL USE TYPE II PORTLAND CEMENT. LIME IS NOT PERMITTED.

16. THE TOP GRANITE WALL STONES AND ARCH END STONES SHALL BE DOWELLED TO THE CONCRETE BACKING WITH 1/2" DIA. HOT DIP GALVANIZED STEEL ROD EPOXY RESIN ANCHORED 2" INTO THE GRANITE AND 3" INTO THE CONCRETE (TYP).

DESIGN CRITERIA NOTES:

1. THE PROJECT INTENT IS TO RECONSTRUCT THE GRANITE RETAINING WALLS AND REPLACE THE EXISTING ARCH CULVERT WITH THREE NEW PRECAST CONCRETE MANUFACTURED ARCH CULVERTS.

2. THE MANUFACTURED ARCH CULVERTS SHALL BE DESIGNED BY THE MANUFACTURER FOR THE SITE CONDITIONS AND HS25-44 TRUCK LOADING, OR OTHER CONTROLLING HIGHWAY DESIGN LOAD.

3. THE WALLS ARE DESIGNED FOR A 260 PSF UNIFORM LIVE LOAD.

75% DESIGN NOT FOR CONSTRUCTION

	NO.	REVISION	APP'D	DATE
DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BY:DCM				
PROJECT NO:1095				
FILE: FOOTINGS				

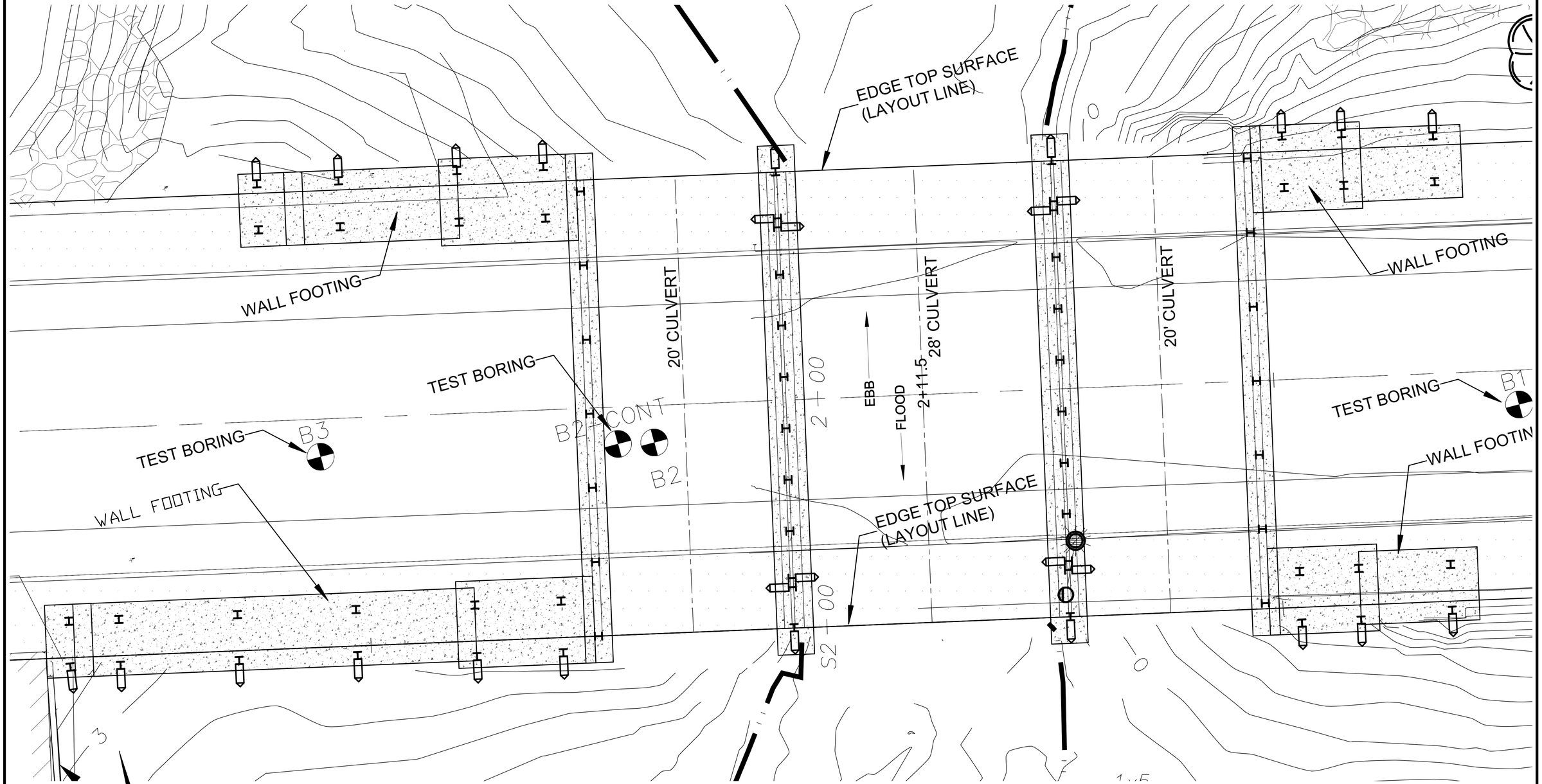
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

FOUNDATION PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

S-1



4 0 4 8 16
(FEET)

75% DESIGN NOT FOR CONSTRUCTION

DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BYDCM				
PROJECT NO:XX				
FILE: XXX				
	NO.	REVISION	APP'D	DATE

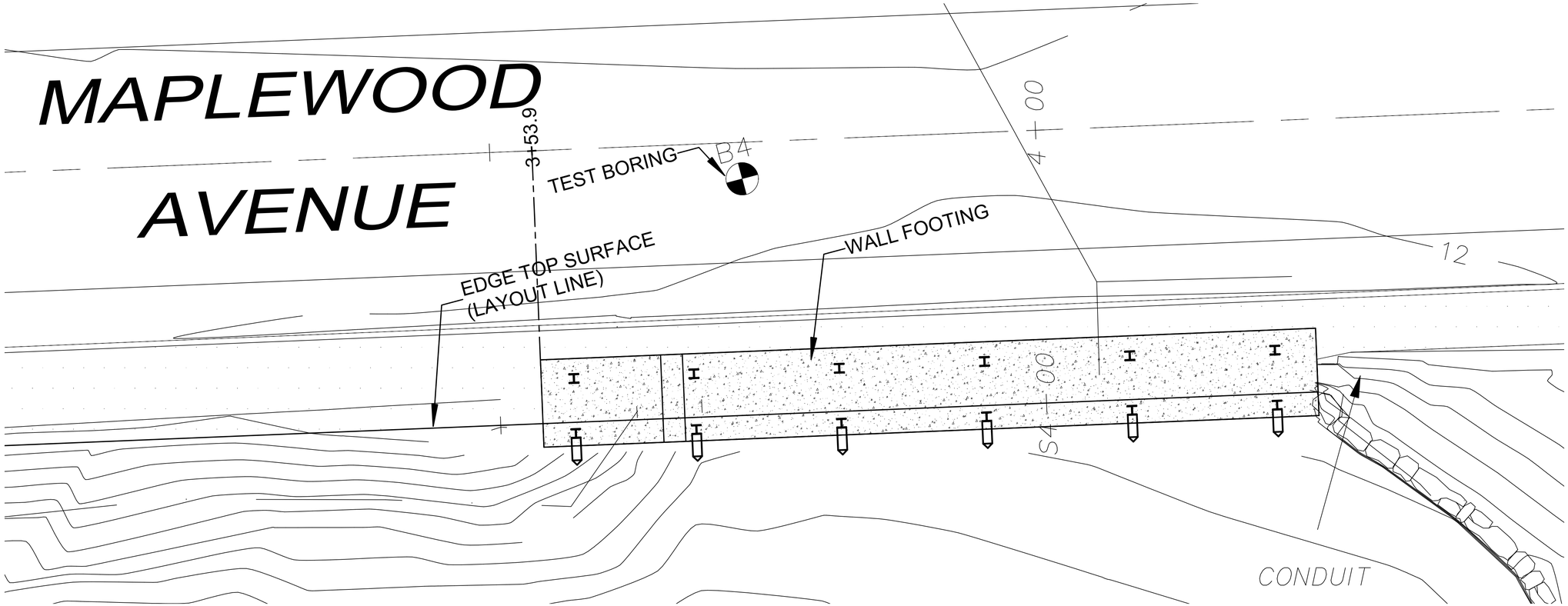
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

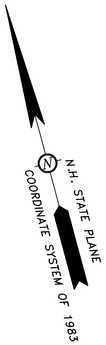
WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

FOUNDATION PLAN – MAIN AREA

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

S-2





4 0 4 8 16
(FEET)

75% DESIGN NOT FOR CONSTRUCTION

DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BY:DCM				
PROJECT NO:XX				
FILE: XXX				
	NO.	REVISION	APP'D	DATE

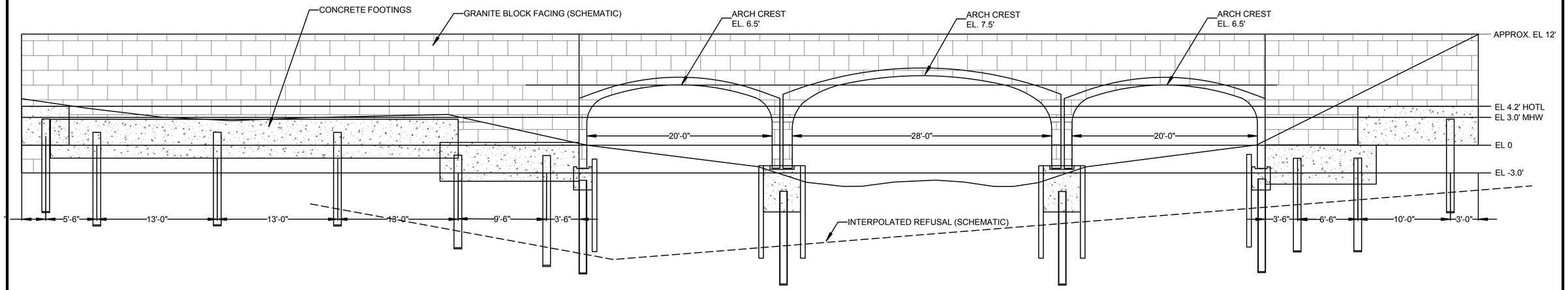
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

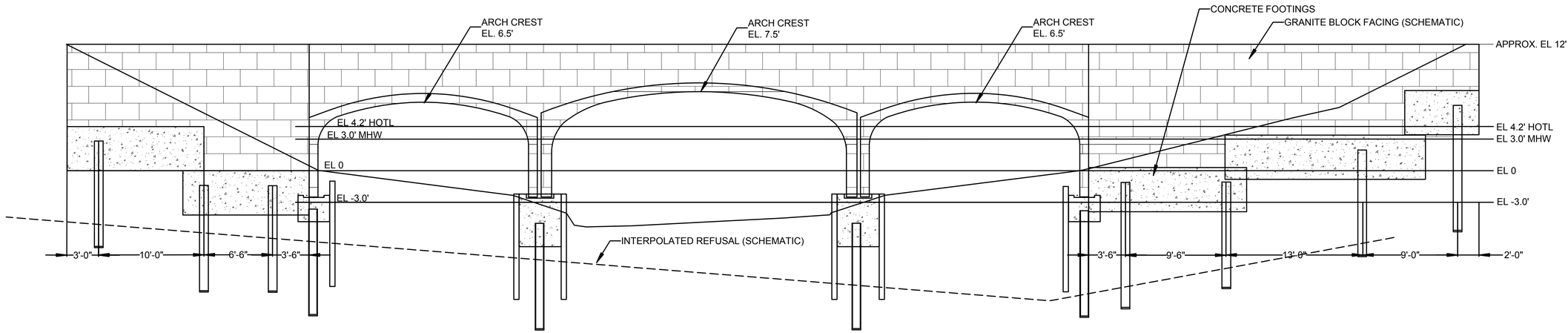
FOUNDATION PLAN – SOUTHEAST

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

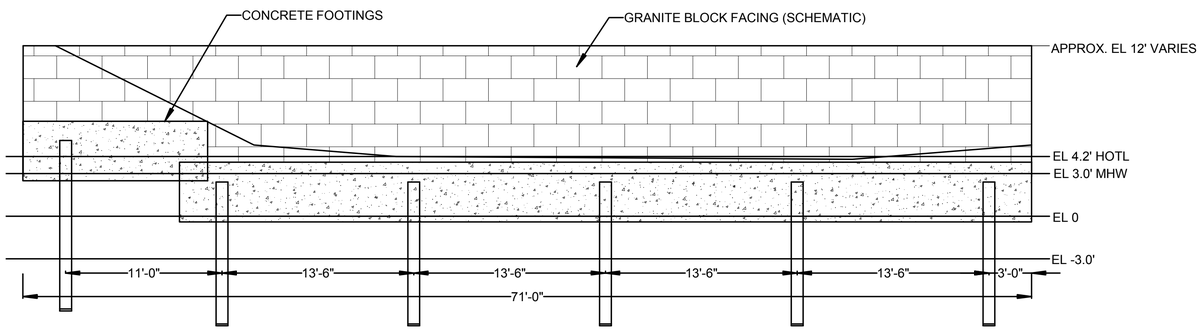
S-3



PROPOSED CULVERT ELEVATION - SOUTH SIDE



PROPOSED CULVERT ELEVATION - NORTH SIDE



PROPOSED CULVERT ELEVATION - SOUTHEAST

APPROX. WATER LEVELS (NGVD 29 DATUM)

100 YR FLOOD	9'
HOTL LINE	4.2'
MHW	3.0'
NGVD 1929	0.0'
OBS LW (NORTH)	-3.0'
MLW (EST.)	-3.5'

NOTE:
ELEVATIONS IN FEET RELATIVE TO NGVD 29 DATUM; TIDAL ELEVATIONS ARE APPROXIMATE. MLW APPROX. EL. -3.5'

4 0 4 8 16
(FEET)

75% DESIGN NOT FOR CONSTRUCTION

DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BY:DCM				
PROJECT NO:1095				
FILE: DETAILS				
	NO.	REVISION	APP'D	DATE

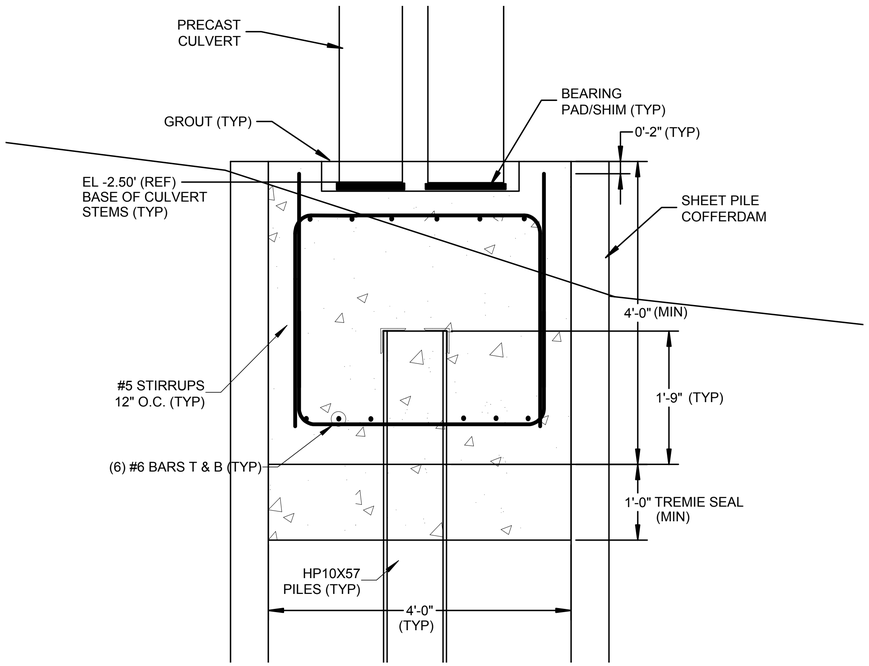
MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

CULVERT DETAILS

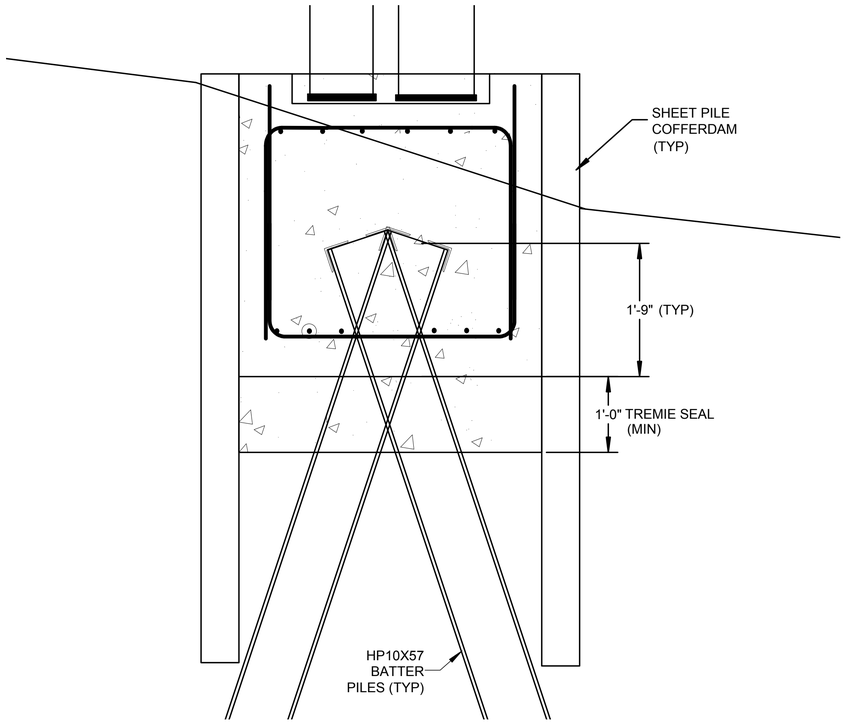
CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

S-4



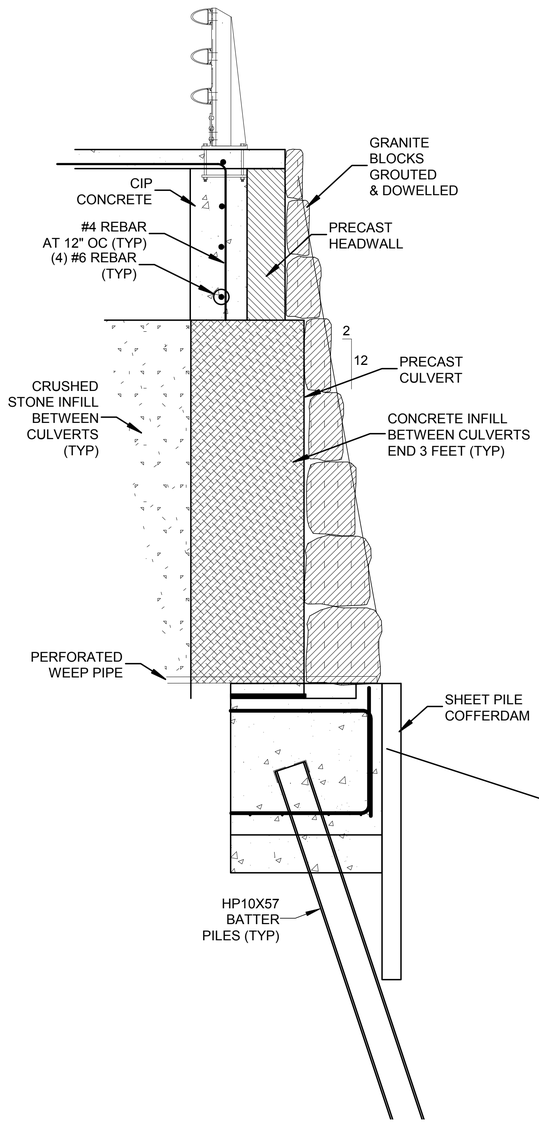
INNER FOOTING DETAIL - TYPICAL

1 1/2 0 1 2 3
(FEET)



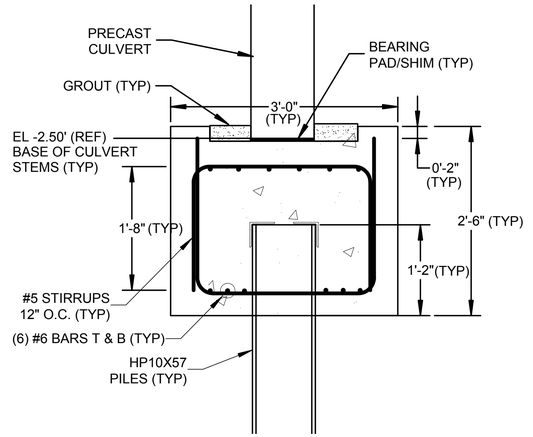
INNER FOOTING DETAIL AT BATTER PILES

1 1/2 0 1 2 3
(FEET)



CULVERT VENEER DETAIL (TYP)

2 0 2 4
(FEET)



OUTER FOOTING DETAIL - TYPICAL

1 1/2 0 1 2 3
(FEET)

CONCRETE REBAR LAP SPLICES:

#4 16"STD 20" TOP BARS

#5 19"STD 24" TOP BARS

#6 23"STD 29" TOP BARS

#7 33"STD 43" TOP BARS

#8 37"STD 49" TOP BARS

NOTE:
ELEVATIONS IN FEET RELATIVE TO NGVD 29 DATUM; TIDAL ELEVATIONS ARE APPROXIMATE

75% DESIGN NOT FOR CONSTRUCTION

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

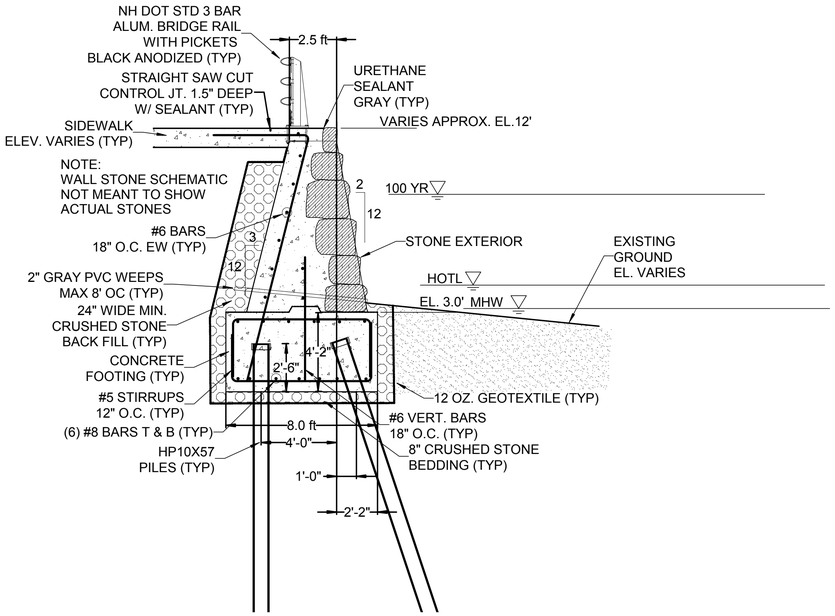
WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BY:DCM				
PROJECT NO:1095				
FILE: DETAILS				
	NO.	REVISION	APP'D	DATE

CULVERT DETAILS

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

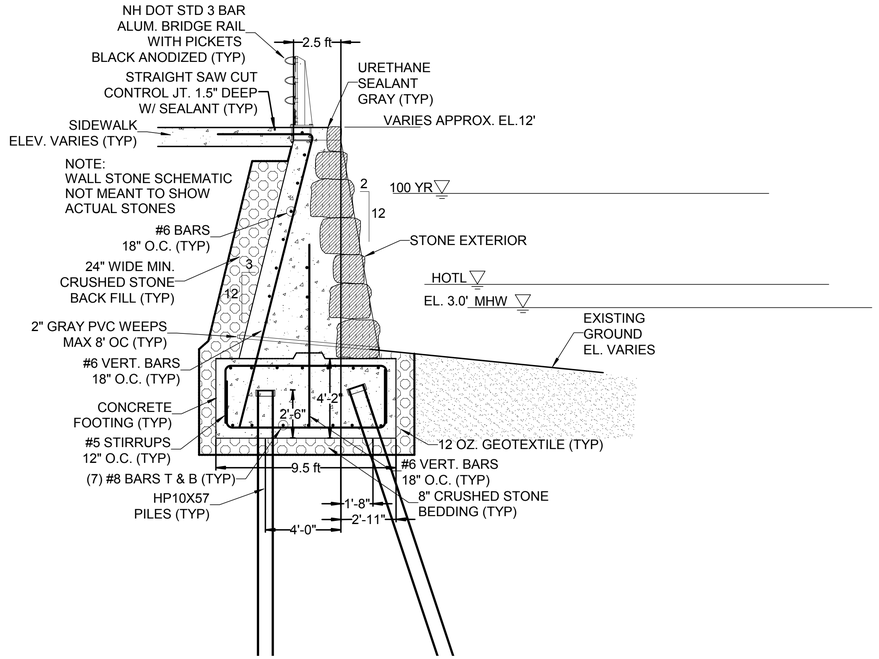
S-5



PROPOSED WALL SECTION - TYPICAL

4 0 4 8

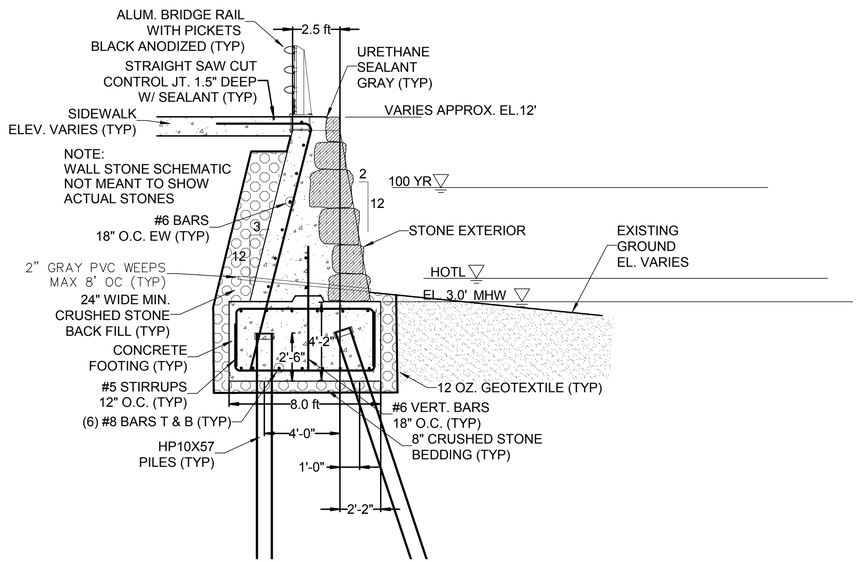
(FEET)



PROPOSED HIGHER WALL SECTION - TYPICAL

4 0 4 8

(FEET)



PROPOSED WALL SECTION - SOUTHEAST

4 0 4 8

(FEET)

NOTE:
ELEVATIONS IN FEET RELATIVE TO
NGVD 29 DATUM; TIDAL ELEVATIONS
ARE APPROXIMATE

75% DESIGN NOT FOR CONSTRUCTION

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

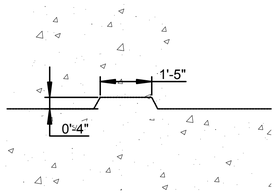
WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BY:DCM				
PROJECT NO:1095				
FILE: DETAILS				
	NO.	REVISION	APP'D	DATE

WALL DETAILS

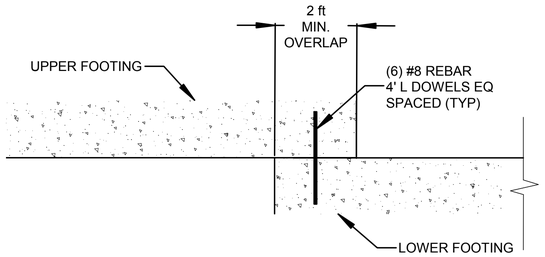
CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

S-6



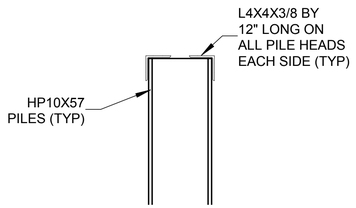
WALL FOOTING SHEAR KEY DETAIL (TYP)

2 0 2 4
(FEET)



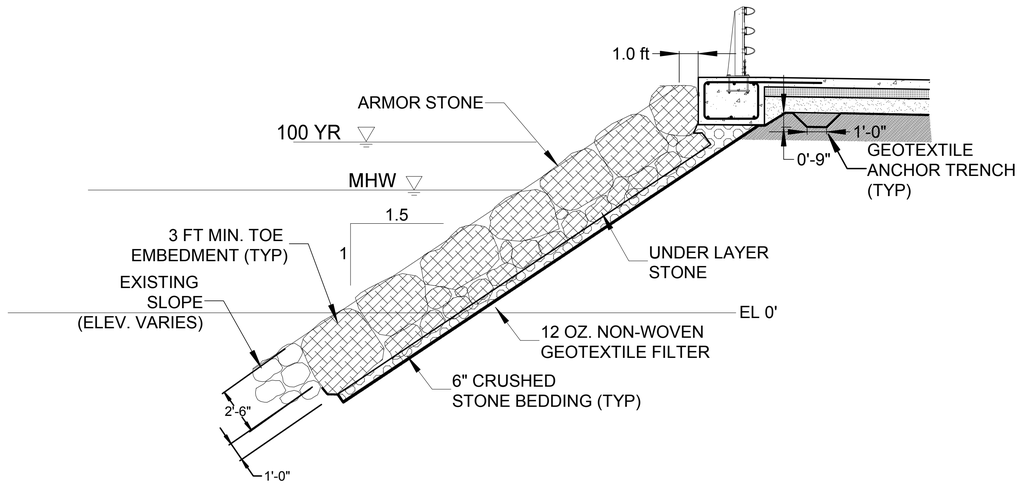
FOOTING LAP JOINT DETAIL (TYP)

2 0 2 4
(FEET)



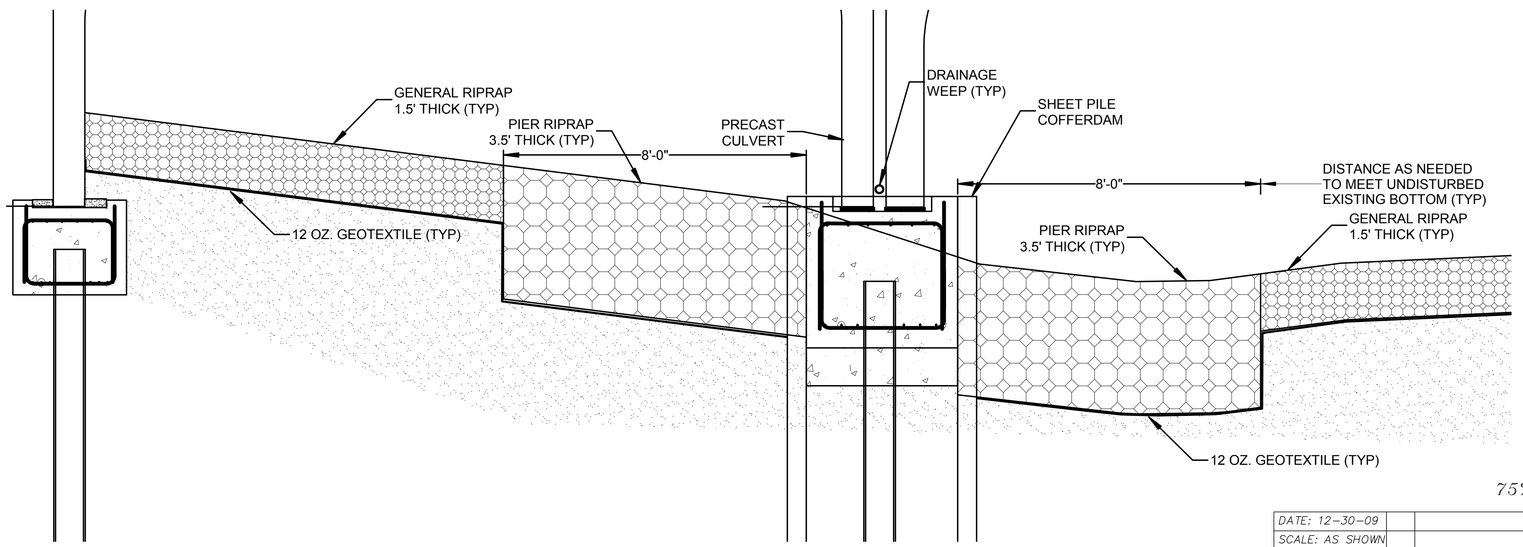
PILE HEAD DETAIL (TYP)

1 1/2 0 1 2 3
(FEET)



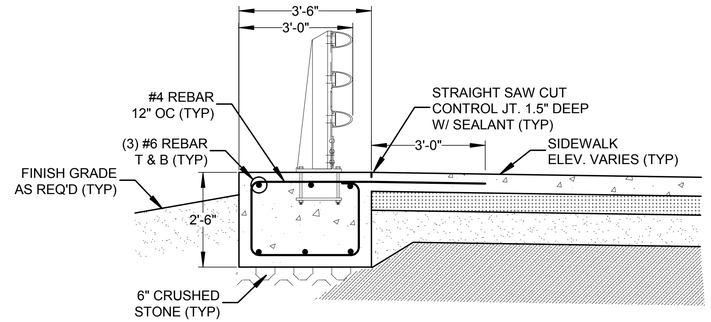
PROPOSED REVETMENT SECTION - TYPICAL

4 0 4 8
(FEET)



PROPOSED RIPRAP SECTION - TYPICAL

2 0 2 4
(FEET)



GRADE BEAM DETAIL (TYP)

2 0 2 4
(FEET)

MAPLEWOOD AVE
CULVERT REPLACEMENT &
NORTH MILL POND RESTORATION
PORTSMOUTH, NH

WATERFRONT ENGINEERS LLC
3 Linda Lane
Stratham, New Hampshire
(603) 772-3706
www.waterfrontengineers.com

75% DESIGN NOT FOR CONSTRUCTION

DATE: 12-30-09				
SCALE: AS SHOWN				
DRAWN BY: VARIES				
DESIGN BY: DCM				
APPROVED BY:DCM				
PROJECT NO:1095				
FILE: DETAILS				
	NO.	REVISION	APP'D	DATE

MISC DETAILS

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

S-7

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

WATERFRONT ENGINEERS LLC
ALTUS ENGINEERING, INC.
HAIGHT ENGINEERING, PLLC

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
75% DESIGN SUBMISSION

Date: 12/30/2009
Plan Date: 12/30/2009
Location: **Maplewood Ave & North Mill Pond**
Portsmouth, NH

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	SUBTOTAL
DEMOLITION					
Clear and Grub	SF	225	$50	$11,250	
Tree Removal	EA	10	$250	$2,500	
Saw Cut	LF	525	$3	$1,722	
Pavement	SY	1575	$7	$10,316	
Concrete (Sidewalk, Rubble, Block Wall)	SY	600	$7	$3,930	
Granite Curbing Remove and Salvage	LF	800	$10	$8,000	
Catch Basins	EA	3	$800	$2,400	
Drain Line	LF	100	$10	$1,000	
Rip-Rap Remove and Salvage	SY	350	$25	$8,750	
Granite Bridge Support Rem. & Salvage	LS	1	$10,000	$10,000	
Bridge I.D. Sign Remove and Salvage	EA	4	$100	$400	
Metal Culvert with Concrete Footings	EA	1	$25,000	$25,000	
Site Excavation	CY	3700	$15	$55,500	
Chainlink Fence	LF	65	$10	$650	
Guardrail	LF	580	$125	$72,500	
					$213,918
EROSION CONTROL					
Silt Fence	LF	600	$5	$3,150	
Stabilized Construction Entrance	EA	2	$4,000	$8,000	
Inlet Protection	EA	5	$30	$150	
					$11,300
EARTHWORK					
Earth Excavation(fill)	CY	2700	$22	$59,400	
Common Fill	CY	2700	$22	$59,400	
Slope Protection Riprap (revetment)	TONS	2000	$60	$120,000	
General Riprap	TONS	500	$45	$22,500	
Geotextile (Riprap/revetment Backing)	SY	1800	$4	$7,200	
Loam	CY	30	$16	$480	
Seed & Mulch	SY	250	$2	$450	
					$269,430
STORM DRAINAGE					
12" ADS	LF	125	$35	$4,375	
Excavate 6' Trench	CY	170	$4	$680	
Backfill Sand	CY	170	$3	$510	
Trench Compaction	CY	170	$1	$213	
Catch Basin Frame and Grate	EA	3	$2,500	$7,500	
4' Dia. CB includes excavation & backfill	VF	42	$330	$13,860	
Water Quality Unit (Stormceptor)	EA	2	$10,000	$20,000	
					$47,138

	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	SUBTOTAL
	SITE					
	PAVEMENT					
	Base Course 2-1/2"	TON	275	$125	$34,375	
	Wear Course 2"	TON	220	$110	$24,200	
	Prep Subgrade	SY	2650	$1	$2,359	
	Geotextile	SY	1900	$2	$3,800	
	Import Crushed Gravel 6"	CY	365	$28	$10,220	
	Import Gravel Subbase 12"	CY	780	$26	$20,280	
	Cold Plaining	SY	450	$14	$6,300	
	Re-set Bridge ID Sign	EA	2	$100	$200	
	No Parking Sign	EA	2	$225	$450	
	Bike Lane Sign	EA	2	$225	$450	
						$102,634
	PAVEMENT MARKINGS					
	Retrofractive - Single Line	LF	2050	$1	$2,050	
	Bike Lane Symbol	EA	3	$47	$140	
	Bike Lane Arrow	EA	2	$47	$93	
						$2,283
	CURBING					
	Install Vertical Granite Curb	LF	800	$30	$24,000	
	Re-set Vertical Granite Curb	LF	610	$20	$12,200	
	6" Concrete Walk (Fiber Reinforced)	SY	705	$110	$77,550	
						$113,750
	FINISHING					
	Bridge rail	LF	580	$350	$203,000	
	4' Chainlink Fence	LF	35	$25	$875	
	Light Pole & fixture	EA	12	$3,000	$36,000	
	Light Pole base	EA	12	$1,500	$18,000	
	Finish Grading	SY	4300	$0	$602	
						$258,477
	General Costs					
	MOB/DEMOB	LS	1	$50,000	$50,000	
	Vibration Monitoring	LS	1	$10,000	$10,000	
	Traffic Control Plan	LS	1	$10,000	$10,000	
	SWPPP & Reviews	LS	1	$10,000	$10,000	
	Traffic Maintenance (Officer/Flaggers)	Allow	1	$25,000	$25,000	
						$105,000
SITE UTILITIES						
	UTILITY EXCAVATION					
	TRENCHING FOR GAS MAIN	LF	460	$30	$13,800	
	TRENCHING FOR ELECTRIC, CABLE, FIRE ALARM CONDUIT	LF	410	$40	$16,400	
						$30,200
	REMOVAL AND DISPOSAL OF EXISTING UTILITIES	LS	1	$25,000	$25,000	
						$25,000
	SANITARY SEWER					
	SEWER SIPHON TANK AND FIT UP	EA	2	$30,000	$60,000	
	SEWER MANHOLES	EA	5	$5,000	$25,000	
	24" PVC SDR 35	LF	125	$200	$25,000	
	10" HDPE FUSED JOINT SEWER SIPHON	LF	360	$500	$180,000	
	12" HDPE FUSED JOINT SEWER SIPHON	LF	180	$550	$99,000	
	BYPASS PUMPING	LS	1	$20,000	$20,000	
	TESTING	LS	1	$4,000	$4,000	
						$413,000
	WATER					
	WATERLINE TEE (8")	EA	2	$500	$1,000	
	WATERLINE TEE (8"x16")	EA	2	$500	$1,000	
	WATERLINE (8")	LF	45	$75	$3,375	

	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	SUBTOTAL
	WATERLINE (16")	LF	355	$120	$42,600	
	WATERLINE GATE (8")	EA	4	$1,500	$6,000	
	WATERLINE GATE (16")	EA	2	$5,000	$10,000	
	WATERLINE (24" SLEEVE)	LF	100	$140	$14,000	
	WATERLINE BENDS (16")	EA	4	$700	$2,800	
	WATERLINE CAP (8")	EA	2	$500	$1,000	
	WATERLINE CAP (16")	EA	2	$700	$1,400	
	WATERLINE SERVICE	LF	1	$400	$400	
	WATERLINE TESTING AND CLORINE INJECTION TAP	LS	1	$4,000	$4,000	
						$87,575
STRUCTURAL						
	CULVERTS					
	FOUNDATION PILES (HP10X57)	EA	38	$2,400	$91,200	
	PIER COFFERDAMS	EA	2	$33,000	$66,000	
	END FOOTINGS	CY	32	$800	$25,600	
	PIER FOOTINGS	CY	105	$800	$84,000	
	PRECAST CULVERTS	LS	1	$560,000	$560,000	
	STONEWORK (GRANITE ENDS)	SF	1,000	$100	$100,000	
	CRUSHED STONE	CY	150	$28	$4,200	
	INCIDENTAL MATERIALS	LS	1	$10,000	$10,000	
	RIPRAP (inside culverts)	TON	740	$45	$33,300	
	EXCAVATION/DREDGING	CY	1,700	$30	$51,000	
	GEOTEXTILE (abutment backing)	SY	130	$4	$520	
						$1,025,820
	WALLS					
	EXCAVATION	CY	1,600	$30	$48,000	
	FOUNDATION PILES (HP10X57)	EA	44	$2,400	$105,600	
	FOOTINGS	CY	220	$500	$110,000	
	STONEWORK (salvaged stone)	SF	1,900	$70	$133,000	
	CAP STONE	LF	230	$17	$3,910	
	BACKING CONCRETE	CY	265	$300	$79,500	
	GEOTEXTILE	SY	860	$4	$3,440	
	CRUSHED STONE	CY	260	$28	$7,280	
	BACKFILL (Crushed Gravel 6")	CY	970	$28	$27,160	
	GRADE BEAM	CY	70	$300	$21,000	
						$538,890

	SUBTOTAL		**$3,244,414**
		Contingency 10%	**$ 324,441**
Escalation from 2010 to 2012 at 3% per annum		Escalation	**$ 197,585**
	TOTAL	**$3,766,440**	

Exclusions:

No bedrock excavation

Contaminated soil handling & disposal

Professional services, including architectural and archeological services

Assumptions:

Maplewood Avenue will be closed to throguh traffic for 90-days

This is an engineers opinion of probable construction cost. The Engineer has no control over the cost of labor, materials, equipment or services furnished by others or over the Contractor(s) methods of determining prices or over competitive bidding or market conditions. Waterfront Engineers LLC cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from this opinion of probable cost.

CONTRACT DOCUMENTS AND SPECIFICATIONS

for

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

Bid Proposal #xx-xx

John P. Bohenko, City Manager

City of Portsmouth, New Hampshire

Prepared by:

City of Portsmouth
Engineering Division
Public Works Department

TABLE OF CONTENTS

City of Portsmouth
Portsmouth, New Hampshire
Department of Public Works

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

INVITATION TO BID

Sealed bid proposals, **plainly marked, Maplewood Avenue Culvert Replacement and North Mill Pond Restoration**, Bid Proposal #XX-XXX **on the outside of the mailing envelope as well as the sealed bid envelope,** addressed to the Finance/Purchasing Department, City Hall, 1 Junkins Avenue, Portsmouth, New Hampshire, 03801, will be accepted until **x:xx p.m., Month ,Year**; at which time all bids will be publicly opened and read aloud.

The project consists of reconstruction of the existing granite seawalls, remove existing culvert and replace with three natural bottom pre-fabricated concrete arch culverts, rebuild roadway, install bridge railings, lighting and inverted siphon sewer crossing and other aspects of project as provided in complete project description.

Specifications may be obtained from the City's web site: www.cityofportsmouth.com, by contacting the Finance/Purchasing Department on the third floor at the above address, or by calling the Purchasing Coordinator at 603-610-7227. Questions may be addressed to the Purchasing Coordinator. Addenda to this bid document, if any, including written answers to questions, will be posted on the City of Portsmouth website under the project heading.

There will be a mandatory pre-bid meeting on Date and Time... The pre-bid meeting will be held in the conference room located on the first floor of the Portsmouth Public Works Building located at 680 Peverly Hill Road in Portsmouth, NH.

Completion date will be **XXX** calendar days from the date of the Notice to Proceed. Liquidated damages shall be assessed at $100.00 per day.

Bidders must determine the quantities of work required and the conditions under which the work will be performed.

The City of Portsmouth reserves the right to reject any or all bids, to waive technical or legal deficiencies, to re-bid, and to accept any bid that it may deem to be in the best interest of the City.

Each Bidder shall furnish a bid security in the amount of ten percent (10%) of the bid. The Bid Security may be in the form of a certified check drawn upon a bank within the State of New Hampshire or a bid bond executed by a surety company authorized to do business in the State of New Hampshire, made payable to the City of Portsmouth, N.H.

The General Contractor will be permitted to subcontract portions of the work not to exceed an aggregate dollar value of 50% of the total contract bid amount in complete accordance with Section 108 of the State of New Hampshire Standard Specifications for Road and Bridge Construction.

INSTRUCTIONS TO BIDDERS

BIDDING REQUIREMENTS AND CONDITIONS

1. Special Notice to Bidders and Addenda

Appended to these instructions is a complete set of bidding and general contract forms. These forms may be detached and executed for the submittal of bids. The plans, specifications, and other documents designated in the proposal form will be considered as part of the proposal, whether attached or not.

The bidders must submit a statement of bidder's qualifications, if requested, subsequent to bid opening but prior to award.

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

2. Interpretation of Quantities in Bid Schedules

The quantities appearing in the bid schedule are approximate only and are prepared for the comparison of bids. Payment to the contractor will be made only for actual work performed and accepted in accordance with the contract. Any scheduled item of work to be done and materials to be furnished may be increased, decreased or omitted as hereinafter provided, and no claim for loss, anticipated profits or costs incurred in anticipation of work not ultimately performed will be allowed due to such increase or decrease.

3. Examination of Plans, Specifications and Site Work

The bidder is expected to examine carefully the site of the proposed work, the plans, standard specifications, supplemental specifications, special provisions and contract forms before submitting a proposal. The submission of a bid shall be considered conclusive evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the contract. It will be conclusive evidence that the bidder has also investigated and is satisfied with the sources of supply for all materials.

Plans, surveys, measurements, dimensions, calculations, estimates and statements as to the condition under which the work is to be performed are believed to be correct, but the contractors must examine for themselves, as no allowance will be made for any errors or inaccuracies that maybe found therein.

4. Familiarity with Laws

The bidder is assumed to have made himself or herself familiar with all federal and state laws and all local by-laws, ordinances and regulations which in any manner affect those engaged or employed on the work or affect the materials or equipment used in the work or affect the conduct of the work, and the bidder, if awarded the contract, shall be obligated to perform the work in conformity with said laws, by-laws, ordinances and regulations notwithstanding its ignorance thereof. If the bidder shall discover any provision in the plans or specifications which is in conflict with any such law, by-law, ordinance or regulation the bidder shall forthwith report it to the engineer in writing.

5. Preparation of Proposal

a) The bidder shall submit its proposal upon the forms furnished by the Owner. The bidder shall specify a lump sum price in figures, for each pay item for which a quantity is given and shall also show the products of the respective prices and quantities written in figures in the column provided for that purpose and the total amount of the proposal obtained by adding the amount of the several items. All words and figures shall be in ink or typed. If a unit price or a lump sum bid already entered by the bidder on the proposal form is to be altered it should be crossed out with ink, the new unit price or lump sum bid entered above or below it and initialed by the bidder, also with ink.

b) The bidder's proposal must be signed with ink by the individual, by one or more general partners of a partnership, by one or more members or officers of each firm representing a joint venture; by one or more officers of a corporation, by one or more members (if member-managed) or managers (if manager-managed) of a limited liability company, or by an agent of the contractor legally qualified and acceptable to the owner. If the proposal is made by an individual, his or her name and post office address must be shown, by a partnership the name and post office address of each general and limited partner must be shown; as a joint venture, the name and post office address of each venturer must be shown; by a corporation, the name of the corporation and its business address must be shown, together with the name of the state in which it is incorporated, and the names, titles and business addresses of the president, secretary and treasurer.

6. Nonconforming Proposals

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

- If the proposal is on a form other than that furnished by the Owner, or if the form is altered or any portion thereof is detached;
- If there are unauthorized additions, conditional or altered bids, or irregularities of any kind which may tend to make the proposal or any portion thereof incomplete, indefinite or ambiguous as to its meaning;
- If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award; or
- If the proposal does not contain a unit price for each pay item listed except in the case of authorized alter pay items.

7. Proposal Guaranty

No proposal will be considered unless accompanied by a bid bond, surety, or similar guaranty of the types and in an amount not less than the amount indicated in the Invitation to Bid. All sureties shall be made payable to the "City of Portsmouth". If a bid bond is used by the bidder it shall be:

- In a form satisfactory to the Owner;
- With a surety company licensed, authorized to do business in, and subject to the jurisdiction of the courts of the State of New Hampshire; and
- Conditioned upon the faithful performance by the principal of the agreements contained in the sub-bid or the general bid.

In the event any irregularities are contained in the proposal guaranty, the bidder will have four business days (not counting the day of opening) to correct any irregularities. The corrected guaranty must be received by 4:00 p.m. If irregularities are not corrected to the satisfaction of the Owner, the Owner, in its sole discretion, may rejected the bid.

8. Delivery of Proposals

When sent by mail, the sealed proposal shall be addressed to the Owner at the address and in the care of the official in whose office the bids are to be received. All proposals shall be filed prior to the time and at the place specified in the invitation for bids. Proposals received after the time for opening of the bids will be returned to the bidder, unopened.

9. Withdrawal of Proposals

A bidder will be permitted to withdraw his or her proposal unopened after it has been submitted if the Owner receives a request for withdrawal in writing prior to the time specified for opening the proposals.

10. Public Opening of Proposals

Proposals will be opened and read publicly at the time and place indicated in the invitation for bids. Bidders, their authorized agents, and other interested parties are invited to be present.

11. Disqualification of Bidders

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

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

12. Material Guaranty and Samples

Before any contract is awarded, the bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the construction of the work, and the Owner may, in its sole discretion, reject the bid based on the contents of the statement or as a result of the failure of the bidder to submit the statement.

AWARD AND EXECUTION OF CONTRACT

1. Consideration of Proposals

a) After the proposals are opened and read, they will be compared on the basis of the total price for all sections of work to be charged to perform the work and any such additional considerations as may be identified in the bid documents. The results of such comparisons will be immediately available to the public. In case of a discrepancy between the prices written in words and those written figures, the prices written in words shall govern. In case of a discrepancy between the total shown in the proposal and that obtained by adding the products of the quantities of items and unit bid prices, the latter shall govern.

b) The Owner reserves the right to reject any or all proposals, to waive technicalities or to advertise for new proposals, if, in the sole discretion of the Owner, the best interest of the City of Portsmouth will be promoted thereby.

2. Award of Contract

Within 30 calendar days after the opening of proposals, if a contract is to be awarded, the award will be made to the lowest responsible and qualified bidder whose proposal complies with all the requirements prescribed. The successful bidder will be notified, in writing, mailed to the address on his or her proposal, that his or her bid has been accepted and that the bidder has been awarded the contract.

The award shall not be considered official until such time that a Purchase Order, fully executed contract or an award letter has been issued by the Finance Director. No presumption of award shall be made by the bidder until such documents are in hand. Verbal notification of award is not considered official. Any action by the bidder to assume otherwise is done so at his/her own risk and the City will not be held liable for any expense incurred by a bidder that has not received an official award.

3. Cancellation of Award

The Owner reserves the right to cancel the award of any contract at any time before the execution of such contract by all parties without any liability of the Owner.

4. Return of Proposal Guaranty

All proposal guaranties, except those of the three lowest bidders, will be returned upon request following the opening and checking of the proposals. The proposal guaranties of the three lowest bidders will be returned within ten days following the award of the contract if requested.

5. Contract Bond

At the time of the execution of the contract, the successful bidder shall furnish:

- Labor and materials payment bond in the sum equal to 100 percent of the contract amount.

At the time of project completion, the Owner may, in its sole discretion, permit the Contractor to substitute a maintenance bond in lieu of holding retainage for the entire guaranty period. If a bond is furnished it shall meet the following criteria:

- The bond shall be in an amount equal to 20 percent of the contract amount. Such bond shall guarantee the repair of all damage due to faulty materials or workmanship provided or done by the contractor. The

guarantee shall remain in effect for a period of one year after the date of final acceptance of the job by the Owner.

Each bond shall be: (1) in a form satisfactory to the Owner; (2) with a surety company licensed and authorized to do business and with a resident agent designated for services of process in the State of New Hampshire; and (3) conditioned upon the faithful performance by the principal of the agreements contained in the original bid. All premiums for the contract bonds are to be paid by the contractor.

6. Execution and Approval of Contract

The successful bidder is required to present all contract bonds, to provide proof of insurance, and to execute the contract within 10 days following receipt of the City's notification of acceptance of the bid. No contract shall be considered as in effect until it has been fully executed by all parties.

7. Failure to Execute Contract

Failure to execute the contract and file an acceptable bond within 10 days after notification of acceptance of bid shall be just cause for the cancellation of the award and the forfeiture of the proposal guarantee which shall become the property of the Owner, not as a penalty, but in liquidation of damages sustained. Award may then be made to the next lowest responsible bidder, or the work may be re-advertised as the Owner may determine in its sole discretion.

PROPOSAL FORM

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

CITY OF PORTSMOUTH, N.H.

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

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

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

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

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

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

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

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

CITY OF PORTSMOUTH

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

PROPOSAL FORM

CONTRACTOR'S BID SCHEDULE

BID ITEM	EST. QUANT.	UNITS	DESCRIPTION		UNIT PRICE	EXTENDED TOTAL
SCHEDULE 1 - SEWERS						
		LF	24" PVC SDR 35 sewer pipe all depths, A46 _____ _____Dollars and _____ Cents per	LF		
		VF	4' diameter sewer manholes including excavation and backfill: _____ _____Dollars and _____ Cents per	VF		
		VF	5' diameter sewer manholes including excavation and backfill: _____ _____Dollars and _____ Cents per	VF		
		EA	Inverted Sewer Siphon inlet structure: _____ _____Dollars and _____ Cents per	EA		
		EA	Inverted Sewer Siphon outlet structure: _____ _____Dollars and _____ Cents per	EA		
		EA *	Remove sewer manholes including fill materials and disposal of cone section and salvage of frames and cover to DPW: _____ _____Dollars and _____ Cents per	EA *		
		CY *	Furnish and Install Flowable Fill where directed: _____ _____Dollars and _____ Cents per	CY *		

		LS	Furnish and Install Temporary Bypass Pumping including piping and maintenance of sewer flows: _____ _____Dollars and _____ Cents per	LS		
1.14	1	LS	Develop and maintain Health and Safety Plan: _____ _____Dollars and _____ Cents per	LS		
1.18	3,000	LF	Video Inspection: _____ _____Dollars and _____ Cents per	LF		
SUBTOTAL - SCHEDULE 1						
SCHEDULE 2 - DRAINS						
		LF	12" CPE pipe, all depths, including earth excavation, fittings, backfill, and dewatering: _____ _____Dollars and _____ Cents per	LF		
		VF	4' diameter drain manhole including excavation and backfill: _____ _____Dollars and _____ Cents per	VF		
		EA	Furnish and install Storm Water Qualityunit: _____ _____Dollars and _____ Cents per	EA		
SUBTOTAL - SCHEDULE 2						
SCHEDULE 3 - WATER						

		LF	8" diameter ductile iron watermain including earth excavation, fittings not paid for under another item, backfill, and testing: _____ _____Dollars and _____ Cents per	LF		
		LF	16" diameter ductile iron watermain including earth excavation, fittings not paid for under another item, backfill, and testing: _____ _____Dollars and _____ Cents per	LF		
		LF	24" diameter ductile iron watermain sleeve including earth excavation:_____ _____ _____Dollars and _____ Cents per	LF		
		LF *	Furnish and install, 1" copper water service pipe including earth excavation, backfill, insulation, dewatering and testing: _____ _____Dollars and _____ Cents per	LF *		
		EA	8" gate valve assembly including earth excavation, fittings not paid for under another item, backfill, insulation, dewatering and testing: _____ _____Dollars and _____ Cents per	EA		
		EA	16" gate valve assembly including earth excavation, fittings not paid for under another item, backfill, insulation, dewatering and testing: _____ _____Dollars and _____ Cents per	EA		
		EA	16" Butterfly valve assembly including earth excavation, fittings not paid for under another item, backfill, insulation, dewatering and testing: _____ _____Dollars and _____ Cents per	EA		

SUBTOTAL - SCHEDULE 3						
SCHEDULE 4 - RESTORATION						
		TON	Furnish and install 2-1/2" base course: _____ _____Dollars and _____ Cents per	TON		
		TON	Furnish and install 1-1/2" wearing course: _____ _____Dollars and _____ Cents per	TON		
		TON	Hot bituminous pavement, hand worked: _____ _____Dollars and _____ Cents per	TON		
		CY*	Roadbed excavation: _____ _____Dollars and _____ Cents per	CY*		
		SY*	Cold planing existing pavement: _____ _____Dollars and _____ Cents per	SY*		
		SY*	Furnish and install construction fabric where directed in accordance with the standard details: _____ _____Dollars and _____ Cents per	SY*		
		SY	4" concrete sidewalk (fiber reinforced): _____ _____Dollars and _____ Cents per	SY		
		LF	Installation of vertical granite curb: _____ _____Dollars and _____ Cents per	LF		
		LF	Reset vertical granite curb: _____ _____Dollars and _____ Cents per	LF		
SUBTOTAL - SCHEDULE 4						

SCHEDULE 5 - STRUCTURAL						
		CY *	Sediment removal including disposal: _____ _____Dollars and _____ Cents per	CY *		
		LF *	Additional foundation pile length (including splices): _____ _____Dollars and _____ Cents per	LF *		
		TON *	Furnish and install General Riprap: _____ _____Dollars and _____ Cents per	TON *		
SUBTOTAL - SCHEDULE 5						
SCHEDULE 6 - COMMON						
		LS	Mobilization: _____ _____Dollars and _____ Cents per	LS		
		LS	Vibration Monitoring: _____ _____Dollars and _____ Cents per	LS		
		CY *	Ledge removal including disposal: _____ _____Dollars and _____ Cents per	CY *		
		CY *	Additional excavation (where ordered by Engineer) (Minimum $5/C.Y., Maximum $10/C.Y.): _____ _____Dollars and _____ Cents per	CY *		
		CY *	Furnish and install crushed gravel: _____ _____Dollars and _____ Cents per	CY *		

		EA	Furnish and install light pole bases, lights, wiring, conduit and electrifyl: _____ _____Dollars and _____ Cents per	EA		
		LF	Furnish and install electical conduit including earth excavation, fittings, backfill, coordination with utility company, and dewatering: _____ _____Dollars and _____ Cents per	LF		
		CY *****	Furnish and install screened gravel: _____ _____Dollars and _____ Cents per	CY *		
		CY *****	Furnish and install bank-run gravel (where ordered by Engineer) (Minimum $8/C.Y., Maximum $20/C.Y.): _____ _____Dollars and _____ Cents per	CY *		
		LS	Prepare a Traffic Control Plan: _____ _____Dollars and _____ Cents per	LS		
		UNIT	Maintenance of Traffic in accordance with the Traffic Control Plan including furnishing **two (2)** portable message boards: _____ _____Dollars and _____ Cents per	UNIT		
		Allow	Uniformed officer for traffic control: _____ _____Dollars and _____ Cents per	Allow		
		HRS *****	Uniformed flagger for traffic control: _____ _____Dollars and _____ Cents per	HRS *		

		LS	Develop an erosion control and stormwater pollution prevention plan (SWPPP) for approval and obtain NPDES Construction permit: _____ _____Dollars and _____ Cents per	LS		
		LS	Implement and maintain approved erosion control plan and SWPPP: _____ _____Dollars and _____ Cents per	LS		
		LF *	Remove and dispose of Asbestos Cement pipe, all diameters including earth excavation, backfill, disposal, and dewatering: _____ _____Dollars and _____ Cents per	LF *		
		Allow	Geotechnical testing (field work only): _____ Dollars and Cents per	Allow		
SUBTOTAL - SCHEDULE 6						
*** Means Indeterminate Quantity.**						
		Line 1	**TOTAL BID (Schedule 1 - 5)**			
Name of Contractor:					**Date:**	
Notes to Bidders:						
1. Award will be based on Engineers Estimate of Quantities and Contractor Bid for totals of Schedules 1 through 5.						

Notes:

1. All prices must be written in ink. Prices must be written in words as well as figures for the entire proposal. In case of discrepancy, the amount in words shall govern.

2. All prices given shall include items delineated in accordance with the Drawings, Specifications and Contract Documents, as well as any incidental items necessary to complete construction.

ALL 1	Allowance: Uniformed Police Officer Traffic Detail Fourteen Thousand Dollars and no cents	$14,000.00
BASE	Base Bid: Rail, concrete repair, etc. See General Note #4. _____ dollars and _____ cents.	$_____
	CITY OF PORTSMOUTH MAPLEWOOD AVE CULVERT REPLACEMENT TOTAL LUMP SUM BASE BID INCLUDING ALLOWANCE	
	_____ dollars and _____ cents.	$_____

ALT#1	Alternate #1: Replace w-beam rail with galvanized rail painted black. See General Note #3. _____ dollars and _____ cents.	$_____

BID	Bid: Hourly rate for traffic control Flagger _____ dollars and _____ cents per hour	$_____

Total in Figures $_____

In Words $_____

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

_____
Date

_____
Company By:_____
Signature

_____ Title:_____
Business Address

_____
City, State, Zip Code Telephone:_____

The Bidder has received and acknowledged Addenda No._____through _____.

All Bids are to be submitted on this form and in a sealed envelope, plainly marked on the outside with the Bidder's name and address and the Project name as it appears at the top of the Proposal Form.

By:_____
Signature

BID SECURITY BOND

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

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned

_____, as Principal, and

_____, as Surety, are hereby

held and firmly bound unto _____

IN THE SUM OF _____

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

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

_____ _____

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

_____

_____

_____

NOW THEREFORE,

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

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

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

BID SECURITY BOND (continued)

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

IN WITNESS WHEREOF, the parties hereto have duly executed

this bond on the _____ day of _____, 20__.

_____L.S.
(Name of Principal)

(SEAL)

BY _____

_____
(Name of Surety)

BY _____

STATEMENT OF BIDDER'S QUALIFICATIONS

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

1. Name of Bidder

2. Permanent Main Office Address

3. Form of Entity

4. When Organized

5. Where Organized

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

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

8. General character of work performed by your company.

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

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

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

12. List your last 10 contracts of $200,000 or more recently performed, stating:
    A. the approximate cost for each
    B. the nature of the work
    C. the month and year completed

    If the Bidder has performed fewer than 10 contracts of $200,000 or more, provide all project history since the date of the organization or the last three years.

13. List your major equipment available for this contract.

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

STATEMENT OF BIDDERS QUALIFICATIONS (continued)

15. List any subcontractors whom you would expect to use for the following (unless this work is to be done by your own organization).
    a. Guardrail Installation _____
    b. Concrete Repairs _____

16. With what banks do you do business?

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

    b. Latest Financial Statements, certified audited if available, prepared by an independent certified public accountant, must be attached and Certified Audited Statement are preferred. Internal statements may be attached only if independent statements were not prepared.

Dated at _____ this _____ day of _____, 20___.

_____
Name of Bidder

BY_____

TITLE_____

State of_____

County of_____

_____being duly sworn, deposes and

says that the bidder is _____of_____
(Name of Organization)

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

Sworn to before me this ____day of _____, 20__.

_____
Notary of Public

My Commission expires_____

AUTHORIZATION AND RELEASE

As part of the Bid, the Bidder shall execute and submit the Authorization and Release set forth below:

By submitting this Bid, Bidder authorizes Owner, Engineer, and their employees and agents to make such inquiries as they deem necessary to determine whether Bidder's qualifications are satisfactory. Bidder hereby agrees to release and hold harmless Owner, Engineer and any person or entity requested to respond to Owner or Engineer regarding Bidder's qualifications from any and all claims and causes of action related to such inquiries, including without limitation actions for defamation, slander or interference with contractual relations.

Bidder: _____

By: _____

Name: _____

CONTRACT AGREEMENT

MAPLEWOOD AVE CULVERT REPLACEMENT

THIS AGREEMENT made as of the XXth day of XX in the year XXXX**,** by and between the City of Portsmouth, New Hampshire (hereinafter call the Owner) and XXXXXXXX (hereinafter called the Contractor),

WITNESSETH; that the Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE I- Work - The Contractor shall perform all work as specified or indicated in the Contract Documents for the completion of the Project. The Contractor shall provide, at his expense, all labor, materials, equipment and incidentals as may be necessary for the expeditious and proper execution of the Project.

ARTICLE II - ENGINEER - The Director of Public Works or his authorized representative will act as Engineer in connection with completion of the Project in accordance with the Contract Documents.

ARTICLE III - CONTRACT TIME - Work will commence and be completed in accordance with the Notice to Proceed.

ARTICLE IV - CONTRACT PRICE - Owner shall pay Contractor for pavement repair for only those roads designated for repair by Owner. Owner makes no representation that it will undertake all the pavement repairs estimated in the bid proposal form. Contractor will be paid only for work performed in accordance with the Contract Documents as shown under item prices in the Bid Proposal.

ARTICLE V - PAYMENT - Partial payments will be made in accordance with the Contract Documents. Upon final acceptance of the work and settlement of all claims, Owner shall pay the Contractor the unpaid balance of the Contract Price, subject to additions and deductions provided for in the Contract Documents.

ARTICLE VI - RETAINAGE - To insure the proper performance of this Contract, the Owner shall retain certain amounts in the percentage of the Contract Price and for the time specified as provided in the Contract Documents.

ARTICLE VII - LIQUIDATED DAMAGES - In event the Contractor fails to successfully execute the work within the specified contract time the Owner shall assess the Contractor liquidated damages in the amount of **one hundred dollars ($100)** for each calendar day beyond the specified completion date for each section of work. Liquidated damages shall be deducted from the Contract Price prior to final payment of the Contractor.

CONTRACT AGREEMENT (continued)

ARTICLE VIII – CONTRACT DOCUMENTS – The Contract Documents which comprise the contract between Owner and Contractor are attached hereto and made a part hereof and consist of the following:

8.1 This Agreement
8.2 Contractor's Bid and Bonds
8.3 Notice of Award, Notice to Proceed
8.4 Instruction to Bidders
8.5 General Requirements, Control of Work, Temporary Facilities, Measurement and Payment, Standard Specifications, Special Requirements, Utilities and Drawings
8.6 Insurance Requirements
8.7 Technical Specifications
8.8 Drawings
8.9 Special Provisions
8.10 Any modifications, including change orders, duly delivered after execution of this Agreement.

ARTICLE IX – TERMINATION FOR DEFAULT – Should contractor at any time refuse, neglect, or otherwise fail to supply a sufficient number or amount of properly skilled workers, materials, or equipment, or fail in any respect to prosecute the work with promptness and diligence, or fail to perform any of its obligations set forth in the Contract, Owner may, at its election, terminate the employment of Contractor, giving notice to Contractor in writing of such election, and enter on the premises and take possession, for the purpose of completing the work included under this Agreement, of all the materials, tools and appliances belonging to Contractor, and to employ any other persons to finish the work and to provide the materials therefore at the expense of the Contractor.

ARTICLE X – INDEMNIFICATION OF OWNER – Contractor will indemnify Owner against all suits, claims, judgments, awards, loss, cost or expense (including without limitation attorneys fees) arising in any way out of the Contractor's negligent performance or non-performance of its obligations under this Contract. Contractor will defend all such actions with counsel satisfactory to Owner at its own expense, including attorney's fees, and will satisfy any judgment rendered against Owner in such action.

ARTICLE XI – PERMITS – The Contractor will secure at its own expense, all permits and consents required by law as necessary to perform the work and will give all notices and pay all fees and otherwise comply with all applicable City, State, and Federal laws, ordinances, rules and regulations.

ARTICLE XII – INSURANCE – The Contractor shall secure and maintain, until acceptance of the work, insurance with limits not less than those specified in the Contract.

ARTICLE XIII – MISCELLANEOUS –

A. Neither Owner nor Contractor shall, without the prior written consent of the other, assign, sublet or delegate, in whole or in part, any of its rights or obligations under any of the Contract Documents; and, specifically not assign any monies due, or to become due, without the prior written consent of Owner.

CONTRACT AGREEMENT (continued

B. Owner and Contractor each binds himself, his partners, successors, assigns and legal representatives, to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents.

C. The Contract Documents constitute the entire Agreement between Owner and Contractor and may only be altered amended or repealed by a duly executed written instrument.

D. The laws of the State of New Hampshire shall govern this Contract without reference to the conflict of law principles thereof.

E. Venue for any dispute shall be the Rockingham County Superior Court unless the parties otherwise agree.

IN WITNESS WHEREOF, the parties hereunto executed this

AGREEMENT the day and year first above written.

BIDDER:

BY:_____

TITLE:_____

CITY OF PORTSMOUTH, N.H.

BY:_____
John P. Bohenko

TITLE: City Manager

NOTICE OF INTENT TO AWARD

Date:

TO:

IN AS MUCH as you were the low responsible bidder for work entitled:

MAPLEWOOD AVE CULVERT REPLACEMENT PROJECT

You are hereby notified that the City intends to award the aforesaid project to you.

Immediately take the necessary steps to execute the Contract and to provide required bonds and proof of insurance within ten (10) calendar days from the date of this Notice.

Prior to starting work you must deliver to the Owner certificates of insurance and bonds which you are required to purchase and maintain in accordance with the Contract Documents. The City reserves the right to revoke this Notice if you fail to take the necessary steps to execute this Contract.

City of Portsmouth
Portsmouth, New Hampshire

Judie Belanger,
Finance Director

NOTICE TO PROCEED

DATE:

PROJECT: **MAPLEWOOD AVE CULVERT REPLACEMENT PROJECT**

TO:

YOU ARE HEREBY NOTIFIED TO COMMENCE WORK IN ACCORDANCE

WITH THE AGREEMENT DATED, ON OR

BEFORE_____ AND THE DATE OF COMPLETION OF ALL WORK

SHALL BE ***(either*** xxxxxxxx xx, xxxx ***or*** xxxxxxxx xx, xxxx ***to be determined by the City and Contractor based on Part 1-4 of the General Requirements) .***

CITY OF PORTSMOUTH, N.H.

_____

BY: Steven F. Parkinson, PE

TITLE: Public Works Director

ACCEPTANCE OF NOTICE

RECEIPT OF THE ABOVE NOTICE TO
PROCEED IS HEREBY ACKNOWLEDGED BY

_____

This the _____day of_____ 20__

By:_____

Title:_____

CHANGE ORDER

Change Order # 1 Date of Issuance:

Owner: CITY OF PORTSMOUTH, N.H

Contractor:

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

Description:

Purpose of Change Order:

Attachments:

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIME
Original Contract Price: $	Original Completion Date:
Contract Price prior to this Change Order: $	Contract Time prior to this Change Order:
Net Increase of this Change Order: $	Net Increase or Decrease of this Change Order:
Contract Price with all approved Change Orders: $	Contract Time with all approved Change Orders:

RECOMMENDED:	APPROVED:	APPROVED:	
by_____	by_____	by_____	by_____
PW Director	City Finance	City Manager	Contractor

LABOR AND MATERIAL PAYMENT BOND

(This format provided for convenience, actual Labor and Material Bond is acceptable in lieu, if compatible)

Bond Number _____

KNOW ALL MEN BY THESE PRESENTS:

that _____

as Principal, hereinafter called Contractor, and _____ (Surety Company) a corporation organized and existing under the laws of the State of

_____ and authorized to do business in the State of New Hampshire hereinafter called Surety, are held and firmly bound unto the City of Portsmouth, N.H. Obligee, hereinafter called Owner, for the use and benefit of claimants as herein below defined, in the

amount of _____ Dollars ($_____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____ entered into a

contract with Owner for _____ in accordance with drawings and specifications prepared by the Public Works Department, 680 Peverly Hill Road, Portsmouth, N.H. 03801, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract and for the hire of all equipment, tools, and all other things contracted for or used in connection therewith, then this obligation shall be void, otherwise it shall remain in full force and effect, subject however, to the following conditions:

(1) A claimant is defined as one having a direct contract with the Principal or, with a subcontractor of the Principal for labor, material, equipment, or other things used or reasonably required for use in the performance of the Contract. "Labor and material" shall include but not be limited to that part of water, gas, power, light, heat, oil and gasoline, telephone service or rental of equipment applicable to the Contract.

(2) The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such a claimant, may sue on this bond for the use of such claimant, prosecute the suit by final judgment for such sum or sums as may be

LABOR AND MATERIAL PAYMENT BOND (continued)

justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any such suit or any costs or expenses of any such suit, and principal and surety shall jointly and severally indemnify, defend and hold the Owner harmless for any such suit, costs or expenses.

(3) No suit or action shall be commenced hereunder by any claimant:

(a) Unless Claimant, other than one having a direct contract with the Principal, shall have given notice to all the following:

The Principal, the Owner and the Surety above named, within six (6) calendar months after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the State of New Hampshire save that such service need not be made by a public officer.

(b) After the expiration of one (1) year following the date on which Principal ceased all work on said contract, it being understood , however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

(c) Other than in a State court of competent jurisdiction in and for the county or other political subdivision of the State in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere. (4) The amount of this bond may be reduced by and to the extent of any payment of payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed on record against said improvement, whether or not claim for the amount of such lien by presented under and against this bond.

Signed and sealed this _____ day of _____, 20____. In the presence of:

_____ BY: _____
(Witness) (Principal) (Seal)

_____
(Surety Company)

_____ BY: _____
(Witness) (Title) (Seal)

LABOR AND MATERIAL PAYMENT BOND (continued)

Note:
If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized Officer or Officers.

If this bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his Power of Attorney showing his authority to sign such Bonds.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Agreement.

MAINTENANCE BOND

At the Owner's election, a maintenance bond may be substituted for retainage at the completion of the project. If theOwner permits a maintenance bond, it shall be in the amount of **Twenty Percent (20%)** of the contract price with a corporate surety approved by the Owner. Such bond shall be provided at the time of Contract completion and shall guarantee the repair of all damage due to faulty materials or workmanship provided or done by the Contractor. This guarantee shall remain in effect for a period of one year after the date of final acceptance of the job by the Owner.

CONTRACTOR'S AFFIDAVIT

STATE OF _____:

COUNTY OF _____:

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

in and for said County and State personally appeared, _____
(Individual, Partner, or duly authorized representative of Corporate)

who, being duly sworn, according to law deposes and says that the cost of labor, material, and equipment and outstanding claims and indebtedness of whatever nature arising out of the performance of the Contract between

CITY OF PORTSMOUTH, NEW HAMPSHIRE

and _____
(Contractor)

of _____

Dated: _____

has been paid in full for Construction of: **MAPLEWOOD AVE CULVERT REPLACEMENT PROJECT**

_____
(Individual, Partner, or
duly authorized
representative of
Corporate Contractor)

Sworn to and subscribed
before me this _____day
of _____ 20____

_____

CONTRACTOR'S RELEASE

KNOW ALL MEN BY THESE PRESENTS that

_____(Contractor) of _____, County of

_____and State of _____

does hereby acknowledge that_____(Contractor)

has on this day had, and received from the CITY OF PORTSMOUTH NEW HAMPSHIRE, final and completed

payment for the Construction of:

MAPLEWOOD AVE CULVERT REPLACEMENT PROJECT

NOW THEREFORE, the said _____

(Contractor)

for myself, my heirs, executors, and administrators) (for itself, its successors and assigns) do/does by these presents remise, release, quit-claim and forever discharge the City of Portsmouth, New Hampshire, its successors and assigns, of and from all claims and demands arising from or in connection with the said Contract dated _____, and of and from all, and all manners of action and actions, cause and causes of action and actions, suits, debts, dues, duties, sum and sums of money, accounts, reckonings, bonds, bills, specifications, covenants, contracts, agreements, promises, variances, damages, judgments, extents, executions, claims and demand, whatsoever in law of equity, or otherwise, against the City of Portsmouth, New Hampshire, its successors and assigns, which (I, my heirs, executors, or administrators) (it, its successors and assigns) ever had, now have or which (I, my heirs, executors, or administrators) (it, its successors and assigns) hereafter can shall or may have, for, upon or by reason of any matter, cause, or thing whatsoever; from the beginning of record time to the date of these presents.

IN WITNESS WHEREOF,

Contractor:

_____ By:_____

print name of witness:_____ Its Duly Authorized _____

Dated: _____

INSURANCE REQUIREMENTS

Insurance shall be in such form as will protect the Contractor from all claims and liabilities for damages for bodily injury, including accidental death, and for property damage, which may arise from operations under this contract whether such operation by himself or by anyone directly or indirectly employed by him.

AMOUNT OF INSURANCE

A) Comprehensive General Liability:
Bodily injury or Property Damage - $2,000,000
Per occurrence and general aggregate

B) Automobile and Truck Liability:
Bodily Injury or Property Damage - $2,000,000
Per occurrence and general aggregate

Additionally, the Contractor shall purchase and maintain the following types of insurance:

A) Full Workers Comprehensive Insurance coverage for all people employed by the Contractor to perform work on this project. This insurance shall at a minimum meet the requirements of the most current laws of the State of New Hampshire.

B) Contractual Liability Insurance coverage in the amounts specified above under Comprehensive General Liability.

C) Product and Completed Operations coverage to be included in the amounts specified above under Comprehensive General Liability.

D) If the work requires the use of marine equipment and/or vehicles, marine insurance in commercially reasonable amounts may be required.

ADDITIONAL INSURED

All liability policies (including any excess policies used to meet coverage requirements) shall include the City of Portsmouth, New Hampshire as named Additional Insured.

1) The contractor's insurance shall be primary in the event of a loss.
2) The Additional Insured endorsement must include language specifically stating that the entity is to be covered for all activities performed by, or on behalf of, the contractor, including the City of Portsmouth's general supervision of the contractor.
3) City of Portsmouth shall be listed as a Certificate Holder. The City shall be identified as follows:

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

GENERAL REQUIREMENTS

PART 1 - SUMMARY

1.1 SCOPE OF WORK

A. The proposed work for this project includes replacement of existing corrugated steel barrel stone arch culvert with a new three barrel pre-cast concrete arched culvert.

1.2 LIMITS OF WORK

A. The project will begin at approximately the intersection Maplewood and Raynes Avenue including the existing causeway across the North Mill Pond and ending at the end of the first lot on the North side of Maplewood Avenue.

1.3 SURVEY/CONSTRUCTION

A. Only an existing conditions ground survey has been completed for this project. The Contractor shall field verify all dimensions within the project area and should be prepared to make any adjustments as required to perform the work and properly fit the new work to the project limits.

1.4 TIME

A. The Contractor may choose from two work windows within which to complete all work at the project site considered under this Contract. The first window is to complete all work at the project site contemplated under this contract between xxxxxxxx xx, xxxx and xxxxxxxx xx, xxxx. The second window is to complete all work at the project site contemplated under this contract between xxxxxxxx xx, xxxx and xxxxxxxx xx, xxxx.

The work window chosen by the Contractor will have no bearing on award of the contract.

1.4 INTENT OF CONTRACT

A. The intent of the Contract is to provide for the construction and completion in every detail of the work described.
   1. The Contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the terms of the Contract.
   2. The Contractor shall be required to conform to the intent of the plans and specifications. No extra claims shall be allowed for portions of the work not specifically addressed in the

plans and specifications but required to produce a whole and complete project, such work will be considered subsidiary to the bid items.

1.5 INCIDENTAL WORK

A. Incidental work items for which separate payment is not measured includes, but is not limited to, the following items:

1. Clean up
2. Construction Signs
3. Mobilization
4. Restoration of property
5. Cooperation with other contractors, abutters and utilities.
6. Accessories and fasteners or components required to make items paid for under unit prices or lump sum items complete and functional.
7. As the project is bid as a Lump Sum, it is expected that the submitted bid will include all work as noted on the plans or reasonably inferred to be necessary for a complete project.

1.6 ALTERATION OF PLANS OR OF CHARACTER OF WORK

A. The Owner reserves the right, without notice to Surety, to make such alterations of the plans or of the character of the work as may be necessary or desirable to complete fully and acceptably the proposed construction; provided that such alterations do not increase or decrease the contract cost. Within these cost limits, the alterations authorized in writing by the Owner shall not impair or affect any provisions of the Contract or bond and such increases or decreases of the quantities as a result from these alterations or deletions of certain items, shall not be the basis of claim for loss or for anticipated profits by the contractor. The contractor shall perform the work as altered at the contract unit price or prices.

GENERAL REQUIREMENTS (continued)

1.7 EXTRA WORK ITEMS

A. Extra work shall be performed by the Contractor in accordance with the specifications and as directed, and will be paid for at a price as provided in the Contract documents or

B. if such pay items are not applicable than at a price negotiated between the contractor and the Owner or at the unit bid price.

C. If the Owner determines that extra work is to be performed, a change order will be issued.

1.8 CHANGE ORDERS

A. The Owner reserves the right to issue a formal change order for any increase, decrease, deletion, or addition of work or any increase in contract time or price.

B. The contractor shall be required to sign the change order and it shall be considered as part of the Contract documents.

1.9 FINAL CLEAN UP

A. Before acceptance of the work, the contractor shall remove from the site all machinery, equipment, surplus materials, rubbish, temporary buildings, barricades and signs. All parts of the work shall be left in a neat and presentable condition. On all areas used or occupied by the contractor, regardless of the contract limits, the bidder shall clean-up all sites and storage grounds.

B. The items prescribed herein will not be paid for separately, but shall be paid for as part of the total contract price.

1.10 ERRORS AND INCONSISTENCY IN CONTRACT DOCUMENTS

A. Any provisions in any of the Contract Documents that may be in conflict with the paragraphs in these General Requirements shall be subject to the following order of precedence for interpretation.

1. Technical Specifications will govern General Requirements

GENERAL REQUIREMENTS (continued)

PART 2 - CONTROL OF WORK

2.1 AUTHORITY OF ENGINEER

A. All work shall be done under supervision of the Engineer and to his satisfaction. The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work; all questions that may arise as to the interpretation of the plans and specifications; and all questions as to the acceptable fulfillment of the Contract by the Contractor.

B. The Engineer will have the authority to suspend the work wholly or in part for such periods as he may deem necessary due to the failure of the Contractor to correct conditions unsafe for workers or the general public; for failure to carry out provisions of the Contract; for failure to carry out orders; for conditions considered unsuitable for the prosecution of the work, including unfit weather; or for any other condition or reason deemed to be in the public interest. The Contractor shall not be entitled any additional payments arising out of any such suspensions.

C. The Owner reserves the right to demand a certificate of compliance for a material or product used on the project. When the certificate of compliance is determined to be unacceptable to the Engineer the Contractor may be required to provide engineering and testing services to guarantee that the material or product is suitable for use in the project, at its expense (see Sample of Certificate of Compliance).

D. The Contractor shall plan paving operations so that the Engineer will have sufficient advanced notification to provide the necessary inspection and testing. Sufficient notification will be considered 48 hours.
   1. In the event that paving is suspended, the 48 hour notification shall be required again before restarting the paving operations unless otherwise agreed by the Engineer.
   2. Consistent notification of paving intent without actually paving will result in the following actions:
      a. First offense – verbal warning
      b. Second offense – written warning
      c. Third and subsequent – liquidated damages will be charged for one working day.

2.2 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK

A. If the City determines that non-conforming work substantially conforms to the Contract, the City may accept the non-conforming work provided that the City may require a credit to the City to be deducted from amounts otherwise due the Contractor. If the City and

GENERAL REQUIREMENTS (continued)

Contractor cannot agree to the amount of the credit, the work shall be unacceptable work.

B. The Contractor shall remove, replace, or otherwise correct all unacceptable work as directed by the City at the expense of the Contractor, without cost or liability to the City.

C. Prior to Final Acceptance and upon written order by the City, the Contractor shall remove or uncover unauthorized work. After examination, the Contractor shall rebuild the uncovered work to a condition conforming to the Contract at the expense of the Contractor and without cost or liability to the City. Any delay arising from unauthorized work shall be an inexcusable delay.

D. Prior to Final Acceptance and upon written order by the City, the Contractor shall uncover un-inspected work. After examination, the Contractor shall rebuild the uncovered work to a condition conforming to the Contract.
   1. If the City determines that the un-inspected work is acceptable, the uncovering, removing, and rebuilding will be paid for as extra work and any delay resulting there from shall be an excusable delay.
   2. If the City reasonably determines that the un-inspected work is unacceptable, the uncovering, removing, and rebuilding shall be at the Contractor's expense and any delay resulting there from shall be an inexcusable delay.

2.3 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPES

A. The Contractor shall use every precaution to prevent injury or damage to wires, poles, or other property of public utilities; trees, shrubbery, crops, and fences along and adjacent to the right-of-way, all underground structures such as pipes and conduits, within or outside of the right-of-way; and the Contractor shall protect and carefully preserve all property marks until an authorized agent has witnessed or otherwise referenced their location.

B. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

GENERAL REQUIREMENTS (continued)

C. 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 as a result of the failure to perform work by the Contractor, the

Contractor shall restore, at its 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 the Contractor shall make good such damage or injury in an acceptable manner.

D. The Contractor shall be responsible for the preservation of all trees on the project which are not called to be removed. Any trees damaged by the Contractor's operations shall be repaired using approved tree dressing or paint in accordance with the appropriate provisions of Section 650-658 inclusive of the NHDOT Standard Specifications. Damaged trees must be replaced if so determined by the City Arborist, in his or her sole discretion.

E. If the Contractor fails to repair, rebuild or otherwise restore such property as may be deemed necessary, the Owner, after 48 hours notice, may proceed to do so, and the cost thereof may be deducted from any money due or which may become due the Contractor under the contract.

F. It is the intent of the Parties that the Contractor preserve, to as great an extent as possible, the natural features of the site.

2.4 MAINTENANCE DURING CONSTRUCTION

A. The Contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and workers to ensure that the structure is kept in satisfactory conditions at all times.

2.5 SAFETY PRECAUTIONS

A. Upon commencement of work, the Contractor shall be responsible for initiating, maintaining and supervising all safety precautions necessary to ensure the safety of employees on the site, other persons who may be affected thereby, including the public, and other property at the site or adjacent thereto.

B. During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

GENERAL REQUIREMENTS (continued)

C. At the end of each working day, the construction site shall be left in a safe and orderly manner. All materials and equipment on site that have not been incorporated into the work shall be placed in secured areas outside the traveled way and off private property, unless the Contractor has obtained agreements with said property owners for storage of materials and equipment. Portions of the work which are in progress shall be protected to avoid damage to the work and/or protect pedestrians and vehicles utilizing the project area.

2.6 PERMITS

A. It will be the responsibility of the Contractor to obtain all permits required for the operation of equipment in, or on, all city streets and public ways.

2.7 MAINTENANCE AND PROTECTION OF TRAFFIC

A. The Contractor shall schedule such police officers or other traffic control personnel as the Engineer deems necessary for the direction and control of traffic within the project site.

B. An Allowance has been included on the Proposal Form that is intended to be sufficient to cover the payment of police officers used for the direction and control of traffic for the project duration. The Contractor shall be responsible for the scheduling, direction and supervision of Traffic Officers.

C. A line item is included on the Proposal Form to receive a hourly rate bid for the use of flaggers for direction and control of traffic. This line item is included in the event that police officers are not required by the City.

D. At least one lane, shall be maintained between 7 A.M. and 7 P.M. unless approved by the Engineer. The maximum work zone in the restricted lane shall not exceed 200 feet unless waived by the City.

E. The Contractor shall be responsible to insure the safe passage of pedestrians thru the work area at all times. At least one (1) pedestrian access shall be provided at all times.

F. The Contractor is responsible for developing a traffic maintenance and signing plan and must get approval from the Engineer before any construction begins. Guidelines for the construction and erection of barricades, warning signs, etc. may be found in the most recent edition of "Manual on Uniform Traffic Control Devices for Streets and Highways".

GENERAL REQUIREMENTS (continued)

2.8 BARRICADES AND WARNING SIGNS

A. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public.

B. The Contractor shall be held responsible for all damage to the work due to any failure of the warning devices to properly protect the work from the traffic, pedestrians or other causes.

C. Roadway closed to traffic shall be protected by effective barricades.
   1. Obstructions shall be illuminated during hours of darkness.
   2. Suitable warning signs shall be provided to control and direct traffic in a proper manner, as approved by the engineer.

D. The work prescribed herein will not be paid for separately but will be paid for as part of the Contract Price unless specifically appearing as a bid item.

2.9 TRAFFIC SIGNS

A. All existing traffic signs which are to be removed during construction shall be carefully dismounted and the posts removed and shall be stacked in an area approved by the City Engineer. The Contractor shall protect the signs from damage while in his possession and shall repair, at no additional cost to the City, any damages caused by his operations.

B. Stop signs are to be maintained at their original locations at all times during the progress of the work.

C. Prior to the start of any construction work, the Contractor and Engineer shall prepare a mutually acceptable inventory of all signs within the project limits which shall be used as a guide for replacement should signs be removed for construction purposes. The signs shall be inventoried by station location and approximate offset, legend of sign and post.

D. This work shall be considered as subsidiary obligation of the contract for which no specific payment will be made. All signs shall conform to the MUTCD.

2.10 LIMITATION OF OPERATIONS

A. The Contractor shall conduct the work at all times in such a manner and in such sequence as will assure the least interference with traffic.

GENERAL REQUIREMENTS (continued)

B. The Contractor shall not open up work to the prejudice or detriment of work already started.

C. The Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections, if finishing such section is essential to public convenience.

GENERAL REQUIREMENTS (continued)

PART 3 - TEMPORARY FACILITIES

3.1 STORAGE FACILITIES

A. The Contractor shall not store materials or equipment in a public right-of-way beyond the needs of one working day. Equipment and materials shall be stored in an approved location.

B. The Contractor shall protect all stored materials from damage by weather or accident and shall insure adequate drainage at and about the storage location.

C. Prior to final acceptance of the work all temporary storage facilities and surplus stored materials shall be removed from the site.

3.2 SANITARY FACILITIES

A. The Contractor shall provide for toilet facilities for the use of the workers employed on the work.

B. Temporary toilet facilities may be installed provided that the installation and maintenance conform with all State and local laws, codes, regulations and ordinances governing such work. They shall be properly lit and ventilated, and shall be kept clean at all times.

C. Prior to final acceptance of the work all temporary toilet facilities shall be removed from the site.

3.3 TEMPORARY WATER

A. The Contractor shall make all arrangements with the local water department for obtaining water connections to provide the water necessary for construction operations and shall pay all costs.

3.4 TEMPORARY ELECTRICITY

A. The Contractor shall make all arrangements with the Public Service Company for obtaining electrical connections to provide the electrical power necessary for construction operations and security lighting and shall pay all electrical connection and power costs.

B. The Contractor shall be responsible for obtaining an electrical permit from the City Electrical Inspector.

GENERAL REQUIREMENTS (continued)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT OF QUANTITIES

A. All work completed under the contract will be measured according to the United States standard measure.

B. The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice. Unless otherwise stated all quantities measured for payment shall be computed or adjusted for "in place" conditions.

C. Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures having an area of 9 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the dimensions shown on the plans or ordered in writing.

D. Structures will be measured according to lines shown on the plans or as ordered unless otherwise provided for elsewhere in the specifications.

E. In computing volumes of excavation, embankment, and borrow, the average end area method will be used. Where it is impracticable to measure by the cross-section method, acceptable methods involving three-dimensional measurement may be used. When measurement of borrow in vehicles is permitted, the quantity will be determined as 80 percent of the loose volume.

F. In computing volumes of concrete, stone and masonry, the prismoidal method will be used. The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois.

G. Except as specified below, all materials that are measured or proportioned by weight shall be weighed on scales which the Contractor has had sealed by the State or by a repairman registered by the Commissioner of Agriculture. All weighing shall be performed in a manner prescribed under the Rules and Regulations of the Bureau of Weights and Measures of the New Hampshire Department of Agriculture.

H. Weighing of materials on scales located outside New Hampshire will be permitted for materials produced or stored outside the state, when requested by the Contractor and approved. Out-of-state weighing in order to be approved, must be performed by a licensed public weigh master or a person of equal authority in the state concerned on scales accepted in the concerned state.

GENERAL REQUIREMENTS (continued)

I. Each truck used to haul material being paid for by weight shall bear a plainly legible identification mark, and if required, shall be weighed empty daily at such times as directed.

J. When material is weighed, the individual weight slips, which shall be furnished by the Contractor, for trucks, trailers, or distributors, shall show the following information: the date; the project; the material or commodity; the dealer or vendor; the Contractor or Subcontractor; the location of the scales; the vehicle registration number or other approved legible identification mark; the tare and net weights, with gross weights when applicable; and the weigher's signature or his signed initials.

K. The right is reserved to weight any truck, trailer, or distributor, at locations designated, before and after making deliveries to the project.

L. Bituminous materials will be measured by the gallon or ton.

M. When material is specified to be measured by the cubic yard but measurement by weight is approved, such material may be weighed and the weight converted to cubic yards for payment purposes. Necessary conversion factors will be determined by the Owner.

N. The term "lump sum" when used as an item of payment will mean complete payment for the work described in the item.

O. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories, so as to provide the item complete and functional. Except as may be otherwise provided, partial payments for lump sum items will be made approximately in proportion to the amount of the work completed on those items.

P. Material wasted without authority will not be included in the final estimate.

4.2 SCOPE OF PAYMENT

A. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials and for performing all work under the contract in a complete and acceptable manner and for all risk, loss, damage or expense of whatever character arising out of the nature of the work or the prosecution thereof.

GENERAL REQUIREMENTS (continued)

B. The Contractor shall be liable to the Owner for failure to repair, correct, renew or replace, at his own expense, all damage due or attributable to defects or imperfections in the construction which defects or imperfections may be discovered before or at the time of the final inspection and acceptance of the work.

C. No monies, payable under the contract or any part thereof, except the first estimate, shall become due or payable if the Owner so elects, until the Contractor shall satisfy the Owner that the Contractor has fully settled or paid all labor performed or furnished for all equipment hired, including trucks, for all materials used, and for fuels, lubricants, power tools, hardware and supplies purchased by the Contractor and used in carrying out said contract and for labor and parts furnished upon the order of said Contractor for the repair of equipment used in carrying out said contract; and the Owner, if he so elects, may pay any and all such bills, in whole or in part, and deduct the amount of amounts so paid from any partial or final estimate, excepting the first estimate.

4.3 COMPENSATION FOR ALTERED QUANTITIES

A. Except as provided for under the particular contract item, when the accepted quantities of work vary from the quantities in the bid schedule the Contractor shall accept as payment in full, so far as contract items are concerned, at the original contract unit prices for the accepted quantities of work done. No allowance will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor resulting either directly from such alterations or indirectly from unbalanced allocation among the contract items of overhead expense on the part of the Bidder and subsequent loss of expected reimbursements therefore or from any other cause.

B. Extra work performed will be paid for at the contract bid prices or at the price negotiated between the Owner and the Contractor if the item was not bid upon. If no agreement can be negotiated, the Contractor will accept as payment for extra work, cost plus 15% (overhead and profit). Costs shall be substantiated by invoices and certified payroll.

4.4 PARTIAL PAYMENTS

A. Partial payments will be made on a monthly basis during the contract period based on invoicing for materials and documented costs for work performed. From the total amount ascertained as payable, an amount equivalent to ten percent (10%) of the whole will be deducted and retained by the Owner until the requirements of Article 4.6 “Acceptance and Final Payment”, are met.

GENERAL REQUIREMENTS (continued)

4.5 FINAL ACCEPTANCE

A. Upon due notice from the Contractor of presumptive completion of the entire project, the City Engineer will make an inspection. If all construction provided for and contemplated by the contract is found complete to his satisfaction, this inspection shall constitute the final inspection and the City Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of the final inspection.

B. If, however, the inspection discloses any work in whole or in part, as being unsatisfactory, the City Engineer will give the Contractor the necessary instructions for correction of such work, and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed. In such event, the City Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

4.6 ACCEPTANCE AND FINAL PAYMENT

A. When the project has been accepted and upon submission by the Contractor of all required reports, completed forms and certifications, the Owner will review the final estimate of the quantities of the various classes of work performed. The Contractor may be required to certify that all bills for labor and material used under this contract have been paid.

B. The Contractor shall file with the Owner any claim that the Contractor may have regarding the final estimate at the same time the Contractor submits the final estimate. Failure to do so shall be a waiver of all such claims and shall be considered as acceptance of the final estimate. From the total amount ascertained as payable, an amount equal to ten percent (10%) of the whole will be deducted and retained by the Owner for the guaranty period. This retainage will be waived provided the required Maintenance Bond has been posted. After approval of the final estimate by the Owner, the Contractor will be paid the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the provisions of the contract.

C. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

D.

GENERAL REQUIREMENTS (continued)

4.7 GENERAL GUARANTY AND WARRANTY OF TITLE

A. The Contractor unconditionally warrants and guarantees that the project will be free from warranty defects for one year from the date of Final Acceptance. Final Acceptance includes receipt of all conforming closeout documentation.

B. If the City discovers any warranty defects during the warranty period, the Contractor agrees to promptly perform all remedial work at no additional cost or liability to the City. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within a period of twelve (12) months from the date of final acceptance of the work. The Owner will give notice of defective materials and work with reasonable promptness.

C. Neither the final certification of payment nor any provision in the contract nor partial or entire use of the improvements embraced in this Contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express or implied warranties or responsibility for faulty materials or workmanship.

D. No material, supplies or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease purchase or other agreement by which an interest therein or in any part thereof is retained by the Seller or supplier. The Contractor shall warrant good title to all materials, supplies and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this Contract shall have the right to a lien upon any improvements or appurtenances thereon.

E. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontractors and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

4.8 NO WAIVER OF LEGAL RIGHTS

A. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of acceptance. Such final acceptance, however, shall not preclude

or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or be stopped from recovering from the Contractor or his Surety, or both, such overpayment as it may sustain by failure on the part of the Contractor to fulfill his obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

B. The Contractor, without prejudice to the Contract shall be liable to the terms of the Contract, shall be liable to the Owner for latent defects, fraud or such gross mistakes as may amount to fraud, and as regards the Owner's right under any warranty or guaranty.

4.9 TERMINATION OF CONTRACTOR'S RESPONSIBILITY

A. Whenever the improvement provided for by the Contract shall have been completely performed on the part of the Contractor and all parts of the work have been released from further obligations except as set forth in his bond and as provided in Article 4.8 above.

PART 5 - SPECIAL REQUIREMENTS

5.1 PRECONSTRUCTION CONFERENCE

A. A conference will be held at a specified location by the City, within ten (10) days after the awarding of the contract. At this time, the contractor will be required to submit a schedule and a plan showing project activities.
   1. In addition to the contractor any subcontractors are required to attend.
   2. City officials and representatives of the various utility companies involved in the project will be present at this meeting.

B. It is the purpose of this meeting to inform the various agencies of the proposed work schedule, and to give them the opportunity of discussing any difficulties and of offering suggestions to the Contractor concerning his proposed schedule in order that full cooperation may be reached.

5.2 SCHEDULE OF OPERATIONS

A. The above mentioned schedule of operations shall consist of a bar chart detailing the Work Plan/Sequence of Construction

5.3 WORKING HOURS

A. No work shall proceed on this project prior to the hour of 7:00 A.M. or after 6:00 P. M. (prevailing time) on any working day with out written approval from the Engineer. The definition of work for this specification shall include the starting or moving of equipment, machinery, or materials.

B. Any day worked for four hours or more shall be considered a full working day.

5.4 NOTIFICATION OF RESIDENTS

A. Residents shall be notified sufficiently in advance of any construction affecting the resident's driveway and sidewalk to allow adequate time for his removal of personal vehicles.

B. Locations of curb cuts for drive access affecting individual residents shall be brought to residents’ attention.

5.5 MATERIALS

A. Materials shall meet the requirements specified for the various subsections of the specifications. Equals shall be approved only prior to the bid opening.

5.6 SURVEY

A. No field survey has been completed for this project.

5.7 SHEETING AND BRACING

A. Any sheeting and/or bracing required for the satisfactory installation of drainage and/or sanitary sewerage structures will not be paid for separately but shall be considered as incidental to the appropriate bid item.

5.8 OCCUPATIONAL SAFETY AND HEALTH

A. The Contractor is hereby advised that all work to be furnished to the City shall be performed with equipment, methods, and use of personnel in conformance with the pertinent Occupational Safety and Health Act requirements of the State of New Hampshire and with the regulations for construction as specified by the City of Labor and Occupational Safety and Health Administration (OSHA) as currently amended.

5.9 EXTENT OF OPEN EXCAVATION

A. The extent of excavation open at any one time shall be controlled by OSHA regulations and by existing conditions and location of work area.

B. All excavations must be backfilled to grade at the end of the workday.

5.10 DUST CONTROL FOR STREET

A. Calcium chloride shall be spread only on disturbed unpaved areas. Calcium chloride shall not be spread on paved areas that are covered by granular material. These areas shall be swept clean of all granular material.

B. Dust on paved areas shall be controlled with water before sweeping.

C. This work and materials shall be considered as subsidiary obligation of the contract for which no specific payment will be made.
   1. This work may be necessary after final acceptance of the work and prior to expiration of the maintenance bond.
   2. This work shall be done at no additional cost to the City.

5.11 WASTE MATERIAL

A. All waste material shall be removed from the site and the area left clean upon completion of work.

B. Any equipment or structures damaged by the Contractor shall be repaired or replaced at no additional cost to the City.

PART 6 - UTILITIES

6.1 COOPERATION WITH UTILITIES.

A. At points where the Contractor's operations are adjacent to properties of telephone, gas, water and/or power companies, or are adjacent to other property, damage to which might result in considerable expense, loss or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

B. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations in order that
   1. these operations may progress in a reasonable time,
   2. duplication or rearrangement work may be reduced to a minimum,
   3. services rendered by those parties will not be unnecessarily interrupted.

C. No person, firm, or corporation, shall make or cause to be made any opening or excavation in a City Street, way, or public place until contact has been made with all utilities to locate any existing underground gas, water, telephone, power or other installations within said street, way or public place.

D. When gas or other flammable service to buildings is discontinued, the existing service line for such service shall be terminated at a point outside the building.

E. In the event of interruption to water or utility services as a result of accidental breakage, or as a result of being exposed or supported, the Contractor shall promptly notify the proper authority. He shall cooperate with the same authority in the restoration of such service as promptly as possible.

F. Water lines, gas lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals and all other utility appurtenances within the limits of the proposed construction are to be moved by the Utilities without expense to the Contractor, unless otherwise provided for, or as noted in the plans.

G. The Contractor shall ascertain the location of existing utilities and any other necessary information by direct inquiry at the office of the following utility owners:

H. Dig Safe: Call before you dig- 1-888-344-7233

PART 7 - DRAWINGS

7.1 SHOP DRAWINGS

A. The Contractor shall submit working and detail drawings, well in advance of the work, to the City Engineer for review.

B. The Contractor's drawings shall consist of shop detail, erection and other working plans showing dimensions, sizes and quality of material, details and other information necessary for the complete fabrication and erection of the pertinent work.

C. The Contractor shall submit two sets of drawings to the City Engineer.

D. Prior to the approval of the drawings, any work done or materials ordered for the work involved shall be at the Contractor's risk.

E. One set of the drawings will be returned to the Contractor approved or marked with corrections to be made. After approval has been given, the Contractor shall supply the City Engineer with two sets of the revised detail working drawings.

F. The City Engineer's approval of the Contractor's working drawings will not relieve the Contractor from responsibility for errors in dimensions or for incorrect fabrication processes, or from responsibility to complete the contract work.

7.2 RECORD DRAWINGS

A. The Contractor shall keep daily records of all changes in the work, ties to all new service connections, and elevations of all inverts.

B. Upon completion of the project, the Contractor shall deliver to the Engineer marked-up set of plans with all changes and required information indicated in red.

C. Final payment will not be made until the Engineer receives the marked-up set of plans.

SITEWORK SPECIFICATIONS

FOR

MAPLEWOOD AVENUE CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

PORTSMOUTH, NEW HAMPSHIRE

Prepared For:

City of Portsmouth
NHDES
New Hampshire Coastal Program

DECEMBER 30, 2009

NHDES

NEW HAMPSHIRE
COASTAL PROGRAM

Prepared By:
Waterfront Engineers LLC
3 Linda Lane
Stratham, New Hampshire 03885

In association with:
Altus Engineering, Inc.
133 Court Street
Portsmouth, New Hampshire 03801

Haight Engineering, PLLC
181 Watson Road
Dover, New Hampshire 03820

SECTION 02000 – INTRODUCTION TO SITEWORK

PART 1.0 - GENERAL

1.1 REFERENCE STANDARDS

A. All work included or ordered under this contract shall be done in conformity with the applicable provisions of the State of New Hampshire Department of Transportation "Standard Specifications for Road and Bridge Construction", latest edition, hereinafter referred to as "Standard Specifications", and the City of Portsmouth rules, regulations, codes, ordinances and specifications.

B. Division 1 - "Requirements and Covenants" of the "Standard Specifications" will not apply to this project except as follows:

1) When any of the Technical Specifications of Divisions II and III of the "Standard Specifications" reference Division I.

2) Definition: Whenever the word "Department" or "Commissioner" is referred to in the Standard Specifications, it shall mean The City of Portsmouth and it's authorized representatives.

3) Definition: Whenever the word "Engineer" is referred to in the Standard Specifications, it shall mean Waterfront Engineers, LLC, and it's authorized representatives.

C. Titles to divisions and paragraphs in these specifications and in the notes on the drawings are introduced for convenience, and shall not be taken as an exact, correct or completed segregation of materials and labor.

D. No responsibility is assumed by the engineer or the Owner for omissions or duplications by the contractor or his subcontractors due to real or alleged error in arrangement of matter in this specification or in notes on the drawings.

E. Latest revisions of federal, state and ASTM Specifications shall be used where only the specification number without date or revision number is given in specifications.

F. Measurement and payment, state and ASTM Specifications are not applicable because all work is to be completed on a lump sum basis.

1.2 The Standard Specifications do not fully describe the contract and are hereby modified by Supplemental Specifications consisting of the following sections:

Section 02000 - Introduction to Sitework
Section 02050 - Site Demolition
Section 02202 - Site Earthwork
Section 02218 - Earth Trench Excavation and Backfill
Section 02229 – Backfill Control
Section 02373 – Geotextile
Section 02375 - Stormwater Pollution Prevention
Section 02400 – Dewatering
Section 02510 - Bituminous Pavement Sawcut and Patch
Section 02550 - Pavement Striping
Section 02601 – Sewer Manholes
Section 02610 – Pipe & Fittings - General
Section 02611- Ductile Iron Pipe
Section 02622- PVC Pipe & Fittings
Section 02623 – Corrugated Polyethylene Pipe (CPE) and Fittings
Section 02624 – High Density Polyethylene Pipe (HDPE) and Fittings
Section 02640 – Water Main and Appurtenances
Section 02651 – Sewer Testing
Section 02750 - Storm Drainage
Section 02930 - Loaming & Seeding

If conflicts arise between any of the Specifications, the most stringent specifications shall govern.

1.3 GENERAL

A. Omissions from the plans and/or specifications of express reference to any labor or materials reasonably to be inferred there from and necessary for the proper execution of the work shall not relieve the contractor or Subcontractor from furnishing them of a kind in keeping with the general character of the work.

B. The Owner's Representative shall decide all questions which may arise as to the quality, quantity, acceptability, fitness and rate of progress of the several kinds of work, and materials to be performed and furnished under the contract and shall decide all questions which may arise as to the fulfillment of the contract on the part of the sitework contractor. The Owner's Representative's determination and decisions shall be final and conclusive.

1.4 PROJECT CONDITIONS

A. It was not possible for the Owner and/or engineer to observe all existing conditions in the completion of these documents. Unforeseen conditions are expected to be discovered. The accuracy of the existing conditions data is not

guaranteed to the contractor. During the execution of the work, it shall be the contractor's responsibility to discover, identify and observe existing conditions not anticipated by the Construction Documents and promptly notify the engineer of such conditions and proposed solutions at no additional cost. The contractor's bid shall anticipate delays associated with conflicts with existing utilities.

1.5 ADDITIONAL REPSONSIBILITIES

A. PERMITS:

The following permits have been obtained. Contractor is responsible for familiarizing himself with the conditions of these permits and conducting all work in accordance with these permits:

1) NHDES Dredge and Fill Permit *Permit Pending*
2) NHDES Discharge Permit *Permit Pending*

B. UTILITIES:

The contractor shall send proper notices, make necessary arrangements and perform all other services required for the removal or the care, protection, and maintenance of utilities, including, but not limited to: water, sewer, drainage, electric, gas, alarm, television, telephone, and telegraph poles and wires, and all other items of this character above or below ground, on and around the site, assuming all responsibility and paying all costs related thereto. Related services to any existing facilities shall not be disrupted without the prior approval of the Owner, and then only to the minimum extent required. The contractor shall call Digsafe at least 72 working day hours in advance of excavating near or around any underground utility installations.

C. JOB SITE LAYOUT, CONDITIONS AND MEASUREMENTS:

Contractor shall employ a Licensed Engineer/Surveyor to determine all lines and grades and to field verify existing job conditions and measurements shown on the drawings. All discrepancies shall be reported to the Owner's Representative for clarification. No additional compensation will be made to the contractor for any error or negligence on his part, nor for discrepancies between actual conditions found at the buildings and sites and as indicated in the Contract Documents after the work has commenced.

D. ROADS AND ACCESS TO THE SITE:

Access to the site for workmen and the delivery or removal of construction materials and/or equipment shall be made only from locations approved by the Owner. Existing roads, lanes and other required fire access shall remain

accessible to fire vehicles at all times. Hauling permits and route approvals shall be obtained from governing authorities as applicable.

E. DUST CONTROL:

1) Contractor shall continuously implement a dust control program to minimize dust in maximum area of disturbance.

2) Areas to be left undisturbed for more than twenty-one (21) days shall be temporarily seeded by the fourteenth (14^{th}) day after construction activity has permanently or temporarily ceased in that area.

F. DEWATERING:

1) The contractor shall protect the work, including but not limited to all excavations, trenches, buildings and materials from storm water, ground water, back-up or leakage of sewers, drains or other piping, and from water of any other origin and shall control, collect and dispose of any accumulation of such water. Dewatering operations shall include, but not be limited to:

a) Furnishing, operating and maintaining all pumps, piping, drains and other equipment, including spare units available for immediate use in the event of equipment breakdowns.

b) Designing, constructing, maintaining and removing cofferdams, temporary under drains, well points and all other systems necessary for dewatering.

c) Disposing of all water in a safe and proper manner, acceptable to governing authorities.

2) The contractor shall pay all costs related to dewatering. All damage resulting from dewatering operations, or the failure of the Contractor to maintain the work in a suitable dry condition, shall be promptly repaired by the contractor at no additional cost to the Owner.

G. SITEWORK RECORD DRAWINGS:

1) Contractor shall submit Record Drawings of all sitework on reproducible mylar medium and digital .DFX format to the Owner and Engineer upon project completion and prior to final payment. Record Drawings shall be prepared and certified correct by a Licensed Land Surveyor or Professional Engineer.

H. TRAFFIC REGULATIONS AND PARKING:

1) The contractor shall provide adequate personnel, flagmen, signs, barricades and equipment to properly regulate traffic at times when the work interferes with the normal flow of traffic through the work area. Parking for workmen and construction vehicles shall be limited to areas designated by the Owner. Parking areas and roadways outside the limits of the contract shall be kept free of debris resulting from construction related traffic. If at any time the Owner's Representative or the City of Portsmouth determines that additional traffic control personnel are required to execute the work, the contractor shall provide additional personnel at no additional cost.

1.6 EXTRA WORK

A. CLASSIFICATION OF EXCAVATION:

1) Rock excavation shall consist of solid rock, which cannot be removed without blasting. Underground boulders greater than two (2) cy that cannot be incorporated in the work will be paid as rock excavation. Boulders greater than two (2) cy with fifty (50) percent or more of their volume located above existing ground elevation will be considered subsidiary to the base bid and will not be measured or paid for as extra work.

2) Rock structure excavation shall consist of all solid rock, which cannot be removed without blasting for pipes, conduits, tanks, manholes, catch basins, utility structures, etc. Underground boulders greater than two (2) cy that cannot be incorporated in the work will be paid as rock excavation. Boulders greater than two (2) cy with fifty (50) percent or more of their volume located above existing ground elevation will be considered subsidiary to the base bid and will not be measured or paid for as extra work.

3) Material located below subgrade, which is determined by the Owner's Representative to have an unsatisfactory bearing capacity shall be directed to be removed and shall be considered unsuitable and shall be paid for as unsuitable excavation. Overexcavation of subgrade soils, which become loose and saturated after they are exposed will not be measured or paid for as extra work.

4) Material located below subgrade for pipes, conduits, tanks, manholes, catch basins, utility structures, etc., which is determined by the Owner's Representative to have an unsatisfactory bearing capacity shall be directed to be removed, shall be considered unsuitable, and shall be paid for as unsuitable structure excavation. Over-excavation of subgrade soils, which

become loose and saturated after they are exposed, will not be measured or paid for as extra work.

5) The Owner's Representative shall be the sole judge as to whether material encountered shall be classified as rock or unsuitable in accordance with the above descriptions.

B. CLASSIFICATION OF FILL:

1) Shall meet the requirements of Section 02202 – Site Earthwork.

C. MEASUREMENT:

Any rock removed prior to sectioning or unsuitable material removed without the Owner's Representative's approval will be considered subsidiary to the base bid and will not be measured or paid for as extra work.

1) Rock Excavation:

a) When the contractor is directed in writing to remove open rock, the material removed will be measured and paid for as extra work. Material removed outside the template lines will not be measured or paid for as extra work. Fill material to replace rock removed shall not be measured or paid for separately and shall be included in the unit price for rock excavation.

b). Rock excavation shall include removal of all material classified as rock. The lower horizontal and vertical limits shall be the finish subgrade limits shown on the plans, or defined in these specifications. The upper limits shall be the actual elevations of rock in the field. Rock excavation below the finish subgrade lines shown on the plans will not be paid for as extra work.

2) Rock Structure Excavation:

a) When the contractor is directed in writing to remove structure rock, the material removed will be measured and paid for as extra work. Material removed outside the template lines without written approval of the Owner's Representative will not be measured or paid for as extra work. Fill material to replace rock removed shall not be measured or paid for separately and shall be included in the unit price for rock structure excavation.

b) Rock structure excavation for pipes, conduits, catch basins, manholes etc., shall include removal of all material classified as rock. The vertical limit shall be top of rock measured in the field

to six (6) inches below the outside of the base of the structure (in event of pipe, six (6) inches outside of pipe). The horizontal limits shall be six (6) inches from the outside walls of the structure, parallel and concentric thereto. Where the payment limits for rock structure excavation and rock excavation conflict, rock excavation shall be used as the basis for payment.

3) Unsuitable Excavation:

a) When the contractor is directed in writing to remove material below subgrade having an unsatisfactory bearing capacity, the material removed will be measured and paid for as extra work. Fill material to replace unsuitable material removed shall not be measured or paid for separately and shall be included in the unit price for unsuitable excavation.

b) Unsuitable excavation shall include removal of all material below subgrade classified as unsuitable. The upper horizontal and vertical limits shall be the finish subgrade limits shown on the plans as defined in the specifications. The lower limits shall be as directed by the Owner's Representative. Unsuitable excavation outside these limits and/or over excavation of subgrade soils, which become loose and saturated after they are exposed will not be paid for as extra work.

4) Unsuitable Structure Excavation:

a) When the contractor is directed in writing to remove material below subgrade for pipes, conduits, tanks, manholes, catch basins, utility structures, etc. having an unsatisfactory bearing capacity, the material removed will be measured and paid for as extra work. Fill material to replace unsuitable material removed shall not be measured or paid for separately and shall be included in the unit price for unsuitable structure excavation.

b) Unsuitable structure excavation shall include removal of all material below subgrade for pipes, conduits, tanks, manholes, catch basins, utility structures, etc classified as unsuitable. The upper horizontal and vertical limits shall be the finish subgrade limits shown on the plans as defined in these specifications. The lower limits shall be as directed by the Owner's Representative. Unsuitable structure excavation outside these limits and/or over excavation of subgrade soils, which become loose and saturated after they are exposed will not be paid for as extra work.

c) Where the payment limits for unsuitable excavation and unsuitable structure excavation conflict, unsuitable excavation shall be used as the basis for payment.

D. PAYMENT:

1) Rock Excavation:

a) The accepted quantity of rock excavation will be paid at the contract unit price per cubic yard, including removal, disposal, backfill and compaction.

2) Rock Structure Excavation:

a) The accepted quantity of rock structure excavation will be paid at the contract unit price per cubic yard, including removal, disposal, backfill and compaction.

3) Unsuitable Excavation:

a) The accepted quantity of unsuitable excavation will be paid at the contract unit price per cubic yard, including removal, disposal, backfill and compaction.

4) Unsuitable Structure Excavation:

a) The accepted quantity of unsuitable structure excavation will be paid at the contract unit price per cubic yard, including removal, disposal, backfill, and compaction.

- End of Section -

SECTION 02050 - SITE DEMOLITION

PART 1.0 - GENERAL

1.1 REFERENCES

A. Refer to other divisions of these specifications, other sections in this division, and drawings for related work, which may affect the work of this section.

B. The Contract Drawings indicate and show limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work.

1.2 SCOPE

A. The work of this section consists of the demolition and legal disposal of materials shown to be removed on the drawings as required for removal work, new construction, or relocation.

1.3 JOB CONDITIONS

A. The contractor shall inspect the premises prior to submittal of his proposal for verification of existing conditions, which will affect his work.

B. Provide necessary protection to ensure the safe passage of persons around the area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities as well as persons.

C. Promptly repair damages caused to adjacent facilities by demolition operations, as directed by the Owner and at no cost to the Owner.

1.4 PERMITS

A. The contractor shall obtain all permits required by local, state and federal governing authorities for removal and disposal of all demolition materials.

1.5 DEMOLITION

A. The contractor shall use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air, to the lowest level of air pollution practical for the condition of work. The contractor shall comply with all governing regulations.

B. Proceed with demolition in a systematic manner.

1.6 DISPOSAL OF DEMOLISHED MATERIALS

A. At regular intervals, remove from the site all debris, rubbish, and other materials resulting from demolition operations, and legally dispose of off the site. Storage or sale of demolished materials to be removed will not be permitted on the site.

B. Burning of removed materials will not be permitted on the site.

C. No demolition materials may be stored or disposed of on-site unless specifically allowed by the contract documents.

D. Carefully remove, retain and store on-site in a protected area under cover any items indicated to be salvaged, reused, or reinstalled.

1.7 CLEANING-UP

A. Clean adjacent structures and improvements of all dust, dirt, and debris caused by demolition operations, as directed by Owner.

B. Return remaining adjacent areas to existing condition prior to the start of demolition work.

PART 2.0 - MATERIALS

2.1 DEMOLITION SCHEDULE (Site Items)

A. Demolition includes, but may not be limited to, removal of the following materials, structures, systems, etc., as well as indicated on the drawings:

1) Existing concrete and pavement areas labeled to be removed within work limits.

2) Existing curbing labeled to be removed.

3) Existing light pole bases, poles and fixtures.

4) Existing landscaping.

5) Existing utilities.

6) Existing fencing and miscellaneous structures.

7) Existing granite blocks to be reused shall be stored off site at the Owners direction

PART 3.0 - EXECUTION

2.1 DETAILS OF WORK

A. All demolished materials shall be taken from the site at once by the contractor and unless otherwise noted or directed by the Owner, will become his property (or his subcontractor's in some cases). None of the materials shall be reused in the new permanent construction unless specifically noted on the plans or specifications or approved in writing by the Owner. All materials removed from the site shall be legally disposed of.

- End of Section -

SECTION 02202 – SITE EARTHWORK

PART 1.0 GENERAL

1.1 GENERAL REQUIREMENTS

A. Refer to other divisions of these specifications, other sections in this division, and drawings for related work, which may affect the work of this section.

B. The Contract Drawings indicate limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other and both shall be followed to properly complete the work.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, and services, etc. and perform all operations necessary for earthwork required for the execution of all construction as indicated on the drawings, specified herein or otherwise required for a complete and proper job.

B. Without limiting the generality thereof, the scope of work under this section shall include, but shall not necessarily be limited to, the following items:

1) Excavation and stockpiling of materials suitable for reuse in an on-site location approved by the Owner.

2) Removing existing material and replacing that material in a suitable manner in accordance with the requirements of the plans.

3) Removal and offsite disposal of existing pavements, foundations, and utilities which may be encountered and backfilling to the grades shown on the plans.

4) Excavation, fill, refill, backfill, subgrade preparation and compaction as indicated or required, including, but not necessarily limited to, all work related to the culverts, footings, utilities, walls, roadway, sidewalks, waterlines, sewers, guard rails and light poles, as well as general earthwork.

5) Excavation to subgrade limits and disposal (off-site) of unsuitable or excess materials.

6) Proofrolling subgrade for pavement areas, walks and utilities.

7) Protection of excavated subgrade areas including diverting surface runoff from excavations. (Note: Subgrade soils, which become wet or unstable after excavation shall be replaced with crushes stone underlain with a woven geotextile fabric. This work is considered subsidiary and will not be paid for as extra work).

8) Trench and pit excavations, beddings, fills and backfills, including compaction.

9) Base and sub-base course material under walks and pavements, including compaction.

10) Rough and finish grading.

11) Dewatering and control of water for all construction operations.

12) Protection of existing buildings, pavements, walks, utilities, landscaping, etc. to remain.

13) Dust, erosion, siltation and environmental controls.

14) Sheeting, shoring and bracing of all excavations and as otherwise required.

1.3 LAW AND REGULATIONS

A. All work shall be accomplished in accordance with regulations of local, county and state agencies and national or utility company standards as they apply.

1.4 SITE INVESTIGATION

A. The contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling, and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, ground water table or similar physical conditions at the site, the confirmation of subsurface materials to be encountered, the character of equipment and facilities needed prior to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract. Any failure by the contractor to acquaint himself with all information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work.

1.5 JOB CONDITIONS

A. Dust Control

Use all means necessary to control dust on and near the work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the work or if resulting from the condition in which the contractor leaves the site. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the site. Areas to be left undisturbed for more than twenty-one (21) days shall be temporarily seeded by the fourteenth (14^{th}) day after construction activity has permanently ceased in that area.

B. Protection

Use all means necessary to protect all materials of this section before, during, and after installation and to protect all objects designated to remain. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

C. Bracing

Properly support all trenches and all other excavations in strict accordance with all pertinent rules and regulations. Brace, sheet, and support trench walls and other excavations in such a manner that they will be **safe** and that the ground alongside the excavation will not slide or settle, and that **all existing improvements of every kind, whether on public or private property, will be fully protected from damage.** In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

PART 2.0 - PRODUCTS

2.1 FILL MATERIAL, GENERAL

A. Approval Required

All fill material shall be subject to the review of the Owner's Representative. Qualified materials shall not change in source or character unless requalified. The Owner's Representative review of a material shall not in any way diminish the contractor's responsibility to fulfill all requirements of the specifications.

B. Notification

For approval of fill materials, the contractor shall:

1) Notify the Owner's Representative at least four (4) working days in advance of intention to import material.

2) Provide sample to Owner's Geotechnical Engineer for the examination and certification of the material.

3) Sources shall be accessible to the Owner, or his agent, for inspection or additional sampling.

2.2 FILL MATERIAL

A. Crushed Gravel

The material shall consist of gravel, crushed gravel, crushed stone, air-cooled blast furnace slag, or crushed hydraulic-cement concrete free from clay, loam, or organic matter and shall conform to the following gradation:

Sieve Size	Percentage By Weight Passing
3 Inch	100
2 Inch	95 – 100
1 Inch	55 - 85
No. 4	27 – 52
No. 200	0 – 12

B. Structural Fill

The material shall consist of hard durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used. Fine particles shall consist of natural or processed sand. The materials shall be free of organic, frozen, or other deleterious materials and shall conform to the following gradation:

Sieve Size	Percentage By Weight Passing
3 Inch	100
2 Inch	95 –100
1 Inch	55 – 85
No. 4	27 – 52
No. 200	0 – 12

C. Sand Blanket

The material shall meet the requirements for sand borrow (NHDOT 304.1) as specified in the Standard Specifications.

D. Common Fill

The material shall consist of mineral soil free of organics, frozen soil, debris, or other deleterious material. The maximum particle size shall be 8 inches and no more than 30 percent by weight should pass the No. 200 sieve.

E. Geotextile Fabric

The fabric shall be non-woven Mirafi 140N or approved equal or as specificed on plan.

2.3 USE OF MATERIAL

A. Crushed Stone

Material meeting at least the minimum requirements of crushed stone specified herein shall be used as a stabilizing layer for pavement areas, for utility trenches, saturated areas at or below the water table and as bedding material for utility pipelines.

B. Structural Fill

Material meeting the minimum requirements of structural fill specified herein shall be used on the construction of the building pad.

C. Sand Blanket

Material meeting at least the minimum requirements of sand blanket specified herein shall be used as backfill material for utility pipelines as indicated on the drawings.

D. Common Fill

Common fill may be used to achieve finish subgrades outside the building footprint bearing zones. Excavated inorganic fill or glaciofluvial sand may be selectively reused as common fill provided that it is free of deleterious material and can be adequately compacted.

E. On-Site Fill

If on-site fills are found to be suitable and approved by the Owner's Representative, they may be substituted for common fill at approved fill locations. Use of these soils as common fill is applicable during periods of construction when the climate and moisture are favorable for reusing silty soils. Within wet environments, these soils may be unstable for reuse. **The use of on-site fill material shall be strictly subject to the prior approval of the Owner's Representative.**

PART 3.0 EXECUTION

3.1 GENERAL

A. Familiarization

Prior to all work of this section, the contractor shall become thoroughly familiar with the site, the building and site conditions, and all portions of the work covered by this section. The contractor shall satisfy himself, by actual examination of the site of the work, as to the existing conditions, contours and the elevations and the amount of work required under this section.

B. Conditions

The contractor acknowledges that he has satisfied himself as to the nature and location of the work the general and local conditions, particularly those bearing upon site access and transportation, disposal, handling, and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, ground water table, or similar physical conditions at the site, the conformation and subsurface materials to be encountered, the character of equipment and facilities needed prior to and during the prosecution of the work and facilities needed prior to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract.

Any failure by the contractor to acquaint himself with all available information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty and cost of successfully performing the work.

C. Protection

The contractor shall protect existing utilities, the location of which may be shown approximately on the drawings, or which are located in the field by the contractor or others. Utilities whose location is not known shall be protected insofar as possible. All costs for repair of utilities broken or damaged by the contractor or his subcontractors shall be the responsibility of the contractor.

D. Inspection and Tests

Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this section prior to all required inspections, tests, and approvals. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner. After the work has been completely tested, inspected and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

3.2 STRIPPING UNSUITABLE OR EXCESS MATERIALS

A. All unsuitable or excess materials shall be stripped to subgrade limits from areas of new construction or regrading. Materials suitable for reuse shall be stored in designated locations that will not interfere with roadway reconstruction, culvert replacement or utility operations. Topsoil shall be stripped and stored before any underlying excavating has begun. Stripped topsoil to be reused shall be free from clay, stones larger than 1" diameter and debris. Excess materials and all materials not suitable for reuse shall be legally disposed of off-site. All excavations shall be performed in a manner to minimize the disturbance of underlying natural ground to remain and existing structures to remain.

B. The contractor shall excavate unsuitable material below subgrade limits to specified grades or to suitable subgrade soils in structure and pavement areas in the manner specified below as directed by the Owner's Representative. The Owner's Representative shall determine unsuitable materials to be any material having an unsatisfactory bearing capacity.

C. The contractor shall follow a construction procedure, which permits visual identification of subgrade soils. In the event that groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the contractor's chosen method of dewatering and allow visual observation of the bottom and placement of crushed stone and backfill in the dry.

D. If subgrade soils become unstable after they have been exposed, the contractor may be required to overexcavate and backfill with compacted structural fill or crushed stone underlain by geotextile fabric to stabilize areas which may become disturbed due to surface runoff. This work is considered part of the base bid and will not be paid for as extra work.

E. Over Excavation Correction

Excavation beyond indicated or authorized limits shall be refilled with approved select fill or other approved suitable granular soil material. Refills shall be compacted to 95 percent (Modified Proctor) of the maximum dry density at optimum moisture content. Refills shall be provided as required by the Owner's Representative and at no additional cost to the Owner.

3.3 GRADES AND ELEVATIONS

A. The drawings indicate, in general, the alignment and finished grade elevations of site structures. The Owner's Representative, however, may make such adjustments in grades and alignments as are found necessary in order to avoid interferences and other special conditions encountered. Grading between

indicated final grades shall provide smooth, even surfaces, except as otherwise required.

3.4 EXCAVATION FOR SITE STRUCTURES

A. The contractor shall remove completely below grade and above grade all site obstructions, which interfere with the construction of site structures. Any buried boulders, foundations, utilities or other work found shall be completely removed and backfilled with common fill, as specified.

B. If suitable bearing for structures is not encountered at the depth indicated on the drawings or as required in these specifications, the Owner's Representative shall be notified immediately. The work shall not proceed further until instructions are given.

3.5 SITE EXCAVATION, FILL AND BACKFILL

A. Pavement Subgrade Preparation

The existing pavement and fill shall be removed from the site to the subgrade limits indicated on the drawings. The subgrade shall be proofrolled with minimum 10 ton vibratory equipment providing at least six (6) passes in each direction. During the proofrolling process, the subgrade shall be observed by the Owner's Representative, and unstable areas shall be over-excavated to a more competent material as directed. All excess excavated material shall be legally disposed of off-site.

Once the subgrade is approved by the Owner's Representative, subgrade fills, where required, may be placed in lifts not exceeding 1 foot thickness and compacted to at least 95 percent of the maximum dry density as determined by ASTM D-1557. Pavement subgrade fill may consist of compacted common fill.

B. Unpaved and Landscaped Area Preparation

1) Surficial topsoil/forest mat and fill may be left in place in landscape and unpaved areas. Common fill, where required, may be placed in lifts and compacted to at least 92 percent of the maximum dry density as determined by ASTM D-1557.

3.6 SITE DEWATERING

A. The Contractor should anticipate the need for dewatering in excavations. Water levels should be controlled to at least two (2) feet below subgrade elevations.

B. The contractor shall be required to maintain a dewatered and stable subgrade during construction. Surface water should be diverted away from excavations.

Subgrade soils that become unstable shall be replaced with crushed stone underlain with a geotextile or structural fill.

C. The contractor shall provide, at his own expense, adequate pumping equipment (including standby) and drainage facilities to keep the excavated site areas sufficiently dry from groundwater and/or surface runoff so as not to adversely affect site construction procedures or cause excessive disturbance of underlying natural ground.

D. Satisfy all local, state and federal environmental conservation requirements for discharge of groundwater to surface waters. Any such operation may require permits from the New Hampshire Department of Environmental Services (DES).

3.7 SHEETING, SHORING AND BRACING

A. Provide shoring, sheeting, and/or bracing of excavations as required to assure complete safety against collapse of earth at side of excavations. Alternatively, lay back excavations to a stable slope.

B. Excavations shall be adequately sheeted, shored and braced as necessary to permit proper execution of the work and to protect all slopes and earth banks until new building walls are cured and acceptable for backfill. Sheet piling shall be installed if required to prevent cave-ins or settlement and to protect workmen and utilities. Shoring and bracing may be removed as the backfilling progresses, but only when banks are safe against caving, taking all necessary precautions to prevent collapse of excavation sides. Bracing of all foundation walls during backfilling and compaction shall be provided as required.

1) The Owner's Representative may direct that sheeting, shoring, and bracing be left in place at any time during the progress of the work and direct that timber used for sheeting and bracing, authorized to be left in place, but cut off at a specified elevation. In removing sheeting or bracing, all necessary precautions shall be taken to prevent voids and collapse of excavation sides. Voids, if formed, shall immediately be filled with gravel and then compacted.

2) The installation of sheeting, shoring, and bracing shall comply with the safety precautions as outlined in the Associated General Contractors of America "Manual of Accident Prevention in Construction," and all local and state regulations. Dewatering shall be performed as required or as directed by the Owner's Representative for all excavations below ground water level.

C. Comply with local and state safety regulations and with the provisions of the Occupational Safety and Health Act (OSHA).

3.8 PLACING SITE FILL

A. Base courses for site structures, pavements, sidewalks and culverts shall be made with materials indicated on the drawings, and specified in the Standard Specifications.

B. Frost

1) Do not excavate to full indicated depth when freezing temperatures may be expected, unless fill material or structures can be constructed immediately after the excavation has been completed. Protect the excavation from frost if placing of fill or structure is delayed.

2) Fill shall not be placed over frozen soil. Soil that is frozen shall be removed prior to placement of compacted fill. Remove all frozen uncompacted soil prior to placing additional fill for compaction.

C. Protect fill area by grading to drain and providing a smooth surface which will readily shed water. Grade the surface of the areas in such a manner as to prevent ponding of surface runoff water in areas to receive compacted fill.

D. To the extent that it is practicable, each layer of fill shall be compacted to the specified density the same day it is placed.

E. Fill that is too wet for proper compaction shall be diced, harrowed or otherwise dried to the proper moisture content for compaction to the required density. If the fill material cannot be dried within forty-eight (48) hours of placement, it shall be removed and replaced with drier fill.

F. 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.

B. Fill shall be placed in horizontal layers not to exceed thicknesses previously specified. Where the horizontal layer meets a natural rising slope, the layer shall be keyed into the slope by cutting a bench.

H. The subgrade areas to be fine graded for loaming and seeding, mulching and landscaping shall be raked to remove all stones larger than 1" diameter and other unsatisfactory material and shall then be rolled. Any depressions, which may occur during the rolling, shall be filled with additional suitable material and the surface regraded and rerolled until true to the lines and grades required. Care shall be taken not to affect the line or grade of walls and footings during grading and rolling operations.

I. All fill materials shall be spread uniformly by acceptable methods over the areas required to be covered so that the required thickness after compaction shall be obtained. The material shall be thoroughly consolidated by vibratory tampers, hand tamping or other approved means, to the final compacted grades as required. In no case shall the fill materials be placed in excess of twelve (12) inches for each lift before compaction.

3.9 SOILS OBSERVATION

A. The Owner's Representative will perform on-site observations during this phase of the construction operations. The services of the Owner's Representative will include, but not be limited to, the following:

1) Observations during excavation and dewatering within new culvert areas and controlled fill areas.

2) Observations during backfilling and compacting operations within that area defined as within the new culvert areas and other areas as appropriate.

3) The field observations performed by the Owner's Representative and his presence does not include supervision or direction of the actual work by the contractor, his employees, or agents. Neither the presence of the Owner's Representative nor any observations performed by him shall excuse the contractor from meeting the soils and compaction requirements as specified or correcting any defect in his work.

3.10 COMPACTION

A. Fills, refills and backfills within the new pavement areas, beneath all site structures and the various areas listed below shall be compacted to not less than the following specified maximum dry densities as determined by ASTM D-1557.

B. Compaction Requirements

Areas		Minimum Degree of Compaction
1)	Below footing structures	95%
2)	Pavement Base and Subbase	95%
3)	Below Grassed or Landscaped Areas	92%
4)	Trench Bedding and Backfill Material	95%

C. Methods: The compaction guidelines given below are stated to provide minimum compaction standards only and in no way relieves the contractor of his obligation to achieve the above specified degree of compaction by whatever additional effort is necessary.

D. All percentages of compaction specified herein shall be related to the maximum dry density at the optimum moisture content as established by ASTM Test Method D1557, according to ASTM Test Methods D1556, D2922 or D2167. Prior to placing, at least one representative sample of each of the fill materials proposed to be furnished for the earthwork operations to determine gradation and moisture density characteristics.

E. Test Prior to Placement

All soil samples proposed to be used for fills, refills, and backfills shall be delivered to the Owner's Representative by the contractor in fifty (50) pound sacks. All costs for obtaining, transporting and delivering soil samples to the Owner's Representative shall be borne by the contractor. Costs for making all laboratory tests required to obtain the characteristics of the materials, including gradation tests, and determination of moisture density relationships, shall be paid for by the Owner.

F. Tests After Field Compaction

Compaction tests shall be performed following field compaction. These tests shall be made by Owner's Representative. These field density tests shall be made to determine the actual in-place densities being attained.

G. Correction of Improper Compaction

If any of the field density test results fail to meet the density as specified herein for the earthwork involved, then the contractor shall remove all of the earthwork in that portion of the work involved as determined by the Owner's Representative, and shall replace it in accordance with these Specifications to the required density. After the work is replaced additional field density tests shall be made by the Owner's Representative, and the contractor shall reimburse the Owner for all costs for such additional testing.

H. No rolling equipment shall be used to compact materials within four (4) feet of the vertical faces of any concrete walls or utility pipes. Plate vibratory tampers shall be used in these restricted areas and in other areas too confined to satisfactorily use rolling equipment.

3.11 GRADING

A. General

Perform all rough and finish grading required to attain the elevations shown on the drawings, or as otherwise directed by the Owner's Representative or required for a complete and proper job.

B. Rough Grading

Proper allowances shall be made for paving, or other finish surfaces. Rough grading shall be reasonably even and free from irregularities, and shall provide positive drainage away from structures without ditching or pools.

C. Fine Grading

Any depressions, which may occur, shall then be filled with additional suitable materials and the surface then regraded until true to the lines and grade required. Areas to be fine graded for loaming and seeding shall be raked to remove all stones and other unsatisfactory materials and shall be suitably compacted.

D. Treatment After Completion of Grading

After grading is completed, permit no further excavating, filling, or grading. Use all means necessary to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.12 DUST, EROSION AND ENVIRONMENTAL CONTROLS

A. Dust control shall be maintained constantly throughout the construction period and shall be accomplished by the uniform application of calcium chloride at the rate of 1 1/2 pounds per square yard by means of a lime spreader or other approved method. Water may also be used for dust control and applied by sprinkling with water trucks with distributors for that purpose as required or directed by the Owner's Representative to maintain dust control.

B. The contractor shall be responsible for exercising every precaution to prevent erosion and siltation of lower elevations and existing drainage systems and watercourses throughout the construction period. All damage caused by inadequate erosion control measures shall be repaired at the contractor's expense. Erosion control and siltation of lower elevations and existing drainage systems shall be effectively controlled by the construction and continual use of erosion control measures as shown on drawings and as directed by the Owner's Representative.

C. All environmental controls shall be performed in accordance with all applicable rules and regulations of local, county and state agencies having jurisdiction.

3.13 ROCK REMOVAL

A. General

1) This section includes the excavation and disposal of all rock and boulders encountered to the lines and grades indicated on the drawings or as specified. The contractor shall dispose of the excavated material and shall furnish suitable backfill material in place of the excavated rock. Rock shall be removed to a minimum depth as detailed on the drawings.

2) The contractor must obtain blasting permit from the local Fire Department.

B. Execution - Blasting

1) Whenever possible, rock excavation shall be by use of modern mechanical means including ripper, large backhoe, jack hammers, predrilling at close spacing to aid excavation and other means selected by the contractor. The use of explosives shall be limited as much as practicable by utilizing mechanical methods of excavation to the maximum feasible extent throughout the area. If mechanical methods are not feasible, the contractor shall employ only controlled blasting methods to assist in rock excavation.

2) Controlled blasting is blasting for excavation of rock in which the various elements of the blast (hole size, hole depth, spacing, burden, charge size, distribution, delay sequence) are carefully balanced and controlled to provide a distribution of charge that will excavate the rock to the required contours and depths with as uniform a surface as possible to minimize overbreak, stressing and fracturing of the rock beyond the excavation line. Smooth wall blasting, pre-splitting, cushion blasting and line drilling are examples of operations included in the term "controlled blasting."

3) Blasting shall be supervised and performed by an experienced licensed blaster. Copies of the blasters' license for the State of New Hampshire to purchase, own, possess, transport or use explosives shall be submitted to the Owner's Representative prior to any blasting on the site.

4) The Owner's Representative shall, at all times, have the authority to prohibit or halt the contractor's methods of blasting and excavation if it cannot be shown that no damage to adjacent structures will occur as a result of the plan.

5) Blasting Criteria

a) Perform blasting operations in a manner to minimize noise (over pressure) and vibration. Use blasting procedures and covers providing effective suppression of noises and vibration and employ other abatement measures necessary for protection of both employees and the public. In addition, restrict working hours and schedule operations in a manner that will limit as much as practicable the disturbance to the public in areas adjacent to the

work and to occupants of buildings in the vicinity of the work. Compliance with the requirements of this section will not relieve the contractor from responsibility for compliance with local ordinances, regulations, and other sections.

b) Blast holes shall not be drilled through overburden material. All overburden shall be stripped to the top of rock prior to any drilling.

c) Blasting shall be done to permit the cut to the lines, grade, and cross sections indicated on the drawings.

d) Rock shall be fragmented to less than one cubic yard. Breakage one cubic yard or greater will be further fragmented by mechanical means or block holding at no expense to the Owner.

6) Ground Vibration Due to Blasting

a) Conduct blasting operations to avoid damage to structures. The contractor is to obtain recommendations from the Owner's Geotechnical Engineer on peak particle velocity.

b) Blasting adjacent to fresh concrete shall be limited by the Owner's Geotechnical Engineer's recommendations.

c) Peak particle velocity is defined as the instantaneous maximum vector sum of the velocity vectors in three (3) mutually perpendicular directions at the point of interest.

7) Test Blasts

Perform a series of small charge test blasts acceptable to the Owner's Representative with monitoring at the site prior to commencement of production blasting. The purpose is to establish local ground-borne vibration and airborne over pressure propagation characteristics and anomalies to aid in determination of efficient charges that will not cause the ground-borne vibration and airborne over pressure limits to be exceeded. Effect of blast sequence and line drilling in amount of overbreak shall also be observed. Schedule and coordinate each test blast with the Owner's Representative. On the basis of these test blasts, submit proposals for full scale blasting in accordance with this section.

8) Blasting Plans

After completion of blasting trials as specified above and prior to starting operations submit the following details of the proposed blasting operations.

a) Location, depth, area, anticipated excavation lines and relationship to adjacent excavation and structures.

b) Diameter, spacing, burden, depth, pattern and inclination of blast holes.

c) Type, strength, amount in terms of weight and cartridges of explosives to be used in each hole, on each delay and the total for the blast.

d) The distribution of the charge in the holes and the priming of each hole.

e) Type, sequence and number of delays; delay pattern.

f) Stemming of holes and matting or covering of blast area.

g) Qualifications of the person or persons who will be directly responsible for designing each blast, for supervising the loading of the shot and firing it.

9) Approval

All products, materials, and procedures used for rock excavation by blasting are subject to acceptance by the Owner's Representative. Acceptance by the Owner's Representative of the blasting procedures as listed above shall not relieve the contractor of his responsibility for the adequacy of his blasting plan to obtain adequate breakage and for limiting vibration, noise, and overbreak.

10) Monitoring

The contractor shall submit to the Owner's Representative at the time of the blast the following information:

a) Date, time and location of blast.

b) Amount of explosives used by weight and number of cartridges.

c) Total number of delays used and number of holes used for each period.

d) On a diagram of the approved blast pattern indicate any holes not drilled, drilled but not loaded, changes in spacing or in pattern of delays or in loading of holes.

e) Total number of holes, maximum charges per hole and corresponding delay number.

f) An evaluation of the blast indicating tights, areas of significant overbreak, unusual results and any recommended adjustments for the next blast.

This information shall be submitted in writing to the Owner's Representative within three (3) calendar days of the blast.

C. Excess Rock Excavation

1) If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Owner's Representative, the excess excavation, whether resulting from over breakage or other causes, shall be backfilled, by and at the expense of the contractor, with material approved by the Owner's Representative.

- End of Section -

SECTION 02218 - EARTH TRENCH EXCAVATION AND BACKFILL

PART 1.0 - GENERAL

1.1 REFERENCES

A. General Requirements Division 1 apply to this section.

B. Refer to other divisions of these specifications, other sections in this division and drawings for related work, which may affect the work of this section.

C. The Contract Drawings indicate limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other and both shall be followed to properly complete the work.

1.2 SCOPE

A. This section includes all trench excavation for sewer, water, drainage, electric, gas, telephone and cable pipelines and appurtenances, including drainage sheeting and bracing, backfilling, disposal of surplus material and miscellaneous grading. All work shall be done as indicated on the drawings and as herein specified.

B. No backfilling of utilities shall occur until the contractor receives authorization from the appropriate utility representative.

C. Excavation for pipelines shall be the width and depth as indicated on the drawings. Excavation for structures and appurtenances shall provide suitable room for their construction.

D. All pavements shall be cut using a saw.

E. The contractor shall furnish and place all sheeting, bracing and supports and necessary dewatering and shall carry out the excavation in such a manner as to eliminate all possibilities of undermining or disturbing existing pipelines, utilities, roadways, shoulders and/or structures.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following related work is specified and included in other sections of this specification.

1) Site Earthwork - Section 02202.

PART 2.0 - PRODUCTS

2.1 EQUIPMENT

A. Equipment shall be at contractor's option.

PART 3.0 - EXECUTION

3.1 EXCAVATION

A. The contractor shall perform all excavation of every description and of whatever substances encountered to the depths shown on the drawings or directed by the Owner's Representative.

B. No extras will be allowed for quicksand excavation, muck excavation, or any other type unless specifically provided for in the bidding schedule.

C. Excavated material may be used at other parts of the construction project as required for fill, etc, if approved by the Owner's Representative. Any surplus material shall be legally disposed of off-site by the contractor.

D. The sidewalls of all trench excavation shall be kept as nearly vertical as possible in all roadways, lawns, near building, etc., by sheeting, bracing, or other means. The cost of sheeting, bracing, or other means is subsidiary and no extras will be allowed.

E. The bottom of the trenches shall be accurately graded as required to provide uniform bearing for each section of pipe.

F. Where damage is liable to result from withdrawing sheeting, sheeting shall be left in place. Care shall be taken not to excavate below the depth specified.

3.2 QUICKSAND EXCAVATION

A. Where quicksand excavation is encountered, the contractor shall drive tight sheeting to a depth, which will effectually cut off the flow of sand. Well points and other methods shall follow as rapidly as possible thereafter. A satisfactory foundation must, however, be secured. When pipe is constructed through quicksand excavation, the trench shall be carried to a sufficient depth to permit the pipe to be encased in concrete.

3.3 EXCAVATION BELOW TRENCH GRADE

A. Where the bottom of the trench shall have been taken out to a greater depth than required, it shall be refilled to the proper grade with bedding material and be

placed and compacted as specified. The contractor shall receive no additional compensation.

3.4 EXPLORATORY EXCAVATION

A. When, it is necessary to explore an excavation to determine the best line and grade for the construction or to locate existing utilities for properly carrying out the work, the contractor shall make such exploratory excavations for such purposes and shall backfill, compact and maintain the ground surface in a safe and satisfactory condition for travel.

3.5 EXCAVATION NEAR EXISTING UTILITIES, ETC.

A. It may be necessary to excavate near existing pipes, drains and other utilities in certain locations. Some of these have been indicated on the drawings, but no attempt has been made to show all of the services and the completeness and accuracy of the information given is not guaranteed.

B. As the excavation approaches pipes, conduits, or other underground structures and utilities, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools.

C. When determination of the exact location of a pipe or other underground structure is necessary for doing the work properly, the contractor may be required to excavate test pits to determine such locations. Such test pits shall be considered as incidental to other excavation, the contractor shall receive no additional compensation, the work being understood to be included as part of the normal excavation.

D. If the utility is of the opinion that at any point sufficient or proper support has not been provided, they may order additional supports placed at the expense of the contractor. Compliance with such order shall not relieve the contractor from his responsibility for the sufficiency of such supports. It shall be the responsibility of the contractor to prevent damage to or displacement of utilities and to consult with and request the concurrence of the utility company's representative in this matter at all locations. The cost of protecting such utilities shall be considered incidental to the cost of installing the pipe.

3.6 TRENCH SURCHARGES

A. The excavated material shall be placed adjacent to the excavation in a manner to cause no excessive surcharge on the trench bank nor to obstruct free access to structures and appurtenances. Should traffic or other conditions make it impracticable or unsafe to stack material adjacent to trench, it shall be hauled and stored at a location provided by the contractor and at the expense of the

contractor. When required, it shall be rehandled and used in backfilling the trench by the contractor and at his expense.

3.7 SHEETING AND BRACING

A. The contractor shall be responsible for the design, construction, maintenance and safety of all sheeting and bracing as required to support the sides of the excavation and to prevent the movement of earth which could in any way damage or endanger adjacent structures, utilities, roadways, increase the width of the excavation to more than that specified, or delay the work.

3.8 DRAINAGE AND DEWATERING OF EXCAVATION

A. The contractor shall, during construction, conduct his operations so as to prevent at all times the accumulation of water, ice and snow in excavations or in the vicinity of excavated areas so as to prevent water from interfering with the progress or quality of the work.

B. Accumulated water, ice and snow shall be promptly removed and disposed of by dewatering. Disposal shall be carried out in a manner which will not create a hazard to public health; nor cause injury to public or private property, work completed or in progress, or public streets; nor cause any interference in the use of streets and roads by the public.

C. During construction, when an unstable condition in the pipe subgrade has been created due to the contractor's excavation, the subgrade shall be stabilized by dewatering or other appropriate means.

3.9 BACKFILLING - GENERAL

A. In general and unless other material is indicated on the drawings or is specified, material used for backfilling trenches and excavations around pipeline structures shall be suitable material which was removed in the course of making the construction excavations or as specified.

B. Frozen materials shall not be placed in the backfill nor shall material be placed upon frozen material. Previous frozen material shall be removed or shall be otherwise treated as required before new backfill is placed.

C. Backfilling shall be done as soon as practicable after the pipe has been laid and jointed.

3.10 SUITABLE TRENCH BACKFILL MATERIAL

A. Suitable backfill material as specified in Section 02202 – Site Earthwork.

B. Backfill material shall be controlled to prevent segregation of materials, which will result in formation of voids.

C. The cost of making the excavated material suitable for backfill, or supplying borrow material, will be included in the cost of installing the pipe. There will be no extra payment for borrow, mixing or reconditioning excavated material.

D. Pipe bedding materials shall be as specified in Section 02202 – Site Earthwork.

3.11 BACKFILLING PIPE TRENCHES

A. Backfilling shall begin as soon as practicable after the pipes have been installed and approved by the appropriate utility and Owner's Representative. Backfilling shall proceed until complete or is sufficient to allow pipe testing.

B. Special backfill requirements are specified on the drawings.

C. Remainder of the trench shall be backfilled as follows:

1) In paved areas, road shoulders and seeded areas, the entire depth of trenches above the special backfill shall be backfilled in eight (8") inch layers with suitable backfill material and each layer thoroughly and carefully compacted as specified. Bring backfill up to bottom of gravel base and/or loam.

2) All backfill shall be thoroughly compacted as specified herein.

D. The nature of the excavated materials will govern both their acceptability for backfill and the method best suited for their placement and compaction in the backfill.

1) Both the materials and the methods shall be subject to acceptance by the Owner's Representative.

2) No stones or rock larger than six (6") inches in the greatest dimension shall be placed in the backfill.

3) No backfill shall be dumped directly into the trench from trucks.

3.12 TOP OF BACKFILL

A. In paved and shoulder areas, backfill shall be carried up to pavement or shoulder subgrade ready to receive the gravel base. In other areas, backfill shall be brought up to adjacent finished grade minus the depth of any required topsoil and so as to provide a finished surface slightly mounded over the trench. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth

required for proper compaction and shall then be refilled and compacted with the surface restored to required grade and degree of compaction, mounded over and smoothed off, at no additional expense.

3.13 BACKFILL AROUND PIPE STRUCTURES

A. The contractor shall not place backfill against or on structures until they have attained sufficient strengths to support the loads to which they will be subjected, without distortion, cracking, or other damage. As soon as possible after the structures are adequate, they shall be backfilled with suitable backfill material.

The material shall be placed in eight (8") inch uniform layers and compacted on all sides of the structure.

B. The material shall be placed and compacted as specified.

3.14 COMPACTION

A. Compaction densities shall be as specified in Section 02202 – Site Earthwork.

B. Methods and equipment proposed for compaction shall be subject to the prior acceptance by the Owner's Representative. Compaction generally shall be done with vibrating equipment. Displacement of, or injury to the pipe and structure shall be avoided. Movement of in-place pipe or structures shall be at the contractor's risk. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Owner's Representative and at the expense of the contractor.

C. Testing:

1) Field density tests may be ordered by the Owner's Representative for each foot of depth of backfill at 50 foot intervals along the trench.

2) The contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.

3) Any costs of retesting required as a result of failure to meet compaction requirements shall be borne by the contractor.

3.15 FILL AND GRADING

A. Excavated material not required for backfilling around pipes or structures may be used for fill in areas, which require material for regrading upon approval of the Owner's Representative.

B. The regrading shall be carried out as directed by the Owner's Representative so that all surface water will drain towards swales or drainage pipes.

C. All material shall be of such nature that after it has been placed and properly compacted, it will make a dense and stable fill.

3.16 PROTECTION OF EXISTING STRUCTURES

A. All existing pipes, wires, poles, fences, property line markers and other items, which the Owner's Representative decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from injury by the contractor, at no additional cost. Should such items be injured, they shall be restored by the contractor, without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

3.17 ACCOMMODATION OF TRAFFIC

A. Streets and drives shall not be unnecessarily obstructed. The contractor shall take such measures at his own expense as may be necessary to keep the street or road open and safe for two-way traffic.

B. The contractor shall construct and maintain, without extra compensation, such adequate and proper bridges over excavations as may be necessary or as directed for the safe accommodation of pedestrians and vehicles. The contractor shall furnish and erect, without cost to the Owner, substantial barricades at crossing of trenches, or along the trench to protect the traveling public.

C. Where deemed necessary, such additional passageways as may be directed shall be maintained free of such obstructions. All material piles, open excavations, equipment and pipe which may serve as obstructions to traffic shall be protected by proper lights, lanterns, or guards as is necessary.

D. All traffic controls shall be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

3.18 EROSION AND SEDIMENTATION CONTROL

A. Contractor shall take all necessary steps to prevent soil erosion.

B. Contractor shall plan the sequence of construction so that only the smallest practical area of land is exposed at any one time during construction.

C. Temporary vegetation and/or mulching shall be used to protect critical areas exposed during development.

D. All temporary erosion and sedimentation control work shall be included in the cost of installing the pipe.

- End of Section -

SECTION 02229 – BACKFILL CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Backfilling work includes backfilling trenches and/or excavation around structures with suitable material removed in the course of excavating and other suitable material. Backfilled areas shall be tested as specified herein.

1.2 QUALITY ASSURANCE

A. Where backfill is required and/or where shown on the Drawings, compact fill to an in-place density not less than the following:

98 percent – under structures and pipe
95 percent – under paved areas and adjacent to structures
90 percent – all other areas

B. The maximum density determination shall be made as specified in AASHTO T 99 (Standard Proctor Test). Proctor tests will be required where the backfill material has changed or is substantially different from existing adjoining material.

C. The Owner reserves the right to require a maintenance bond for any paved areas that do not meet the compaction requirements specified in the contract documents.

D. Determine in-place density in accordance with AASHTO T 191 (Standard Cone Method), AASHTO T 204 (Drive Cylinder Method), AASHTO T 238 and T 239 (Nuclear Methods), or by other methods as approved by the Engineer.

E. Have density testing performed by an independent soils laboratory as approved by the Engineer, at no additional cost to the Owner.

F. Locations of tests (where applicable):

1. Average of two (2) tests between each manhole
2. Average of four (4) tests around each structure.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Excavated Material:

1. Free from large clods of earth.
2. Free from stones and rock fragments over 50 lbs.

B. Other Material:

1. As shown on the Drawings, and/or as directed by the Engineer.

C. Frozen Material:

1. Do not backfill with, or on, frozen materials.
2. Remove, or otherwise treat in manner approved by the Engineer, previously placed material that has frozen prior to placing backfill.

D. Wet Material:

1. It is the Contractor's responsibility to lower and maintain water levels below proposed pipe inverts prior to excavation. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet. Material excavated from the trench that is too wet to be compacted shall be stockpiled and replaced with dry material at no additional cost to the owner.
2. Do not continue excavation of wet materials until the stockpiled materials have dried sufficiently to permit proper compaction.

E. Gravel Borrow:
1. When original excavated material is, in the opinion of the Engineer, unsuitable, use only approved gravel borrow or Control Density Fill ("Flowable Fill") for backfilling, as directed by Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Provide and place all necessary backfill material.
2. Do not allow large masses of backfill to be dropped into the excavation, as from a grab bucket, in such a manner that may endanger pipes and structures.
3. Place material in a manner that will prevent stones and lumps from becoming nested.
4. Completely fill all voids between stones with fine material.
5. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
6. Deposit backfill material evenly on all sides of structures to avoid unequal soil pressures.

B. Sheeting:
1. Leave sheeting in place when damage is likely to result from its withdrawal.
2. Completely fill with suitable material and thoroughly compact all voids left by the removal of sheeting.

C. Backfilling in Paved Areas:
1. Backfill trenches in streets and other paved areas by moistening and compacting each layer to a density at least equal to that of the adjoining original material.
2. Backfill is such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value for paving immediately after backfilling is completed.
3. Where required, place excavated material, that is acceptable to the Engineer for surfacing or pavement subbase, at the top of the backfill to the depths as needed to adequately support pavement.

D. Backfilling Trenches in Non-paved Areas:
1. Grade the ground to a reasonable uniformity.
2. Leave the mounding over the trenches in a uniform and neat condition, satisfactory to the Engineer.

3. Backfill wetland areas in accordance with permits issued for the project.

E. Bedding & Backfilling of Pipelines:
   1. Install pipe bedding and cushion and primary backfill in accordance with the Borrow and Bedding Section in these Specifications.
   2. Deposit and thoroughly compact the remainder of the backfill in 8 inch layers.

F. Placing and Compacting Backfill:
   1. Water Jetting:
      a. Backfill by water jetting shall not be used.
   2. Puddling:
      a. Backfill by puddling shall not be used.
   3. Tamping:
      a. Deposit and spread the backfill material in uniform parallel layers not exceeding 12 inches thick.
      b. Tamp each layer as required to obtain a thoroughly compacted mass.
      c. If necessary, furnish and use an adequate number of power driven tampers, each weighing at least 20 lbs.
   4. Rolling:
      a. Compact material by rolling only when the width and depth of the excavation are sufficient to accommodate the rollers, dozers, mechanical tampers, or other similar powered equipment, as may prove to be acceptable, and when it can be performed without causing damage to pipes installed in the excavation.
      b. Deposit and spread the backfill material in uniform parallel layers not exceeding 12 inches thick.
      c. Roll each layer as required to obtain a thoroughly compacted mass.
   5. Other placing and compacting methods may be employed only when approved by the Engineer.

G. Improper Backfill
   1. When, in the opinion of the Engineer, excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
   2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
   3. Excavation, backfilling, compacting work and testing performed to correct improper backfilling shall be performed at no additional cost to the Owner.

END OF SECTION

SECTION 02373 - GEOTEXTILE

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4354	Sampling of Geosynthetics for Testing
ASTM D 4355	Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus
ASTM D 4491	Water Permeability of Geotextiles by Permittivity
ASTM D 4533	Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	Determining Apparent Opening Size of a Geotextile
ASTM D 4759	Determining the Specification Conformance of Geosynthetics
ASTM D 4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	Identification, Storage, and Handling of Geosynthetic Rolls and Samples

1.2 SUBMITTALS

The following shall be submitted:

Product Data

Samples

Samples for quality assurance.

Certificates

Geotextile

A minimum of 7 days prior to scheduled use, manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has

been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could damage other geosynthetic layers. The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturer.

1.3 DELIVERY, STORAGE AND HANDLING

Delivery, storage, and handling of geotextile shall be in accordance with ASTM D 4873.

1.3.1 Delivery

The Engineer shall be notified a minimum of 24 hours prior to delivery and unloading of geotextile rolls. Rolls shall be packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, rolls shall be immediately rewrapped with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Each roll shall be labeled with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.3.2 Storage

Rolls of geotextile shall be protected from construction equipment, chemicals, sparks and flames, temperatures in excess of 160 degrees F, or any other environmental condition that may damage the physical properties of the geotextile. To protect geotextile from becoming saturated, rolls shall either be elevated off the ground or placed on a sacrificial sheet of plastic in an area where water will not accumulate.

1.3.3 Handling

Geotextile rolls shall be handled and unloaded with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 - PRODUCTS

2.1 RAW MATERIALS

2.1.1 Geotextile

Geotextile shall be a black nonwoven pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. The use of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be allowed. Stabilizers and/or inhibitors shall be added to the base polymer, as needed, to make the filaments resistant to deterioration by ultraviolet light, oxidation, and heat exposure. Regrind material, which consists of edge trimmings and other scraps that have never reached the consumer, may be used to produce the

geotextile. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. Geotextiles shall meet the requirements specified in Table 1. Where applicable, Table 1 property values represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum average roll values.

Geotextile shall be a black non-woven geotextile having a minimum weight of 12 oz per sq. yard (ASTM D5261), such as PROPEX GEOTEX 1291 or approved equal meeting the following GAI-LAP MARV at a 97% confidence level:

TABLE 1
MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAB STRENGTH	LBS	300	ASTM D 4632
SEAM STRENGTH	LBS	250	ASTM D 4632
PUNCTURE	LBS	200	ASTM D 4833
TRAPEZOID TEAR	LBS	125	ASTM D 4533
APPARENT OPENING SIZE	U.S. SIEVE	100	ASTM D 4751
PERMITTIVITY	SEC -1	0.8	ASTM D 4491
ULTRAVIOLET DEGRADATION	PERCENT	70 AT 500 HRS	ASTM D 4355

2.1.2 Thread

Sewn seams shall be constructed with high-strength polyester, nylon, or other approved thread type. Thread shall have ultraviolet light stability equivalent to the geotextile and the color shall contrast with the geotextile.

2.2 MANUFACTURING QUALITY CONTROL SAMPLING AND TESTING

The Manufacturer shall be responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request. Manufacturing quality control sampling and testing shall be performed in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D 4354, Procedure A. Acceptance of geotextile shall be in

accordance with ASTM D 4759. Tests not meeting the specified requirements shall result in the rejection of applicable rolls.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Subgrade Preparation

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile. Subgrade materials and compaction requirements shall be in accordance with Section 02200.

3.1.2 Placement

The Contractor shall notify the Engineer a minimum of 24 hours prior to installation of geotextile. Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall also be free of tensile stresses, folds, and wrinkles.

3.2 SEAMS

3.2.1 Overlap Seams

Geotextile panels shall be continuously overlapped a minimum of 12 inches at all longitudinal and transverse joints. Where seams must be oriented across the slope, the upper panel shall be lapped over the lower panel. If approved, sewn seams may be used instead of overlapped seams.

3.2.2 Sewn Seams

Factory and field seams shall be continuously sewn on all slopes steeper than 1 vertical on 4 horizontal. The stitch type used shall be a 401 locking chain stitch or as recommended by the manufacturer. For seams that are field sewn, the seams shall be sewn using the same equipment and procedures as will be used for the production seams. Down slope seam strength shall meet the minimum requirements specified in Table 1. The thread at the end of each seam run shall be tied off to prevent unraveling. Skipped stitches or discontinuities shall be sewn with an extra line of stitching with a minimum of 18 inches of overlap.

3.3 PROTECTION

The geotextile shall be protected during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed. Adequate ballast (e.g. sand bags) shall be used to prevent uplift by wind. The geotextile shall not be left uncovered for more than 14 days after installation.

3.4 REPAIRS

Torn or damaged geotextile shall be repaired. Clogged areas of geotextile shall be removed. Repairs shall be performed by placing a patch of the same type of geotextile over the damaged area. The patch shall extend a minimum of 12 inches beyond the edge of the damaged area. Patches shall be continuously fastened using approved methods. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Geotextile rolls which cannot be repaired shall be removed and replaced. Repairs shall be performed at no additional cost to the Government

3.5 PENETRATIONS

Engineered penetrations of the geotextile shall be constructed by methods recommended by the geotextile manufacturer.

3.6 COVERING

Geotextile shall not be covered prior to inspection and approval by the Engineer. Cover concrete shall be placed in a manner that prevents disturbance of the geotextile overlap zone, prevents tensile stress from being mobilized in the geotextile, and prevents wrinkles from folding over onto themselves. On side slopes, concrete shall be placed from the bottom of the slope upward. Cover concrete shall not be dropped onto the geotextile from a height greater than 3 feet. No equipment shall be operated directly on top of the geotextile without approval of the Engineer.

-- End of Section --

SECTION 02375 - STORM WATER POLLUTION PREVENTION

PART 1 – GENERAL

1.1 ABBREVIATIONS & DEFINITIONS

A. USEPA – United States Environmental Protection Agency

B. NPDES – National Pollutant Discharge Elimination System

C. NHDOT – New Hampshire Department of Transportation

D. NHDES – New Hampshire Department of Environmental Services

E. NOI – Notice of Intent

F. NOT – Notice of Termination

G. Qualified Products List – Products appearing on this list have been approved for general use. The list is available from the NHDOT Bureau of Materials & Research or at http://www.state.nh.us/dot/business/index.htm.

H. General Permit – USEPA NPDES General Permit for Storm Water Discharges from Construction Activities effective on July 1, 2003 and any subsequent revisions.

1.2 DESCRIPTION

A. Permanent Control:

1. This work shall consist of furnishing and placing hay mulch, bark mulch, wood, straw or coconut fiber mat, synthetic mat, paper mat, jute mesh or other material as a soil stabilization product for erosion control on slopes or ditches for protection to hold the ground and/or cover material (sod, seed, etc.) in place, at locations shown on the plans or where ordered.
2. Slope stabilization shall meet the requirements of the Qualified Products list for either slope greater than or less than 2:1.
3. Channel stabilization shall meet the requirements of the Qualified Products List for either low velocity (less than 9 feet/sec) or high velocity (greater than 9 feet/sec).
4. Permanent stabilization shall be permanent material installed on slopes or in channels.

B. Temporary Control:

1. When the use of hay bales is required, this work shall consist of furnishing and placing hay bales as a temporary erosion and pollution control device at locations shown on the plans or where ordered.

2. When seeding is required, this work shall consist of furnishing, and sowing seed specified as directed.
3. When silt fence is required, this work shall consist of furnishing, installing, maintaining and removing silt fence as shown on the plans or where ordered.
4. When temporary mulch is required this work shall consist of furnishing and placing at locations shown on the plans or where ordered.
5. When erosion stone is required this work shall consist of furnishing, stockpiling, placing and removal if required at locations shown on the plans or where ordered.

C. General Permit:

1. This project constitutes construction activity that disturbs one or more acres of land under the General Permit from the USEPA.
2. The contractor shall be responsible for:

    a. Notice of Intent: The contractor shall submit an NOI to the USEPA in order to be covered by the General Permit. Construction activity shall include any activities that expose soil such as clearing, grading, excavation, landscaping, demolition, building renovation and building construction. The forms, the permit requirements and guidance are available from:

        1) EPA New England Region 1, 1 Congress Street, Suite 1100, Boston, MA 02114-2023, or
        2) EPA Storm Water Processing Center at 866-352-7755, or
        3) http://www.epa.gov/npdes/stormwater/cgp

    b. Notice of Termination: This work shall include the contractor's preparation and submission of a NOT to the USEPA at the completion of the project in accordance with the General Permit.
    c. Storm Water Pollution Prevention Plan: This work shall consist of the required submittal(s) and the preparation of the submittal to obtain final approval of a Storm Water Pollution Prevention Plan, hereinafter called the "Plan", for this project. The Plan shall be a part of the necessary documentation in accordance with the General Permit and this specification. This work shall also include the subsequent monitoring and proper execution of the approved Plan and its temporary and permanent controls during construction.

3. The approved Plan shall be adopted by the Owner for the purposes of submitting a separate NOI, however, the Owner assumes no liability for implementing the Plan nor subsequent monitoring as described under the Plan and these specifications.
4. The Department will furnish the following data, as available, to the Contractor:

    a. Specific reproducible plan sheets and cross-sections of the project, as requested;
    b. Drainage calculations and plans (drainage area size and characteristics; runoff volume; type, size, and slope of pipes; invert elevations; and outlet velocity), as available;

c. Geotechnical Report including soil boring logs, soil types, and test pit data, as available;
d. Other applicable permits obtained for the project; and
e. A list of environmental commitments, as appropriate.

5. Recommended guides for the preparation and execution of the Plan include:

a. *The NHDOT Guidelines for Temporary Erosion and Sediment Control and Stormwater Management* available from the New Hampshire Department of Transportation, 1 Hazen Drive, P. O. Box 483, Concord, NH 03302-0483 and at http://webster.state.nh.us/dot/business/index.htm;
b. *The Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire* and the *Innovative Stormwater Treatment Technologies BMP Manual*, both available from the New Hampshire Department of Environmental Services (NHDES) Public Information and Permitting Office, P. O. Box 95, 6 Hazen Drive, Concord, NH 03302-0095; and
c. *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites* by the USEPA (EPA 833-R-060-04) at http://cfpub.epa.gov/npdes/stormwater/swppp.cfm.

D. Other Attentions

1. The Contractor's attention is called to RSA 72-B, Excavation Tax and Excavation Activity Tax and related administrative rules of the NH Department of Revenue Administration, which among other provisions, levies a tax on earth and excavations as defined in RSA 155-E. Further information may be obtained at http://www.nh.gov/revenue/property_tax/excavation/index.htm.

1.3 RELATED WORK SPECIFIED ELSEWHERE

PART 2 – MATERIALS

2.1 MULCH

A. Hay mulch shall consist of cured hay, free from weeds and rough or woody materials.

B. Bark mulch shall be a bark chipping graded to be approximately 3/8 to 2 inch wide. The chippings shall not have been stored so long and under such conditions that the material has decomposed sufficiently so that it has lost its fibrous texture. Bark mulch must be approved as to grading and condition prior to its use.

C. Temporary mulches may be hay, straw, fiber mats, netting, wood cellulose, bark, chips or other acceptable material and shall be reasonably clean and free of noxious weeds and materials toxic to plant growth.

D. Other types of mulch, as included on the Qualified Products List available from the NHDOT Bureau of Materials & Research or at http://www.state.nh.us/dot/business/index.htm, may be used.

2.2 SOIL STABILIZATION

A. Stabilization material of the type specified shall be a product as included on the Qualified Products List. The material furnished for use shall be of sufficient construction and strength to hold the processed ground and/or cover material (sod, seed, etc.) in place until an acceptable growth of natural or planted material is established.

B. Staples for soil stabilization material matting shall be those as specified by the manufacturer.

2.3 SEED

A. Seed for temporary control shall be shall be a quick-growing specie suitable to the area, such as annual or perennial ryegrass, providing a temporary cover which will not compete with the grasses subsequently sown for permanent cover.

2.4 HAY BALES

A. Hay bales for erosion control shall not be allowed.

2.5 TACKIFIERS

A. Tackifiers for ground coverings shall be as included on the Qualified Products List available from the NHDOT Bureau of Materials & Research or at http://webster.state.nh.us/dot/business/index.htm.

2.6 SILT FENCE

A. Geotextile filter fabric for silt fence shall be made from polypropylene, polyester, or other approved polymeric chemically stable material and be resistant to ultraviolet radiation degradation for at least 12 months. Silt retention capacity shall be no less than 75 percent of silt and suspended solids. The fabric shall meet the following requirements:

Fabric Property	Test Method	Property Requirement*
Grab Tensile Strength (lbs)	ASTM D 4632	100 Minimum
Grab Tensile Elongation (%)	ASTM D 4632	25 Maximum
Puncture Strength (lbs)	ASTM D 4833	60 Minimum
Mullen Burst Strength (psi)	ASTM D 3786	210 Minimum
Trapezoid Tear Strength (lbs)	ASTM D 4533	60 Minimum

*All properties are minimum or maximum average roll values (i.e. the test results for any

sampled roll in a lot shall meet or exceed the minimum values or be less than or meet the maximum value in the table.)

B. Posts for silt fence shall be either wood or steel. Wood posts shall be sound quality hardwood with a minimum cross sectional area of 3 square inches. Steel post shall be standard "T" or "U" section weighing not less than 1 pound per linear foot with projections for fastening wire to the fence. Maximum post spacing shall be 10 feet.

C. Support fence for silt fence, if required, shall be a minimum of 14.5 gauge woven wire with a maximum 6-inch mesh.

2.7 EROSION STONE

A. Erosion stone shall meet the following gradation for a nominal size stone of 1 ½" to No. 4:

Sieve Size	% By Weight Passing
2"	100
1 ½"	95-100
1"	
3/4 "	35-70
1/2 "	
3/8 "	10-30
No. 4	0-5

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to the start of construction requiring erosion and sediment control, the Contractor shall submit four sets of the Plan to the Contract Administrator for approval. Review time shall be proportional to the complexity of the Plan and will be within approximately 15 working days from time of submittal. Names of designated personnel to perform field monitoring shall be included in the submittal. The Plan may be submitted in phases or for specific construction areas. Only work within areas covered by an approved Plan will be allowed.

B. **No work requiring land disturbance shall commence until the Plan has been approved by the Contract Administrator and all NOI's are submitted and accepted.**

C. Permanent erosion control features shall be incorporated into the project at the earliest practicable time, as specified in the contract documents, and as outlined in the approved Plan. Temporary pollution control measures shall be used to correct conditions that develop during construction to temporarily control erosion not associated with permanent control features.

D. When erosion is likely to be a problem, operations shall be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter.

E. The Contractor will limit the area of land disturbance commensurate with the contractor's capability and progress in keeping the finish grading, mulching, seeding and permanent pollution control measures concurrent with operations and in accordance with the accepted Plan.

F. Earth excavation and embankment slopes shall be permanently treated for stabilization before the time the slant height of exposed slopes reaches 30 feet, unless otherwise ordered. Where construction activities are complete within the growing season, all exposed soil areas shall be permanently treated for stabilization within 14 days. Where construction activities are temporarily suspended, all exposed soil areas shall be treated for stabilization within 14 days.

G. As work progresses, patch seeding and mulching shall be done as required on areas previously treated to maintain or establish protective cover.

H. Drainage pipes and ditches shall be constructed in a sequence from outlet to inlet in order to stabilize outlet areas and ditches before water is directed to the new installation or any portion thereof unless conditions unique to the location warrant written approval of an alternative method.

I. Channel and ditch work, including erosion protection items, shall be completed before diversion of the drainage is accomplished.

J. In the event of conflict between these requirements and pollution control laws, rules or regulations of other Federal, State or local agencies, the more restrictive laws, rules or regulations shall apply.

3.2 NOTICE OF INTENT

A. **The contractor shall prepare and submit a General Permit NOI a minimum of seven days before conducting any construction activities that disturb soil.** A copy of the Contractor's NOI shall be given to the Contract Administrator.

B. Following the approval and adoption of the Plan, the Owner shall prepare and submit a separate General Permit NOI as required. A copy of the Owner's NOI shall be given to the Contractor so that a seven-day waiting period passes before any construction activities that disturb soil take place.

C. Submission of an NOI to the USEPA by the Contractor or the Owner does not release the Contractor of fulfilling the requirements of the submission and approval process of the Plan as described below.

D. **Under no circumstances shall work involving the disturbance of land begin until the Plan is approved by the Contract Administrator, an NOI is submitted by the Contractor, an NOI is submitted by the Owner, and both NOI's are acknowledged and accepted by the USEPA.**

3.3 STORM WATER POLLUTION PREVENTION PLAN

A. The Plan shall be prepared, stamped and signed by a Licensed Professional Engineer registered in the State of New Hampshire qualified to prepare erosion and sediment control plans, hereinafter called the "Preparer". Collaboration with other professionals such as soil scientists, geologists and environmentalists may be required as appropriate.

1. Qualifications for preparation of the Plan shall include a minimum of 5 years experience or knowledge of methods of construction and demonstrated knowledge of erosion and sediment control and storm water management measures. The preparer shall have previously submitted plans to NHDES under RSA 485-A:17 Terrain Alteration, to NHDOT under Section 645 Erosion Control – Erosion and Sediment Control and Stormwater Management Plan, or have prepared plans previously under the General Permit and shall have attended workshops on erosion and sediment control and storm water management.
2. **The Contractor shall submit the name and qualifications of the person or firm proposed to prepare the Plan to the Contract Administrator for approval prior to preparing the Plan.** Submittal of the name and qualifications will be accepted after the opening of bids.

B. The Plan shall be developed using a combination of structural, non-structural and vegetative Best Management Practices (BMP's) to adequately control erosion and sedimentation and manage storm water in accordance with required and recommended guidelines described previously unless otherwise specified in the contract documents.

C. The Plan shall include but not be limited to the following information:

1. Specific information describing existing site(s) conditions, description of the project, soils, and sensitive areas, storm water flow directions and areas where soil will be disturbed.
2. The location and extent of surface waters that are included or adjacent to the site within one mile. Surface waters shall include lakes, rivers, streams (both perennial and intermittent), tributaries and wetlands.
3. A description of construction materials and wastes associated with the project (litter, debris, chemicals, fuels, etc.), how their exposure to storm water will be minimized, and how spills will be prevented, contained and cleaned up.
4. A description of how off-site tracking of sediments and dust by vehicles and storm water pollution from off-site material storage areas used for the project, such as soil stockpiles and borrow areas, will be minimized.
5. A description of how sources of non-storm water generated, such as vehicle wash

water, building and pavement wash water, water line flushing, dewatering, and exposed ground water will be prevented from contributing to runoff pollution. (Discharge of wash water contaminated with detergents or other chemicals is not allowed under the General Permit.)

6. Information on any endangered or threatened species on or near the site.
7. The name and location of the body of water (e.g., stream, creek, brook, wetland, river, lake, bay, ocean) that will receive the runoff from the construction site or, if the receiving water is a tributary, the name of the ultimate receiving body of water.
8. Estimates of the total site area, which represents the size of the parcel of property or right of way on which the construction is occurring, and the total area that will be disturbed.
9. A description of the measures to be used for erosion and sediment controls throughout the construction project including stabilization measures for disturbed areas and structural controls to divert runoff and remove sediment. The measures must be shown on the Plan including the location of each measure.
10. A description and schedule of phasing and discussion of the various erosion and sediment controls and stabilization methods as they relate to the construction schedule.
11. A description and schedule for monitoring and maintaining the pollution prevention measures.
12. Department plan drawings as available will show the construction site(s) conditions prior to and after construction by including property lines, right-of-way lines, easements, existing and new structures, drainage, flood plains, wetlands, limits of clearing and grading, proposed final drainage, detours, permanent erosion and sediment control measures, and other critical items. The Contractor's plan drawings shall show temporary drainage and erosion and sediment control measures for the construction site(s) on the contract plans provided by the Department.
13. Additionally the Contractor shall provide plans showing all of the above items for proposed areas related to the construction site(s) not shown on the Department's contract plans, including but not limited to, access and haul roads, equipment and material storage sites, material pits, material processing sites, and disposal areas, except municipally authorized landfill areas and commercial sites. Waste materials are quite often materials unsuitable for embankment construction and generally very susceptible to erosion; therefore, the Contractor shall pay close attention to controlling erosion of these materials.
14. Additional design typicals illustrating practices for erosion and sediment control not shown on the Department plans and specifications shall be included in the Plan. Calculations shall be included to verify all erosion and sediment control and storm water management practices such as, but not limited to, sediment retention and detention basins, energy dissipaters, diversions, waterways, and control of runoff.
15. Specific requirements for General Permit NHR100000: State of New Hampshire to be addressed in the Plan, if applicable, can be obtained at http://www.epa.gov/npdes/stormwater/cgp.
16. The Preparer or the Preparer's designated representative shall assist the Contractor in implementing the Plan and recommend modifications to the Plan for changing operations or inadequate erosion and sediment control and storm water management

measures. The Preparer shall make modifications to the Plan as necessary and resubmit for review and approval. Review time of modifications will be within approximately 10 working days of submittal.

17. The Contract Administrator may order modifications to the Plan for changing operations or for inadequate erosion and sediment control and storm water management measures.
18. The Preparer of the Plan shall be available for on-site consultations with the Contract Administrator within 24 hours of a request.
19. A copy of the Plan and any changes to the plan shall be kept at the construction site from the time construction begins until the site is permanently stabilized. The documents must be made available upon request by the Contract Administrator or any other Federal, State or local agency that has jurisdiction over such matters.
20. Upon completion of the project, a copy of the Plan, complete with all revisions, deficiencies and corrective measures employed during the course of the work shall be given to the Contract Administrator and Owner.

3.4 MONITORING OF THE PLAN

A. The monitoring of the erosion and sediment controls in relation to the Plan shall be the responsibility of the Contractor. The person(s) in charge of the monitoring of the Plan shall be hereinafter referred to as the "Reviewer". The Reviewer shall be identified to all parties at the preconstruction conference and be noted within the Plan.

B. Inspection of erosion and sediment controls by the Reviewer does not relieve the contractor from conducting periodical reviews of the erosion and sediment controls and making repairs.

C. The Reviewer shall keep records on when major grading activities occur, when activities temporarily or permanently cease and when stabilization occurs.

D. Monitoring of the erosion and sediment controls shall include on-site inspections by the Reviewer. Inspections shall be conducted on either of two schedules, 1) weekly, or 2) bi-weekly and within 24 hours after any storm event greater than 0.5 in of rain per 24-hour period. The inspection shall encompass all disturbed areas, material storage areas, structural controls, vehicle entry/exit locations and storm water discharge locations.

E. If the area of project disturbance is entirely stabilized, monitoring of the erosion and sediment controls may occur monthly or not at all if the earth is frozen long-term up until 1 month before thaw as long as there is no earth disturbance.

F. A monitoring report prepared by Reviewer stating the date of review and describing the erosion and sediment control and storm water management measures reviewed, the effectiveness of their operation, any deficiencies, and corrective actions to be undertaken shall be prepared after each review. A copy of the monitoring report shall be provided to the Contract Administrator, Owner and Contractor within two days of each review.

G. The contractor shall correct damage or deficiencies identified by the Reviewer as soon as practicable after each site review and report but in no case later than 7 days after the damage or deficiency was noted. Any changes that may be required to correct deficiencies in the Plan shall be noted on the Plan and also be made within 7 days after the noted deficiency. A copy of any changes to the Plan shall be provided to the Contract Administrator for review and approval.

H. All monitoring reports and records of major grading activities shall be kept at the construction site from the time construction begins until the site is permanently stabilized. The documents must be made available upon request by the Contract Administrator or any other Federal, State or local agency that has jurisdiction over such matters. Upon completion of the project, a copy of all records pertaining to this section shall be given to the Contract Administrator, Owner and Contractor.

3.5 SUSPENSION OF WORK

A. Project work may be suspended, wholly or in part, with no extension of time or additional compensation for failure to submit, implement and maintain the approved Plan, including modifications.

3.6 MULCH

A. Mulching shall be done immediately after each area has been properly prepared. When seed for erosion control is sown prior to placing the mulch, the mulch shall be placed on the seeded areas within 48 hours after seeding. Hay that has been thoroughly fluffed shall be applied at approximately, but not to exceed 3 tons per acre unless otherwise ordered. Blowing chopped hay mulch will be permitted provided the Contractor controls the mulching operation so as not to infringe on property owners or the traveling public. Blown hay mulch shall be applied in such a manner resulting in a minimum amount of matting that would retard the growth of plants. Hay mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch. Matted mulch or bunches shall be removed or otherwise remedied.

B. In order to prevent mulch from being blown away, a light covering of loose branches or approved tackifier shall be employed. Unless otherwise ordered, loose branches shall be removed prior to completion of the work.

C. All baling wire or rope, such as that used in the shipment of mulch shall be disposed of outside the limits of the project in approved areas.

D. Bark mulch shall be placed on the designated areas to the depth specified on the plans or as ordered.

E. On areas treated with bark mulch, the Contractor shall remove weeds and plant material as directed.

3.7 SOIL STABILIZATION PRODUCTS

A. Surfaces of ditches and slopes to receive soil stabilization products shall conform to the grades and cross sections shown on the plans and shall be finished to a smooth and even condition with all debris, roots, stones, and lumps raked out and removed. The soil surface shall be sufficiently loose to permit bedding of the product. Unless otherwise directed, soil shall be prepared, including the application of lime, fertilizer and seed prior to installation of the specified type of soil stabilization product.

B. Soil stabilization, of the type specified, shall be installed where shown on the plans, or as directed by the Contract Administrator. Throughout the entire placement area, the soil stabilization product shall be in uniform contact with the existing underlying soils. It is critical that this contact is achieved in order to maximize any seeding or other vegetative growth specified for this area. Matting, if used, shall not be stretched.

C. Installation techniques and procedures shall be as recommended by the manufacturer for the particular site characteristics or as directed. Documentation from the product manufacturer regarding installation techniques and procedures shall be submitted to the Contract Administrator at least 10 working days prior to installation.

   1. Matting, if used, shall be buried around the edges of catch basins and other structures or obstructions as described in the manufacturer's installation requirements.
   2. The spacing of staples shall be as required for specific site considerations depending upon varying factors such as the season of the year or the amount of water encountered or anticipated.

D. For soil stabilization materials that become loosened, raised, or undermined, or if any matting becomes torn, or any matting staples become loose or raised, satisfactory repairs shall be made within 48 hours.

3.8 SEED FOR EROSION CONTROL

A. Areas, which are to be left temporarily or regraded or otherwise disturbed later during construction, may need to be seeded with ryegrass to obtain temporary control. The seed shall be sown at the rate of approximately 1 pound per 1,000 square feet.

3.9 HAY BALES FOR EROSION CONTROL

A. Hay bales shall not be allowed.

3.10 SILT FENCE

A. The Contractor shall construct and dismantle the silt fence as shown on the plans and as recommended by the manufacturer.

1. When two sections of filter fabric adjoin each other, they shall be overlapped by 6 inches, folded, and stapled at a post.
2. Support fence, when required, shall be fastened securely to the fence posts with staples or wire ties.
3. Filter fabric shall be fastened to the support fence, when support fence is required, with ties spaced every 2 feet longitudinally at the top, mid-section, and bottom.

B. Care shall be taken to maintain the silt fence in a functional condition at all times during the construction period.

1. Silt fences shall be inspected at a minimum according to the Plan schedule of monitoring. In times of prolonged rainfall or water diversion, extra inspections may be necessary. The Contractor shall immediately correct all deficiencies.
2. Remove retained material when "bulges" develop in the silt fence or when deposits reach approximately one-half the height of the silt fence.
3. Fabric which has decomposed, has become ineffective or does not retain silt or suspended solids and is still needed, shall be replaced.

C. The Contractor shall remove the silt fence after all work has been completed and it is no longer needed or as ordered. Sediment deposits that are removed or left in place after the fabric has been removed shall be graded to conform to the existing topography and shall be vegetated.

3.11 EROSION STONE

A. Erosion stone shall be placed to provide for temporary control of erosion or pollution including stone check dams, inlet control and stabilized entrances as shown on the Plan. Upon acceptance of the contract, the stone shall be left in place unless considered to be permanent control.

3.12 MAINTENANCE

A. Erosion and sediment controls shall be maintained by the Contractor throughout the life of the project.

3.13 NOTICE OF TERMINATION

A. The contractor shall prepare and submit a General Permit NOT directly to the USEPA within thirty days after the project is done and completely stabilized. A copy of the NOT shall be given to the Contract Administrator.

END OF SECTION 02375

SECTION 02400 – DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. The Contractor shall provide all materials, equipment, and labor necessary for the removal of surface water and as required for the installation and maintenance of silt and erosion control devices.
   2. The Contractor shall build all drains and perform all ditching, pumping, bailing, and all other work necessary to keep the excavation clear of ground water, sewage, or storm water during the progress of the work and until the finished work is safe from damage.

1.2 QUALITY ASSURANCE

A. The Contractor shall use the following reference manual to assure quality where the drawings or technical specifications are silent:
   1. "New Hampshire Stormwater Management Manual dated December 2009 Volumes 1 through 3."

1.3 SUBMITTALS

A. The Contractor shall furnish to the Owner's Field Representative, in writing, his plan for diverting surface water and any excavation dewatering before beginning the construction work for which the diversion is required. The dewatering submittal shall provide information on sources of power to be used, as well as the locations of sumps, pumps, wells, discharge points, filtering methods, and other key features. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

PART 2- PRODUCTS

2.1 ACCEPTABLE MATERIALS

A. Pumped Sediment Removal Filter: Dirtbag® manufactured by "The BMP Store" (www.thebmpstore.com/dirtbag.htm) or approved equal.

PART 3 - EXECUTION

3.1 REMOVAL OF WATER

A. Provide all means necessary for discharge water to meet New Hampshire Department of Environmental Services (NHDES) water quality standard (10 NTU). .

B. Water pumped from excavations shall be piped to points discharging into sedimentation basins or filter devices in a manner which will not cause downstream siltation or damage to adjacent properties or vegetation.

3.2 DIVERTING SURFACE WATER

A. The Contractor shall build, maintain, and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protection works needed to divert surface water through or around the construction site and away from the construction work while construction is in progress. Storm runoff from disturbed areas must discharge into a filtering device prior to discharge into a natural drainage way or storm sewer.

B. Follow manufacture's recommendations for installation, maintenance and removal of

3.4 EROSION CONTROL PROVISIONS

A. The discharge from pumping operations during dewatering operations shall be contained by a device so constructed as to prevent silt from spreading off-site.

B. Prior to removal of all sediment control devices, all retained silt or other materials shall be removed at no additional cost to the Owner.

3.5 REMOVAL OF TEMPORARY WORKS

A. After the temporary works have served their purpose, the Contractor shall remove them or level and grade them to the extend required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

3.6 ENVIRONMENTAL PERMITS

A. All work under this section shall be done in accordance with all federal, state, and local regulations, laws, and rules which may apply and any individual permits that have been obtained for the project.

B. The Contractor shall obtain and all file notifications required by state and federal law and as identified on the Drawings.

C. Any permits requiring the Contractor's signature shall be signed and an original copy provided to the Owner.

D. The Contractor shall post and maintain any permit requiring posting at the project site.

END OF SECTION

SECTION 02455 - STEEL H-PILES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2008; Errata 2009) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 27/A 27M	(2008) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 572/A 572M	(2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

1.2 BASIS FOR CAPACITY

R=2E/(S+0.1) for double acting hammers

R=2WH/(S+0.1) for single acting hammers

in which R is the approximate allowable pile load in pounds, E equals the energy in foot-pounds per blow based on an acceptable certified statement from the manufacturer of the hammer, W equals the weight of the hammer or ram in pounds, H equals the fall of the hammer or ram in feet, and S equals the average inches of penetration per blow for the last three blows. Include all costs incidental to providing steel H-piles in the lump sum contract price bid, including furnishing and driving piles, mobilization, cutting off piles at cutoff elevation, splices, retapping of piles to confirm pile capacity, redriving of heaved piles to the required tip elevation, and providing driving records.

1.3 SUBMITTALS

Pile steel certificate

Pile steel points

Submit descriptions of pile driving equipment at least 30 days prior to commencement of work.

Pile splices proposed

Closeout Submittals

Pile driving records
Submit complete and accurate job pile driving records as specified in paragraph entitled "Records" of this section, within 15 calendar days after completion of driving.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 H-Piles
ASTM A 36/A 36M, ASTM A 572/A 572M, Grade 50. Provide pile tip reinforcements or cast steel points. Provide H-piles of the shape and sections shown.

2.1.2 Pile Splices

Full strength splices. ASTM A 36/A 36M, ASTM A 572/A 572M, Grade 50. Submit proposed method and procedure.

2.1.3 Pile Points
ASTM A 27/A 27M for cast steel points. ASTM A 36/A 36M, ASTM A 572/A 572M, Grade 50 for pile tip reinforcements. Pile points must be provided on all piles.

PART 3 EXECUTION

3.1 PILE DRIVING EQUIPMENT

Select the proposed pile driving equipment, including hammers and other required items, and submit complete descriptions of the proposed equipment in accordance with paragraph "Submittals." Final approval of the proposed equipment is subject to the satisfactory completion and approval of pile tests. Changes in the selected pile driving equipment will not be allowed after the equipment has been approved except as specified and directed. No additional contract time will be allowed for Contractor proposed changes in the equipment.

3.1.1 Pile Driving Hammers

Provide impact or vibratory type pile driving hammers.

3.1.1.1 Impact Hammers

Provide diesel-powered impact pile hammers of the single-acting, double-acting, or differential-acting type. The size or capacity of hammers must be as recommended by the hammer manufacturer for the total pile weight and the character of the soil formation to be penetrated. Hammers must be capable of, and so demonstrated during the development of refusal criteria, hard driving in excess of 20 blows per inch. Obtain driving energy by use of a heavy ram and a short stroke with low impact velocity, rather than a light ram and a long stroke with high impact velocity. Position a pile cap or drive cap between the pile and hammer. Place hammer cushion or cap block between ram and the pile cap or drive cap. Hammer cushion or cap block must have consistent elastic properties, minimize energy absorption, and transmit hammer energy uniformly and consistently during the entire driving period. In accordance with paragraph "Submittals," submit the following information for each impact hammer proposed:

a. Make and model.

b. Ram weight (pounds).

c. Anvil weight (pounds).

d. Rated stroke (inches).

e. Rated energy range (foot-pounds).

f. Rated speed (blows per minute).

3.1.1.2 Vibratory Hammers

The use of vibratory hammers is permitted for initial pile installation, however use of an impact hammer is required to establish load bearing capacity. for each vibratory hammer proposed:

a. Make and model.

b. Eccentric moment (inch-pounds).

c. Dynamic force (tons).

d. Steady state frequency or frequency range (cycles per minute).

e. Vibrating weight (pounds).

f. Amplitude (inches).

g. Maximum pull capacity (tons).

h. Non-vibrating weight (pounds).

i. Power pack description.

3.1.2 Pile Driving Leads

Support and guide hammers with suspended leads, fixed extended leads or fixed underhung leads. Operate vibratory hammers free hanging without leads.

3.2 INSTALLATION

Inspect piles when delivered and when in the leads immediately before driving. Cut piles at cutoff grade by an approved method. Where cutoff is below existing ground or mudline elevation, complete excavation, sheeting, and dewatering before driving pile to cutoff elevation.

3.2.2 Pile Driving Records

Use the preprinted forms attached at the end of this section, or equivalent, for recording pile driving data.

Compile and submit accurate records of the pile driving operations on the approved form in accordance with paragraph "Submittals." Include in driving records for each pile date driven, pile identification number, cross section shape and pile dimensions, location, deviations from design location, original length, ground elevation, top elevation, tip elevation, batter alignment, description of hammer used, number of blows required for each foot of penetration throughout the entire length of the pile and for each inch of penetration in the last foot of penetration, total driving time in minutes and seconds, and any other pertinent information as required or requested such as unusual driving conditions, interruptions or delays during driving, damage to pile resulting from driving, heave in adjacent piles, redriving, weaving, obstructions, predrilling, and depth and description of voids formed adjacent to the pile.

Additional data required to be recorded for impact hammers includes the rate of hammer operation, make, size. Additional data required to be recorded for vibratory hammers includes hammer power pack description, make, size, horsepower applied to pile, and hammer operating frequency.

3.2.3 Pile Placement and Tolerances in Driving

Develop and submit a pile placement plan which shows the installation sequence and the methods proposed for controlling the location and alignment of piles Accurately place piles in the correct location and alignments, both laterally and longitudinally, and to the vertical or batter lines indicated. Establish a permanent base line to provide for inspection of pile placement by the Engineer during pile driving operations prior to driving job piles and maintain during the installation of the job piles.

A final lateral deviation from the correct location at the cutoff elevation of not more than 4 inches will be permitted for vertical and battered piles. Manipulation of piles will not be permitted. A variation of not more than 0.25 inch per foot of pile length from the vertical for vertical piles nor more than 0.50 inch per foot of pile length from the required angle for batter piles will be permitted. In addition to complying with the tolerances stated herein, the clear distance between the heads of piles and the edges of caps must be not less than 6 inches. With prior approval of the Engineer, the Contractor may provide additional concrete and reinforcement to maintain the required minimum clear distance. Redesign of pile caps or additional work required due to improper location of piles is the responsibility of the Contractor. A final variation in rotation of the pile about the center line of the web of not more than 7.5 degrees is permitted. A vertical deviation of not more than 2 inches from the correct cutoff elevations shown is permitted. Inspect piles for heave. Redrive heaved piles to capacity. Maintain the correct relative position of all piles by the use of templates or by other approved means. Piles damaged or not located properly or exceeding the maximum limits for rotation, lateral and vertical deviation, or variation in alignment must be pulled and new piles redriven, or provide additional piles, at a location directed at no additional cost to the owner.

3.2.3.1 Survey Data

After the driving of each pile group is complete and before superimposed concrete is placed, provide the Engineer with an as-driven survey showing actual location and top elevation of each pile. Do not proceed with placing concrete until the Engineer has reviewed the survey and verified the safe load for the pile group driven. Present a survey in such form that it gives deviation from plan location in two perpendicular directions and elevations of each pile to nearest half inch.

3.2.4 Pile Driving

Notify the Engineer 30 days prior to the date pile driving is to begin. Do not drive piles within 100 feet of concrete less than 7 days old. Drive piles with hammers of the same model and manufacturer, same energy and efficiency, and using the same driving system. Operate hammers at all times at the speed and under the conditions recommended by the manufacturer. Where heave is anticipated, the sequence of installation must be such that pile heave is minimized by starting pile driving at the center of the group and proceeding outward and by driving vertical piles prior to driving battered piles where practicable. Prior to driving and with the pile head seated in the hammer, check each pile to ensure that it has been aligned correctly and that the orientation of the web about the centerline is as shown. Once pile driving has begun, keep conditions such as alignment and batter constant. Check and monitor the alignment of battered piles during driving with an accurate batter board level. Drive each pile continuously and without interruption until the required refusal blow count has been attained. Deviation from this procedure will be permitted only when driving is stopped by causes that reasonably could not have been anticipated. A pile that can not be driven to the required depth because of an obstruction, as indicated by a sudden unexplained change in blow count and drifting, must be pulled and redriven or cut off and abandoned, whichever is directed. After piles are driven, cutoff square as required at the indicated cutoff elevation.

Backfill any voids around piles or abandoned holes for pulled piles with sand or crushed stone and compact to the same density as the surrounding soil.

3.2.4.1 Splicing Piles

When approved, provide splices of the full penetration butt weld type. Use only one splice per length of pile. Construct splices to maintain the true alignment and position of the pile sections. Splices must develop the full strength of the pile in both bearing and bending.

3.2.4.2 Jetting

Jetting of piles is not be permitted.

3.2.4.3 Predrilling

Predrilling is permitted if obstruction are encountered. Discontinue predrilling when the pile tip is approximately 5 feet above the anticipated pile tip elevation. Drive pile the final 5 feet of penetration. Predrilling equipment and method must be approved by the Engineer prior to commencing predrilling operation.

3.2.4.4 Heaved Piles

When driving piles in conditions of relatively close spacing, perform observations to detect heave of adjacent piles. Backdrive heaved piles to original refusal blow count without additional cost to the Owner.

3.2.4.5 Pulled Piles

Pull and replace piles damaged or impaired for use during driving with new piles, or cut off and abandon and drive new piles as directed without additional cost to the Owner. The Engineer may require that any pile be pulled for inspection. Replace piles pulled as directed and found to be damaged with new piles at the Contractor's expense.

3.2.4.6 Welding

AWS D1.1/D1.1M.

PILE DRIVING LOG

CONTRACT NO._____ CONTRACT NAME_____
CONTRACTOR_____ TYPE OF PILE_____
PILE LOCATION_____ PILE SIZE: BUTT/TIP: _____ LENGTH_____
GROUND ELEVATION_____ CUT OFF ELEVATION_____
PILE TIP ELEVATION_____ VERTICAL (____) BATTER 1 ON (____)
SPLICES ELEVATION_____
COMPANY_____

HAMMER: MAKE & MODEL_____ WT. RAM_____
STROKE_____ RAM RATED ENERGY_____
DESCRIPTION & DIMENSIONS OF DRIVING CAP_____
CUSHION MATERIALS & THICKNESS_____

INSPECTOR_____

"DEPTH" COLUMN OF PILE DRIVING RECORD REFERENCED TO:
_____ CUT-OFF ELEVATION

TIME: START DRIVING_____ FINISH DRIVING_____ DRIVING TIME_____
INTERRUPTIONS (TIME, TIP ELEV. & REASON)_____

DRIVING RESISTANCE

DEPTH FT.	NO. OF BLOWS	DEPTH FT.	NO. OF BLOWS	DEPTH FT.	NO. OF BLOWS
0		18		36	
1		19		37	
2		20		38	
3		21		39	
4		22		40	
5		23		41	
6		24		42	
7		25		43	
8		26		44	
9		27		45	
10		28		46	
11		29		47	
12		30		48	

13	_____	31	_____	49	_____
14	_____	32	_____	50	_____
15	_____	33	_____	51	_____
16	_____	34	_____	52	_____
17	_____	35	_____	53	_____

DRIVING RESISTANCE IN BLOWS PER INCH FOR LAST FOOT OF PENETRATION:

DEPTH_____ DEPTH_____

1"___2"___3"___4"___5"___6"___7"___8"___9"___10"___11"___12"___

ELEV._____ ELEV._____

REMARKS_____

CUT OFF ELEVATION: FROM DRAWING _____

TIP ELEVATION = GROUND ELEVATION - DRIVEN DEPTH = _____

DRIVEN LENGTH = CUT OFF ELEVATION - TIP ELEVATION = _____

CUT OFF LENGTH = PILE LENGTH - DRIVEN LENGTH = _____

-- End of Section --

SECTION 02510 - BITUMINOUS PAVEMENT SAWCUT & PATCH

PART 1.0 - GENERAL

1.1 REFERENCES

A. Refer to other divisions of these specifications, other sections in this division, and drawings for related work, which may affect the work of this section.

B. The Contract Drawings indicate and show limits of construction for this project. These specifications specify material and work requirements for this project. Both are complimentary to each other, and both shall be followed to properly complete the work. In case of conflict the drawings shall govern.

1.2 SCOPE OF WORK

A. This work shall include the removal of existing bituminous pavement by sawcutting areas of existing pavement areas and removing all bituminous and base material to the pavement subbase, then replacing with new pavement and base courses as indicated on the drawings.

1.3 EQUIPMENT

A. Equipment used for sawing bituminous concrete pavement shall be a gasoline powered wet blade pavement saw. Cutting type roller blades will not be allowed. Existing bituminous concrete shall be carefully removed so as not to disturb the existing pavement to remain.

1.4 MATERIALS

A. Hot bituminous concrete shall be equal to and in accordance with the drawings.

B. Granular base material shall be as specified on the drawings.

1.5 CONSTRUCTION

A. The existing bituminous concrete shall be removed completely from within area sawcut to its full depth.

B. Material removed during this operation shall be properly disposed of off-site.

C. No permanent pavement shall be placed over backfill until compaction has been completed.

D. The contractor will be required to hose clean or sweep all road surfaces after backfilling and before any surfacing is done.

E. Base material shall be approved granular base having a minimum thickness as indicated on the drawings.

F. The existing edges of all pavement along the line of the excavation shall be saw cut back from exposed edges thereof, a sufficient distance to form a sharp, clean, straight edge. The minimum lateral cutback from top of trench wall will be one (1) foot. The cut back pavement will be carefully removed.

G. A bituminous concrete surface shall be constructed to match the thickness indicated on the drawings. The edges of abutting bituminous surfacing shall be painted with an emulsion to assure a satisfactory, watertight bond between the two materials.

H. The bituminous pavement courses shall be rolled thoroughly using rollers weighing approximately ten (10) tons, but not heavy enough to damage existing pavement.

- End of Section -

SECTION 02520 – CEMENT CONCRETE PAVEMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. All labor and materials shall conform to the State of New Hampshire Standard Specification for Road and Bridge Construction, sections 608, 203 & 209, Latest Edition.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the sidewalks and ramps:
   1. Walkways and Ramps shall be 6 inches thick..
   2. All concrete shall be NHDOT Class AA, 4,000 PSI after 28 days with 6 % air entrained with a concrete slump of 3".
   3. All concrete will have polyfiber reinforcing.
   4. Expansion joints shall be 25 feet apart, control joints shall be 5 feet apart and shall be a minimum of ¼ of the depth of the sidewalk (up to 1 ½" deep).
   5. The ends of all sidewalks shall be ramped at a maximum slope for 1:12.
   6. All sidewalks and ramps shall be constructed in accordance with ADA Regulations with appropriate cross slopes.
   7. Excavation for new sidewalks shall be at a depth of 12 inches below finish grade. In areas not abutting buildings or curbing the excavation shall be 6 inches wider that the finished sidewalk width.
   8. All unsuitable materials shall be removed and disposed of offsite. At no time shall unsuitable material be left under the sidewalk areas.
   9. In the areas where a "tactile" strip is used, the concrete shall be fiber mix reinforced with 6"x6"x10ga welded wire mesh.

B. Related Sections include the following:
   1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
   2. Division 3 Section "Sitework Concrete" for general site work applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Test Data: Indicate performance of proposed concrete mix designs based on data from field experience and/or trial mixtures according to ACI 318.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of Cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specifications for Structural Concrete", unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated non-petroleum based form-release agent that will not bond with, stain, or adversely affect concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

C. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.

D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

E. Plain Steel Wire: ASTM A 82, as drawn.

F. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.

G. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

H. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or pre-cast concrete or fiber-reinforced concrete of greater compressive strength than concrete, as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of Cementitious material from the same

manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I or II.

C. Fly Ash: ASTM C 618. Use Class F if reactive aggregates are in mix or if sulfate issues are expected; otherwise, Class F or Class C.

D. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
   1. Class: NHDOT Class AA 4,000 PSI mix.
   2. Maximum Aggregate Size: ¾ inch nominal.
   3. Do not use fine or coarse aggregates containing substances that cause spalling.

E. Water: ASTM C94

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309,

Type 1, Class B.

F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

G. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.6 RELATED MATERIALS

A. Expansion-and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
   1. Type II, non-load bearing, for bonding freshly mixed to hardened concrete.
   2. Type I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
   3. Type IV and V, load-bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Chemical Surface Retarder: Water-soluble, liquid set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

E. Detectable Warning Device ("Tactile" Strip)
The detectable warning surface shall consist of 2' deep x 3' wide Engineered Plastic units or approved equal. The device shall be "Armor Tile" as manufactured and supplied by Engineered Plastics, Inc., 300 International Drive Suite 100, Williamsville, NY 14221, 1.800.769.4463, www.armor-tile.com.

F. The detectable warnings shall be in full compliance with the ADA guidelines (Title 49 DFR Transportation, Part 37.9 Standard for Accessible Transportation Facilities, Appendix A, Section 4.29.2 – Detectable Warning on Walking Surface. The truncated domes shall have a base diameter of nominal 0.9 inch, top diameter of nominal 0.4inch, height of nominal 0.2 inch with a center to center spacing of nominal 2.35 inches.

G. The truncated dome pattern shall align properly from paver to paver if more than 1 paver is required.

F. Color: the tile shall be "light gray".

2.7 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI211.1 and ACI301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

C. Proportion mixes to provide concrete with the following properties:
   1. Compressive Strength (28 Days): 4,000 psi.
   2. Maximum Water-Cement Ratio: 0.45.
   3. Slump Limit: 3 inches.
      a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant or site-verified 2 to 3 inch slump.

D. Cementitious Materials:
   1. Limit percentage, by weight, of cementitious materials other than Portland cement, according to ACI301 requirements for concrete exposed to deicing chemicals.
   2. Provide minimum of 25 percent of total cementitious content as fly ash.

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.0 percent:
   1. Air Content: 6.0 percent for ¾-inch maximum aggregate.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

PART 3 – EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after non-conforming conditions have been corrected and sub-grade is ready to receive payment.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace and secure edge forms, bulkheads and intermediate screed guides for pavement to required lines, grades and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice or other bond-reducing materials.

C. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks and other irregularities, or replace units as required before placement. Set mats for a minimums 2-inch overlap to adjacent mats.

3.4 JOINTS

A. General: Construct construction, isolation and contracting joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than half an hour unless pavement terminates at isolation joints.
   1. Continue reinforcement across construction joints, unless otherwise indicated.
   2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   3. Use epoxy bonding adhesive at locations where fresh concrete is placed against

hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catchbasins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler ½ inch below finished surface if joint sealant is indicated.
   4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   5. Furnish joint fillers in on-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   6. Protect top edge of joint filler during concrete placement with metal, plastic or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

F. Install dowel bars and support assemblies at joints where indicated. Install waxed tube dowel sleeve one-half of dowel length to prevent concrete bonding to one side of joint.
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
      a. Radius: 3/8 inch.

G. Edging: Tool edges of pavement, gutters, curbs and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
   1. Radius: 3/8 inch.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI304R for measuring, mixing, transporting and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spacing, rodding or tramping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
   1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or derbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or surface treatments.

J. Do not operate equipment on concrete until pavement has attained 85% of its 28-day compressive strength.

K. Cold-Weather Placement: Comply with ACI306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

L. Hot-Weather Placement: Place concrete according to recommendations in ACI305R, and as follows when hot weather conditions exist:

   1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Chilled mixing water or chopped ice may be used to

control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI306.1 for cold-weather protection, and follow recommendations in ACI305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry or windy conditions cause moisture loss approaching 0.2 lbs/sq. ft. X h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding and bull-floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven (7) days with the following materials:
   a. Water.
   b. Continuous water-fog spray.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 SURFACE TOLERANCES

A. Comply with tolerances of ACI 117, and as follows:
1. Elevation: ¼ inch.
2. Thickness: Plus 3/8 inch, minus ¼ inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed ¼ inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: ¼ inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: ½ inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel ¼ inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus ¼ inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.9 FIELD QUALITY CONTROL

A. Test results shall be reported in writing to Architect, within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.

B. Nondestructive Testing: Impact hammer, sonoscope or other non-destructive device may be permitted by Architect, but will not be used as the sole basis for approval or rejection.

C. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to

determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic for at least 14 days after placement. When construction traffic is permitted, maintain concrete as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete free of stains, discoloration, dirt and other foreign material. Sweep concrete not more than two (2) days before date scheduled for Substantial Completion Inspection(s).

END OF SECTION 02520

SECTION 02550 – PAVEMENT STRIPING

PART 1.0 - GENERAL

1.1 REFERENCES

A. Refer to other division of these specifications, other sections in this division, and drawings for related work, which may affect the work of this section.

B. The Contract Drawings indicate and show limits of construction for this project. These specifications (refer to Table of Contents) specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work.

1.2 SCOPE OF WORK

A. Without limiting the generality thereof, the scope of work under this section shall include all labor, materials, accessories, service and equipment necessary to furnish and apply all pavement striping, parking stalls and traffic markings as indicated on the drawings and as specified herein.

1.3 GUARANTEE

A. Contractor is to furnish the Owner with a one (1) year unconditional guarantee against fading, chipping, peeling, wearing, etc., for said one year period. The contractor is to provide said guarantee in writing, in a form acceptable to the Owner's Representative, with the bid.

PART 2.0 - PRODUCTS

2.1 PRODUCTS

A. All paint for parking stall and traffic markings shall be fast drying white and yellow traffic paint as specified on the drawings.

B. Material used shall be in accordance with the Standard Specifications, but shall not be installed until the top course of pavement has cured at least a week.

C. The material shall not lift from the pavement in the freezing weather, and shall not smear or spread under normal traffic conditions or at temperature below 120 degrees F.

D. The paint shall not deteriorate by contact with sand, sodium, chloride, calcium chloride or other chemicals used against the formation of ice on the pavement, because of the oil content of pavement materials or from gasoline, grease and oil drippings from vehicles.

PART 3.0 - EXECUTION

3.1 APPLICATION

A. Pavement striping and marking shall be applied in accordance with this specification and the drawings. See drawings for layout and additional notes. No paint shall be applied until the top pavement course has cured at least one (1) week minimum.

B. Lettering shall be painted white, to the size, length and spacing as shown, specified and indicated on the drawings.

C. All stripes shall be applied one coat with brush, spray or marking machine over dry clean pavement only.

D. All paint shall be installed at a rate of not more than 300 linear feet of 4" wide lines per gallon of paint (approximately 0.016").

E. Furnish only skilled workmen who are experienced and normally employed in the work of installing traffic lines. Supply all the necessary equipment and materials for the installation of the traffic lines.

F. If material is applied to the pavement by an extrusion method one side of the shaping die shall be the pavement and the other three (3) sides are contained by, or are part of, suitable equipment for controlling the flow of paint.

G. After application and proper drying time, the material shall show no appreciable deformation or discoloration under traffic conditions and in air and/or road temperature ranging from zero degrees F to 120 degrees F.

H. The stripe shall maintain its original dimensions and placement. The exposed surface shall be free from tack. Cold ductility of the material shall be such as to permit normal movement with the pavement surface without chipping or cracking.

I. Contractor shall clean and sweep all areas to be striped or restriped of all sand, dirt, grease, oil, etc., as required so as to produce a first class job. By proceeding, the striping Subcontractor agrees surface is satisfactory to produce the required first class job and one year guarantee described.

J. The contractor shall protect all buildings, walks, pavement, curbing, trees, shrubs, mulch, cars, etc. from over-spray of paint and damage by his operations.

K. Traffic shall not be permitted on the pavement until the paint is thoroughly dry.

- End of Section -

SECTION 02601 – SEWER MANHOLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install manholes, cast iron frames and covers in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein. Furnish and apply bituminous waterproofing on all outside surfaces of sewer manholes.

1.2 QUALITY ASSURANCE

A. Construct all manholes in conformance with the New Hampshire Department of Environmental Services Standards of Design and Construction for Sewerage and Sewage or Waste Treatment Systems.

B. Construct all manholes of a quality to withstand loads of 8 tons (H-20 loading) without failure for a period of time in excess of 25 years.

C. Construct all manholes of a quality to prevent leakage in excess of 1 gallon per day per vertical foot of manhole.

D. Construct all manholes throughout the entire project from the same materials unless otherwise shown on the Drawings.

E. All castings shall be at least Class 30 conforming to ASTM Standard Specifications for Gray Iron Casting, Designation A40.

F. All essential details of design shall be as shown on the Drawings.

G. Frames and Covers:

1. Acceptable Manufacturers:
   a. Etheridge Foundry Co., Model E245S.
   b. Or equivalent.

H. Masonry:

1. Perform brick masonry work in conformance with the New Hampshire Department of Environmental Services Standards of Design for Construction for Sewerage and Sewage or Waste Treatment Systems.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

B. A description of all methods of jointing.

C. All Certificates of Compliance.

PART 2 - PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A General

1. Risers and tops shall be precast reinforced or non-reinforced concrete, or cast-in-place reinforced or non-reinforced concrete.
2. Manhole bases shall be monolithic to a point 6 inches above the crown of the incoming pipe and shall be constructed of reinforced or non-reinforced concrete.
3. Use concrete that conforms to the requirements of Class A concrete in Section 520 of the N.H.D.O.T. Standard Specifications for manhole bases and cast-in-place manholes.
4. Use reinforcing steel for cast-in-place concrete that conforms to the requirements of the N.H.D.O.T. Standard Specifications for Billet-Steel Bars or Welded Steel Wire Fabric.
5. Construct pipe to manhole joints that are approved by the New Hampshire Department of Environmental Services. In general, use approved non-shrinking mortar or elastomeric or mastic-like sealants to unsure these joints are watertight.
6. Install manhole steps as shown on the Drawings.
7. All manhole covers shall be 30 inches in diameter unless shown otherwise on the Drawings and have the letter "S" or the word "SEWER" in 3 inch letters cast into the top surface.
8. All castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended.
9. Contact surfaces of covers and frame seats shall be machined at the foundry before shipment to prevent rocking of covers in any orientation.
10 All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
11. Prior to being shipped from the foundry, castings shall be sandblasted.
12. Repair all coatings that have been damaged in transit or handling to the satisfaction of the Engineer.

B. Openings:
   1. Provide openings in the risers to receive pipes entering the manhole.
   2. Make openings at the manufacturing plant.
   3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
   4. Location: To permit setting of the entering pipes at the correct elevations.
   5. Openings shall have a flexible watertight union between pipe and the manhole base.
      a. Cast into the manhole base and sized to the type of pipe being used.
      b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.
         1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
         2. Kor N Seal made by National Pollution Control System, Inc.
         3. Link Seal by Thunderline Corporation (Wayne, MI).
         4. Approved Equal.

C. Joints:

1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.
   Acceptable Materials:
   a. Kent-Seal No. 2
   b. Ram-Nek
   c. Or equivalent.
2. Joints between precast sections shall conform to related standards and manufacturer's instructions.

D. Waterproofing:
1. The exterior surface of all manholes shall be given two coats of bituminous waterproofing material.
2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
3. Sufficient 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.
4. When precast manholes are delivered with a coating of bitumastic, field apply one additional coat of waterproofing.

2.2 FRAMES AND COVERS

A. Standard Units:
1. North America manufactured only.
2. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
2. Have machined bearing surfaces to prevent rocking.
3. Castings shall be smooth with no sharp edges.
4. Constructed to support an HS-20 wheel loading.
5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:
   a. Covers - solid with sewer in 3-inch letters diamond pattern.
   b. Frame - 30-inch diameter clear opening, with flange bracing ribs.
6. Minimum weight of frame and cover shall be 338 lbs.
7. Acceptable product: Neenah Model # R-1743, or approved equal.

2.3. MANHOLE BRICK:

1. All brick shall be sound, hard, uniformly burned, regular and uniform in shape and size and of a compact texture.
2. All brick shall meet ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for a Grade SS, hard brick.

2.4. MORTAR:

1. Mortar shall have the following composition by volume:
   a. 1 part Type II Portland cement meeting ASTM C-150 Standard Specifications for Portland Cement.

b. ½ part hydrated lime Type S meeting ASTM Standard Specifications for Hydrated Lime for masonry purposed, Designation C207.
c. 3 parts sand (clean, inert and natural).

2.5. CONCRETE FINE AGGREGATE:

1. Shall meet ASTM ASTM Standard Specifications for Concrete (Fine) Aggregates Designation C33.
2. Shall meet the following gradation:

Sieve #	Percent Passing
3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10

3. Fineness Modulus 2.3 – 3.1

2.6. MANHOLE WATERPROOFING:

1. Acceptable Manufacturers:
   a. Minwax Fibrous Brush Coat, Minwax Co., N.Y., N.Y.
   b. Tremco 121 Foundation Coating, Tremco Mfg. Co., Newark, N.J.
   c. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Manhole Bases:
   1. Place bases on a 6 inch layer of compacted bedding consisting of crushed stone and/or natural stone graded to the following specifications:
      a. 100 percent passing a 1 inch screen.
      b. 90 to 100 percent passing a 3/4 inch screen.
      c. 20 to 55 percent passing a 3/8 inch screen.
      d. 1 to 10 percent passing a number 4 sieve.
      e. 0 to 5 percent passing a number 8 sieve.
      f. Equivalent to Standard Stone Size Number 67, Section 703 of N.H.D.O.T. Standard Specifications.
   2. Properly dewater the excavation while placing the bedding material and placing concrete.

B. Construct inlet and outlet stubs as shown on the Drawings.

C. Invert Channels:
   1. Construct smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
   2. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole.

3. Stop the pipes at the inside face of the manhole where changes of direction occur.
4. Form invert channels as shown on the Drawings.
5. Slope the shelf of the manhole outside the flow channel as shown on the Drawings or as directed by the Engineer.
6. Underlayment of invert and shelf shall consist of brick masonry.

D. Precast Risers and Tops:
1. Use the appropriate combinations of risers and top lengths.
2. Seal joints with an approved type mastic as shown on the Drawings.
3. Perform jointing in accordance with the manufacturer's recommendations and as approved by the Engineer.
4. Install risers and tops level and plumb.
5. Do not permit water to rise over newly made joints until after inspection by the Engineer.
6. Make all joints watertight.
7. Solidly fill annular spaces around pipes entering the manholes with non-shrink mortar or as otherwise shown on the Drawings.
8. When necessary, cut openings carefully to prevent damage to risers and tops. Replace all damaged risers and tops at no additional cost to the Owner.

E. Cast-In-Place Manholes:
1. Place a special plastic waterstop in the joint between the base and the sides of all manholes.
2. Obtain the Engineer's approval of the type of waterstop and the installation.
3. Cast all pipes entering the manholes in place.

F. Drop Manholes:
1. Construct drop manholes as shown on the Drawings.

G. Adjustment to Grade:
1. If necessary, adjust tops of manholes to grade with clean brick masonry.
2. Moisten all bricks by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling. Thoroughly bond.
3. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or other approved method. Protect brick masonry from the weather, frost and flowing sewage as required.

H. Set manhole frames with the tops conforming accurately to the grade of the pavement or finished ground surface or as shown on the drawings.

I. Set frames concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange at the frame shall be completely filled and made watertight.

J. Place a thick ring of mortar extending to the outer edge of the masonry all around and on the top of the bottom flange.

K. Finish the mortar so that it will be smooth and have a slight slope to shed water away from the frame.

L. When the work on each manhole is complete, clean the frame seat and set the cover in place.

3.2 LEAKAGE TESTS

A. General:
   1. Perform vacuum tests on all manholes.
   2. Exfiltration tests on manholes shall be performed in case of vacuum test failure or may be submitted as a substitution with approval by the Engineer.
   3. Tests shall be observed by the Engineer.

B. Preparation:
   1. After manholes have been assembled in place, fill and point all lifting holes and those exterior joints within 6 feet of the ground surface with an approved non-shrink mortar.
   2. Make the tests prior to placing the shelves and inverts and before filling and pointing the horizontal joints below the 6 foot depth line.
   3. Suitably plug all pipes and other openings into the manholes.

C. Test Procedure: Vacuum
   1. Use only an approved testing machine.
      a. National Pollution Control, Inc.
      b. Or approved equal.
   2. Securely brace all plugs.
   3. Check cone section to insure good seal with test machine bladder.
   4. Bring test vacuum to 10 in. Hg gauge.
      a. Time:
         Manholes 0'-10' - 2 minutes
         Manholes 10'-15'- 2.5 minutes
         Manholes 15'-25'- 3 minutes
      b. Allowable leakage is 1" Hg or less per times given.
      c. If pressure drop exceeds 1" Hg in the required time, the manhole shall be repaired and retested.
      d. If the manhole fails after being repaired, the manhole shall be "Water Exfiltration Tested" according to the criteria of the specification.
   5. When a leak is identified repair the area from both inside and out by a method approved by the Engineer. Methods to be considered include parging with hydraulic cement and pressure application of polyurethane grout.

D. Test Procedure: Water Exfiltration Test
   1. Lower groundwater below the bottom of the manhole for the duration of the tests.
   2. Fill the manhole with water to the top of the cone section.
   3. If the excavation has not been backfilled and observation indicates no visible leakage (no water visibly moving down the surface of the manhole); the manhole may be considered to be satisfactorily watertight.
   4. If the test is unsatisfactory, in the opinion of the Engineer, or if the manhole has been backfilled, the test shall be continued.
   5. A period of time may be permitted, if the Contractor so wishes, to allow for absorption.

6. At the end of the absorption time period, refill the manhole to the top of the cone, if necessary, and begin measuring an 8 hour test period.
7. At the end of the test period, refill the manhole to the top of the cone and measure the volume of water added. This amount shall be extrapolated to a 24 hour rate and the leakage shall be determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24 hour period.
8. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made, as directed or approved by the Engineer, to bring the leakage within the allowable rate of 1 gallon per vertical foot per day.
9. Leakage due to a defective section or joint exceeding the 3 gallon per vertical foot per day, shall be cause for the rejection of the manhole.
10. Uncover all rejected manholes as necessary and disassemble, reconstruct or replace them as directed by the Engineer at no additional cost to the Owner.
11. All manhole repairs shall be made inside and out.
12. Retest repaired or replaced manhole and, if satisfactory, fill and finish interior joints.

E. Backfilling:
1. Manhole testing may be conducted either before or after backfilling around the manhole. However, if the Contractor elects to backfill prior to testing, for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test.
2. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.
3. If the manhole test fails, lower the water table and carry out the exfiltration test specified above at no additional cost to the Owner.

F. Accident Prevention: Following the satisfactory completion of the leakage test, place the frame and cover on the top, or provide other means of preventing accidental entry by unauthorized persons, children, animals, etc., until ready to make final adjustment to grade.

END OF SECTION

SECTION 02610 – PIPE & FITTINGS – GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. All work shall conform to City of Portsmouth requirements.

1.2 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

B. If requested by the Engineer, submit manufacturer's "Certification of Conformance" that pipe and pipe fittings meet or exceed the requirements of these Specifications.

C. Submit other documents as specified in the appropriate Sections of this Division.

1.3 QUALITY ASSURANCE

A PVC pipe and fittings standards: Manufacturer shall have a minimum of five (5) years experience in the manufacture of PVC sewer pipe.

1.4 DELIVERY, STORAGE AND HANDLING

A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe and fittings.

B. Do not drop pipe and fittings.

C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations and as directed by the Engineer.

D. Assure that materials are kept clean and dry.

E. Do not store materials directly on the ground.

F. Follow manufacturer's specific instructions, recommendations and requirements.

G. Deliver as job progress requires and store on a smooth bed to prevent point loading.

H. Stack pipe in accordance with manufacturer's instructions.

I. Exercise extra care when handling.

1.5 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:

1. Defects and damage.
2. Deviations beyond allowable tolerances for joint dimensions.
3. Removal of debris and foreign matter.

D. Examine areas and structures to receive piping for:

1. Defects, such as weak structural components, that adversely affect the execution and quality of work.

2. Deviations beyond allowable tolerances for pipe clearances.

E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.

F. Immediately remove all rejected materials from the project site.

G. Start work only when conditions are corrected to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Marking Tape

1. Shall be coded in accordance with the APWA Standards.
2. Shall be indelibly marked indicating the type of utility it is placed over.
3. Shall be three (3) inches wide Terra Tape Sentry Line 1350 (Detachable) by Reef Industries, Houston, TX, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as instructed by the Engineer.
2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
3. Install adaptors, approved by the Engineer, when connecting pipes constructed from different materials.
4. When applicable, support all piping not being installed in trenches in accordance with the "Pipe Hangers & Supports" Section of these Specifications.

B. Installation and Trenches:

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe. Pipe bedding material shall be hand tamped to completely fill the void beneath the pipe's springline.
4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring inverts to the required grade.
6. Set the pipe true to line and grade. Use a transit for line. Use a laser beam aligner for grade.

7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer or any other unyielding object.
8. Make all pipe joints watertight and no sand, silt, clay or soil of any description entering the pipeline at the joints.
9. Immediately after making a joint, fill the holes for the joint with bedding material, and compact.
10. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
11. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
12. Take all necessary precautions to prevent flotation of the pipe in the trench.
13. Where there is evidence of water or soil entering the pipeline, repair the defects to the satisfaction of the Engineer.

C. Temporary Plugs:
1. When pipe installation work in trenches is not in progress, close open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipe lines as conductors for trench drainage during construction.

D. Protection of Water Supplies:
1. There shall be no physical connection between a public or private potable water supply system and a sewer.
2. Horizontal separation of the sewer and water main shall be not less than 10 feet, unless shown otherwise on the Drawings.
3. Whenever sewers must cross water mains, the sewer shall be constructed as follows (unless shown otherwise on the Drawings):
   a. Sewer pipe shall be class 52 ductile iron or PVC SDR 25 for a minimum distance of 9 feet each side of the crossing.
   b. Joints shall be mechanical type water pressure rated with zero leakage when tested at 25 pounds per square inch for gravity sewers and 1-1/2 times working pressure for force mains and joints shall not be located within 9 feet of the crossing.
   c. Vertical separation of the sewer and water main shall not be less than 18".

3.2 CLEANING AND TESTING

A. Cleaning and Testing Piping - General:
1. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
2. When the installation is complete, test all pipelines in the presence of the Engineer and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner.

3. Equipment: Supply all labor, equipment, materials, gages, and pumps required to conduct the tests.
4. Retesting: Perform all retesting required due to failure at no additional cost to the Owner and to the complete satisfaction of the Engineer.

B. Sewer Lines:
1. Outside Sewer Lines: Test as stated in the Section 02651, Final Sewer Testing, of these Specifications.

C. All Other Piping Systems:
1. Pressure Test:
   a. Perform a pressure test for all other piping systems at 1-1/2 times maximum system pressure, or at the maximum working pressure of the piping system, or at a pressure indicated in the appropriate Sections of this Specification.
   b. Tests shall be hydrostatic water, or air pressure as specified or as approved by the Engineer.
2. Perform bacteriological testing of new water service. Re-disinfect pipe not passing the bacteriological tests and retest.
3. Cleaning: Perform all specialized cleaning as specified or required for each system.

END OF SECTION

SECTION 02611 - DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test ductile iron pipe and cast or ductile iron fittings of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. Standards:
1. Cement-mortar lining for water: ANSI A21.4.
2. Rubber gasket joints: ANSI A21.11.
3. Ductile iron pipe thickness: ANSI A21.50.
4. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A21.51.
5. Threaded flanges: ANSI A21.15.
6. Ductile iron fittings: C153/ANSI 21.53
7. Pipe flanges and fittings: ANSI B16-1, ANSI A-21.12.
8. Bolts: COR-TEN ASTM A588.
9. Polyethylene Encasement: ANSI/AWWA C105/A21.5.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

B. If requested by the Engineer, submit manufacturer's "Certification of Conformance" that pipe and fittings meet or exceed the requirements of these Specifications.

1.4 DELIVERY, STORAGE AND HANDLING

A. Exercise extra care when handling pipe and fittings.

B. Exercise extra care when handling cement lined pipe and fittings because damage to the lining will render it unfit for use.

C. Protect the spherical spigot ends and the plain ends of all pipes during shipment by wood lagging securely fastened in place.

1.5 INSPECTION

A. Provide all labor necessary for the Engineer to inspect pipe, fittings, gaskets, and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:
   1. Defects and damage.
   2. Deviations beyond allowable tolerances for joint dimensions.
   3. Removal of debris and foreign matter.

D. Examine areas and structures to receive piping for:
   1. Defects, such as weak structural components that adversely affect the execution and quality of work.
   2. Deviations beyond allowable tolerances for pipe clearances.

E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.

F. Immediately remove all rejected materials from the project site.

G. Start work only when conditions are corrected to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe:
   1. All pipes shall conform to the latest AWWA specification C-151. Unless otherwise shown on the Drawings, the minimum thickness of ductile iron pipe shall be:
      a. For pipe 4 inches in diameter and smaller: Class 52 Ductile Iron, Cement Lined.
      b. For pipe 6 inches in diameter and larger: Class 52 Ductile Iron, Cement Lined.
      c. Pipe with flanges: Class 53 (formerly Class 3).
      d. All ductile iron pipe shall have cement lining of double thickness.
   2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
   3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings.
   4. Factory applied bituminous coatings, as approved by the Engineer, shall be furnished for all under ground piping.

B. Joints (as shown on the Drawings, specified and applicable):

1. General: All joints shall be Class 125 unless otherwise shown on the Drawings.
2. Flanged:
   a. Provide specially drilled flanges when required for connection to existing piping or special equipment.
   b. Flanges shall be long-hub screwed tightly on pipe by machine at the foundry prior to facing and drilling.
   c. Gaskets:
      1) Ring type of rubber with cloth insertion.
      2) Thickness of gaskets 12 inches in diameter and smaller: 1/16 inch.
      3) Thickness of gaskets larger than 12 inches in diameter: 3/32 inch.
   d. Fasteners:
      1) Make joints with bolt, stubs with a nut on each end, or one tapped flanged with a stud and nut.
      2) The number and size of bolts shall meet the requirements of the same American National Standard as the flanges.
      3) Nuts, bolts and studs shall be 316SS.
      4) After jointing, coat entire joint with bituminous material compatible with pipe coating.
   e. When applicable, provide and install flange clamps as shown on the Drawings.
3. Push-on and Mechanical Joint:
   a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
   b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.
4. Grooved split ring couplings, sleeve couplings, flexible joints and couplings: As specified and shown on the Drawings.
5. Joint Bracing:
   a. Provide joint bracing to prevent the piping from pulling apart under pressure as required.
   b. Types of bracing:
      (1)Pipe and fittings with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with an approved bituminous paint after assembly or, if necessary, prior to assembly.
      (2)Mechanical joint ductile iron pipe shall have set screw restrained ductile iron glands.
      (3)Other types of bracing as shown on the Drawings.

C. Standard Fittings:
   1. All joints shall conform to the latest AWWA specification C-153.

2. Class 350, Ductile Iron, Cement Lined except as shown on the Drawings or as specified.
3. Joints the same as the pipe with which they are used or as shown on the Drawings.
4. Provide fittings with standard bases where shown on the Drawings.
5. Provide retainer glands on all fittings.

D. D.Non-Standard Fittings:
1. Fittings having non-standard dimensions shall be subject to the Engineer's approval.
2. Non-standard fittings shall have the same diameter and thickness as standard fittings and shall meet the specification requirements for standard fittings.
3. The laying lengths and types of joints shall be determined by the particular piping to which they connect.
4. Flanged fittings not meeting the requirements of ANSI A21.10 (i.e., laterals or reducing elbows) shall meet the requirements of ANSI B16.1 in Class 125.

E. Polyethylene encasement shall be 8 mil thick, if shown on drawing or required per field conditions.

F. Pipe outside asphaltic coating shall conform to ANSI/AWWA C151/A21.51

PART 3 - EXECUTION

3.1INSTALLATION

A. General:
1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations.
2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
3. Install adaptors, approved by the Engineer, when connecting pipes constructed from different materials.
4. All DI pipe (in trenches or structures) shall be coated with 2 coats epoxy polymide.

B. B.Installation in Trenches:
1. Install polyethylene coating around pipe where shown on the Drawings.
2. Coat all DI pipe with 2 coats of epoxy polymide coating.
3. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
4. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.

5. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
6. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
7. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts up to the required grade.
8. Set the pipe true to line and grade. Use a laser beam aligner.
9. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
10. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay or soil of any description entering the pipeline at the joints.
11. Immediately after making a joint, fill the holes for the joints with bedding material and compact.
12. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
13. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
14. Take all necessary precautions to prevent flotation of the pipe in the trench.
15. Where there is evidence of water or soil entering the pipeline, repair the defects.

C. Temporary Plugs:
1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

D. Assembling Joints:
1. Push-on Joints:
   a. Insert the gasket into the groove of the bell.
   b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
   c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
2. Bolted Joints:
   a. Remove rust preventive coatings from machined surfaces prior to assembly.
   b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.
3. Flanged Joints:
   a. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.

b. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.

4. Mechanical Joints:
   a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
   b. Lubricate the gasket, bell, and spigot by washing with soapy water.
   c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
   d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
   e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
   f. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
      (1)Range of Torque: 60-90 Ft.-lbs.
      (2)Length of Wrench: 10 inches.
   g. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean, and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.

5. Bell and Spigot Joints:
   a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
   b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

E. Fabrication:
1. Tapped Connections:
   a. Make all tapped connections where shown on the Drawings or where directed by the Owner's Field Representative.
   b. Make all connections watertight and of adequate strength to prevent pullout.
   c. Drill and tap normal to the longitudinal axis of the pipe.
   d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
2. Cutting:
   a. Perform all cutting with machines having rolling wheel cutters or knives designed to cut cast or ductile iron. Do not use a hammer and chisel to cut pipe.
   b. After cutting, examine all cut ends for possible cracks.
   c. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

END OF SECTION

SECTION 02622- PVC PIPE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test PVC pipe of the size(s), type(s) and in the location(s) shown on the Drawings and or specified herein.

B. Related work Specified Elsewhere (When Applicable):

1. Site work is specified in this Division.

1.2 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of five (5) years experience in the manufacture of PVC sewer pipe.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit manufacturer's literature, test reports, and certificates in accordance with the General Conditions of the Construction Contract.

1.4 DELIVERY, STORAGE & HANDLING

A. Deliver as job progress requires and store on a smooth bed to prevent point loading.

B. Stack pipe in accordance with manufacturer's instructions.

C. Exercise extra care when handling.

1.5 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:

1. Defects and damage.
2. Deviations beyond allowable tolerances for joint dimensions.
3. Removal of debris and foreign matter.

D. Examine areas and structures to receive piping for:

1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
2. Deviations beyond allowable tolerances for pipe clearances.

E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.

F. Immediately remove all rejected materials from the project site.

G. Start work only when conditions are corrected to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe & Fittings:

1. Type - Polyvinylchloride (PVC) plastic pipe with integral bell and spigot joints. Polymer compounding and classification shall be in accordance with ASTM D-1784 (Class 1254-B).
2. Gravity Sewers:
   a. 4" - 15" nominal diameter sizes shall conform to ASTM D-3034 and SDR=35.
   b. 18" - 27" nominal diameter sizes shall conform to ASTM F-679 (wall thickness T-1).
3. Water Pipe:
   a. PVC C-900 in accordance with AWWA C-900 and ASTM D1598 and D2241. See detail and end of this Section.
4. Furnish straight pipe in standard laying lengths, 12.5 and 20 feet for 18" diameter and less, 12 and 19.5 feet for 21", 24" and 27" diameter.
5. Furnish fittings of approved equal to the pipe and having bell and spigot configuration identical to that of the pipe.

B. Joints:
1. Type - Flexible elastomeric seal conforming to ASTM D-3212 with push-on bell and spigot.
2. Gaskets shall conform to ASTM F-477.
3. Rubber rings for pressure sewer shall conform to ASTM D-1869 and ASTM F477.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with the manufacturer's written instructions and as shown on the Drawings.
B. Exercise extra care during winter construction as pipes impact strength is lower.
C. Prior to backfilling, exercise extra care to maintain water level in open excavation below the pipe invert to avoid flotation of pipe already set to line and grade.

3.2 CLEANING AND TESTING

A. Clean and test PVC pipes: Refer to Final Sewer Testing section in these specifications.

END OF SECTION

SECTION 02623 – CORRUGATED POLYETHYLENE PIPE (CPE) AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, anchor, support and test pipe and pipe fittings of the types and sizes in the locations shown on the Drawings and/or as directed by the Owner's Field Representative.

1.2 QUALITY ASSURANCE

A. Pipe shall be high density polyethylene (HDPE) conforming to the following standard referenced specifications:
   1. AASHTO M294.
   2. ASTM D3350 Polyethylene Plastic Pipes and Fittings.

B. Pipe and fittings shall be provided by a single manufacturer, and a certificate of compliance will be submitted to the Owner's Field Representative for approval.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. The prescribed sizes of pipes are nominal inside diameters. Pipes shall be of the size and length shown on the plans.

B. Smooth Interior Corrugated Polyethylene Pipe:
   1. The product supplied under this specification shall be high density polyethylene corrugated exterior/smooth interior pipe. Twelve - to 36 - inch diameters shall conform to AASHTO M294 Type S. Forty-two and 48 - inch diameters shall have minimum pipe stiffness of 20 and 17 psi, respectively, at 5% deflection; and shall meet all other requirements of AASHTO M294.
   2. Material shall contain 100 percent virgin polyethylene resins and meet ASTM D3350 Cell Classification 335400C.
   3. Pipe greater than 6-inch diameter shall be N-12 IB ST "soil tight" pipe as manufactured by Advanced Drainage Systems (ADS), or approved equal, with integral reinforced polyethylene bell. Bell shall span three corrugations and be sealed with a rubber gasket meeting ASTM F477.

C. Coupling Bands:
   1. Coupling bands shall be used only for 4-inch and 6-inch pipe. Coupling bands shall cover at least one full corrugation on each section of pipe. When gasketed coupling bands are required, the gasket shall be made of closed-

cell synthetic expanded rubber meeting the requirements of ASTM D1056, Type 2. Gaskets shall be installed on the coupling band by the pipe manufacturer. All coupling bands shall meet or exceed the soil-tightness requirement of the AASHTO Standard Specification for Highway Bridges, section 23, paragraph 23.3.1.5.4(e).

D. Fittings:
   1. Furnish fittings of approved equal to the pipe and having connection configurations identical to that of the pipe.
   2. CPE Pipe fittings shall conform to AASHTO M294.
   3. Furnish injection molded fittings where indicated on the drawings.

E. Acceptable Manufacturers:
   1. Hancor, Inc., Findlay Ohio.
   2. Advanced Drainage Systems, Columbus Ohio.
   3. Lane Enterprises, Inc., Ballston Spa, New York.

F. Culvert flared end sections shall be constructed of polyethylene, unless noted otherwise on the Drawings. Connection configuration shall be specifically compatible with the connected drainage pipe,

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with manufacturer's recommendations and as shown on the drawings.

B. Prior to backfilling, exercise extra care to maintain water level in open excavation below the pipe invert to avoid flotation of pipe already set to line and grade.

C. Flared end sections shall be fully supported.

D. Stones larger than one (1) inch in diameter shall not contact the pipe, fittings or appurtenances.

3.2 INSPECTION AND CLEANING

A. Inspect all drain pipes in the presence of the Owner's Field Representative. All pipes not demonstrating uniform slope and alignment shall be replaced at no additional cost to the Owner.

B. Clean all drain pipes upon establishment of turf and full stabilization of the site.

END OF SECTION

SECTION 02624 - HIGH DENSITY POLYETHYLENE (HDPE) PIPE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish, install, and test hdpe pipe of the sizes, types and in the locations shown on the Drawings and or specificed herein.

B. Related work: Specificed elsewhere

a. Site work is specified in this Division.

1.2 GRAVITY HDPE SEWER PIPE

The Contractor shall provide high density polyethylene pipe (HDPE) as specified. The pipe shall be made to diameter and tolerances in accordance with ASTM F714. All pipe shall be made from virgin grade material. The pipe shall be of the diameter and class shown or specified and shall bc furnished complete with all fabricated fittings, and other appurtenances as necessary for a complete and functional system.

Markings: Pipe materials shall be legibly marked by the pipe manufacturer. The following shall be printed on the pipe:

1. Name and trademark of manufacturer.
2. Nominal pipe size.
3. Standard Dimension Ratio.
4. The letters PE followed by the polyethylene grade per ASTM D1248 followed by the Hydrostatic Design Basis in hundreds of psi.
5. Manufacturing Standard Reference.
6. A production code from which the date and place of manufacture can be determined.

The Contractor shall provide submittals to the Engineer for approval on all materials.
Quality Control Submittals:

1. HDPE Pipe, Butt-Fusion Welded Joints:
   a. The Contractor shall provide written verification that personnel using the fusion joining equipment are trained in the skills necessary for the correct joining of HDPE pipe and recommended methods for service connections to the satisfaction of the pipe supplier. Certification of the training shall be provided from the certified representative of the pipe manufacturer.

   b. Fusion equipment shall be operated only by technicians who have been certified by the pipe manufacturer or supplier and who have a minimum of five (5) years of experience fusion welding pipelines. The technician's experience shall be documented in the HDPE pipe submittal, including a current (within the past three years) training certificate.

c. The Contractor shall perform trial fusion welds and submit samples to the Engineer for review prior to installation of the pipe. Full penetration welds shall provide a homogeneous material across the cross section of the weld. The fusion machine and technicians employed for the trial welds shall be the same utilized for the installation work.

d. Quality assurance procedures certified by the pipe manufacturer to be in full accordance with the requirements of this Specification shall be submitted by the Contractor.

2. Certification. The Contractor shall furnish a certified affidavit of compliance for all HDPE pipe and fittings furnished confirming that the materials supplied fully conform to the requirements specified herein.

3. Certifications of Calibration: Approved testing laboratory certificate or manufacturer's calibration certificate.

4. Quality assurance procedures shall be performed by the pipe manufacturer fully in accordance with the requirements of this specification. The certification shall include certified laboratory data confirming that said tests have been performed on a sample of the pipe to be provided under this contract, or pipe from that production run, and that satisfactory results were obtained.

Shop Drawings:

1. The Contractor shall submit catalog cuts, specifications, dimensioned drawings, installation details and sketches, and other pertinent information for the HDPE pipe installation work. All materials provided shall be in full accordance with the requirements of the reference specifications specified above.

2. The Contractor shall verify with the pipe manufacturer all connection details.

3. The Contractor shall submit detail drawings and a written description of the construction procedure to install pipe.

Pipe shall be high molecular weight, high-density polyethylene pipe. The material shall be listed by the Plastic Pipe Institute (PPI) with a designation of PE 3608 and have a minimum cell classification of 345464C, D, or E as described in ASTM D3350. The pipe material shall meet the requirements for Type III, Class B or C, Category 5, Grade P34 material as described in ASTM D1248. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material pipe. Pipe and fittings shall be made in conformance with ASTM F714 and ASTM D3261 as modified for the specified material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in density and other physical properties. Any pipe not meeting these criteria shall be rejected.

Only tools approved by the pipe manufacturer or the Engineer shall be used for assembly of pipe fittings and service connections to ensure proper installation.

The heater plate used for pipe joining shall be equipped with suitable means, such as thermometers or pyrometers, to measure the temperature of plate surfaces and to ensure uniform heating.
Butt fusion fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. Fabricated fittings shall be manufactured using a McElroy Data logger to record fusion pressure and temperature. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained as part of the quality control. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

Each polyethylene fusion fitting shall meet all the material requirements established for the pipe to which the fitting is to be jointed. Fittings fabricated from pipe shall be manufactured from pipe stock with a wall thickness at least 25% greater than that of the pipe to which the fitting is to be joined or shall be otherwise externally reinforced so that the fitting carries a pressure rating equal to that of the pipe from which it is made. Each fitting shall be designed and manufactured to operate at not less than the design pressure of the pipe system for which it is intended.

Polyethylene pipe shall be joined by butt fusion welding, as specified herein.

RESTRAINED JOINTS:

Mechanical restraint for HDPE may be provided by mechanical means separate from the mechanical joint gasket sealing gland. The restrainer shall provide wide, supportive contact around the full circumference of the pipe and be equal to the listed widths. Means of restraint shall be machined serrations on the inside surface of the restrainer equal to or greater than the listed serrations per inch and width. Loading of the restrainer shall be by a ductile iron follower that provides even circumferential loading over the entire restrainer. Design shall be such that restraint shall be increased with increases in line pressure.

Serrated restrainer shall be ductile iron ASTM A536-80 with a ductile iron follower; bolts and nuts shall be corrosive resistant, high strength alloy steel.

The restrainer shall have a pressure rating of, or equal to that of the pipe on which it is used or 150 PSI whichever is lesser. Restrainers shall be JCM Industries, Sur-Grip or pre-approved equal.

Nominal Size	Restraint Width	Serrations per inch
4", 6"	1-1/2"	8
8" 10 & 12"	1-3/4"	8

Pipe stiffeners shall be used in conjunction with restrainers. The pipe stiffeners shall be designed to support the interior wall of the HDPE. The stiffeners shall support the pipe's end and control the

"necking down" reaction to the pressure applied during normal installation. The pipe stiffeners shall be formed of 304 or 316 stainless steel to the HDPE manufacturers published average inside diameter of the specific size and DR of the HDPE. Stiffeners shall be by JCM Industries or pre-approved equal.

Install in accordance with manufacturer's recommendations and as directed herein.

JOINING:

BUTT FUSION: Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a McElroy Data Logger. Temperature , fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

SIDEWALL FUSION: Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

MECHANICAL: Bolted joining may be used where the butt fusion method cannot be used. Flange joining will be accomplished by using a HDPE flange adapter with a ductile iron back-up ring. Mechanical joint joining will be accomplished using either a molded mechanical joint adapter or the combination of a Sur-Grip Restrainer and Pipe Stiffener as manufactured by JCM Industries, Inc. Either mechanical joint joining method will have a ductile iron mechanical joint gland.

OTHER: Socket fusion, hot gas fusion, threading, solvents, and epoxies may not be used to join HDPE pipe.

QUALITY AND WORKMANSHIP: The pipe and/or fitting manufacturer's production facility shall be open for inspection by the owner or his designated agents with a reasonable advance notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to the standards required by this specification.

PIPE PACKAGING, HANDLING & STORAGE: The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact and without physical damage. The transportation carriers shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged.

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

Fused segments of the pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

2.1 EXCAVATION AND BACKFILL

Backfill shall be in accordance with manufacturer's recommendations and as shown on the drawings.

Flow shall be maintained in any sanitary sewers, storm drains, water lines, or water courses encountered in trenching.

The Contractor shall remove all water which may accumulate in the excavation during the progress of the work can be done in the dry. Trenches shall be kept free from water while the pipe or other structures are installed and until backfilling has progressed to a sufficient height to anchor the work against possible flotation or leakage. At all times, the Contractor shall have sufficient pumping machinery available for immediate use. Water shall be disposed of in such a manner as to cause no injury to public or private property, or be a menace to public health.

3.1 PIPE LAYING

Where groundwater occurs, pumping shall continue until filling has progressed to a sufficient height to prevent flotation of the pipe. Water shall be disposed of in such a manner as to cause no property damage or not be a hazarded to public health.

Where construction consists of constructing a new main or extension of an existing main, the downstream end of the new main shall be securely closed with a tight fitting plug until the construction is accepted by the Engineer.

Any section of pipe found to be defective or which has had grade or joints disturbed shall be re-laid by the Contractor at his expense.

Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipe, fittings, and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no

circumstances shall pipe or accessories be dropped or dumped into the trench. The pipe and accessories shall be inspected for visible defects prior to lowering into trench. Any visibly defective or unsound pipe shall be replaced.

The line and grade of existing utilities shall not be altered. Any leakage caused in existing utilities by reason of the Contractor's operations shall be immediately repaired at the Contractor's expense.

Existing sewer lines shall be supported in place with service maintained during construction. The Contractor may, at his option, remove and replace any sewer laterals which are not in use during construction. The Contractor shall be responsible for repairing damage to sewer lines during construction and any damage resulting from improper backfilling.

END OF SECTION

SECTION 02640 – WATER MAIN AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install water lines and appurtenances including, but not limited to: ductile iron pipe, fittings, gate valves, thrust blocks, etc. of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. All materials and work shall conform to the local water company specifications and requirements.

1.2 QUALITY ASSURANCE

A. All units of a system component (i.e. gate valves, valve boxes, etc.) shall be manufactured by one manufacturer for that component.

B. Qualifications of Manufacturer: Products to have been proven reliable in similar installations over a minimum of five (5) years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All water main and appurtenances shall conform to the requirements of the local water company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be performed as shown on the Drawings, as specified by the local water company and supplemented herein.
   1. When installation of valve box is complete, no pressure shall be exerted by valve box on the water main or on the valve.
   2. Valve boxes shall be of such length as required without full extension. The minimum lap shall be 6 inches.
   3. Install so valve covers are exactly level to 1/4 - inch below pavement elevation.
   4. Provide two-foot diameter bituminous strip around valve boxes in field areas.

3.2 TESTING

A. All testing shall conform to be as specified the requirements of the local water company.
B. Chlorination of water mains shall conform to be as specified the requirements of the local water company.

END OF SECTION

SECTION 02651 – SEWER TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. All sewers, manholes, and appurtenant work, in order to be eligible for approval by the Engineer, shall be subjected to tests that will determine the degree of watertightness and horizontal and vertical alignment.
2. Final sewer testing work includes the performance of testing and inspecting each and every length of sewer pipe, pipe joints and each item of appurtenant construction.
3. Perform testing at a time approved by the Engineer, which may be during the construction operations, after completion of a substantial and convenient section of the work, or after the completion of all pipe laying operations.
4. Provide all labor, pumps, pipes, connections, gages, measuring devices and all other necessary apparatus to conduct tests.

PART 2 - PRODUCTS

(NOT PART OF THIS SECTION)

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. Thoroughly clean all sewer lines to be tested, in a manner and to the extent acceptable to the Engineer, prior to initiating test procedures.
2. Perform all tests and inspections only under the direct observation of the Engineer and the plumbing or building inspector and in accordance with the requirements of the local and State plumbing codes.
3. Prior to construction, inform the Engineer of the planned sewer testing pattern.
4. Remedial Work:
   a. Perform all work necessary to correct deficiencies discovered as a result of testing and/or inspections.
   b. Completely retest all portions of the original construction on which remedial work has been performed.
   c. Perform all remedial work and retesting in a manner and at a time approved by the Engineer at no additional cost to the Owner.

B. Line Acceptance Tests - Gravity Sewers:

1. Test all gravity sewer lines for leakage by conducting a low pressure air test conforming to ASTM C-828. Conduct all tests after the tees or saddles and service connections have been installed to the limit indicated on the Contract Drawings. Conduct all tests after backfilling the sewer line trenches.
2. Equipment:

a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
c. All air used shall pass through a single central panel.
d. Connect 3 individual hoses:
   (1) From the control panel to the pneumatic plugs for inflation,
   (2) From the control panel to the sealed sewer line for introducing the low pressure air.
   (3) From the sealed sewer line to the control panel for continually monitoring the air pressure rise in the sealed line.

3. Groundwater Conditions:
   a. In areas where groundwater exists, and at the time of installing the sewer line, install a 1/2 inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall on top of one of the sewer lines entering the manhole.
   b. Immediately prior to performing the line acceptance test, determine the height of groundwater by removing the groundwater test pipe cap, blowing air through the pipe nipple into the ground to clear it, and then connecting a clear plastic tube to the nipple.
   c. Hold the tube vertically and measure the height in feet. Divide this height by 2.3 to establish the pounds of groundwater pressure to be added to the air pressure test readings. (Example: Height of water is 11-1/2 feet, added groundwater pressure is 5 psig, minimum air pressure is 3.5 psig; therefore, the total minimum acceptable pressure is 8.5 psig.)
4. Testing Pneumatic Plugs:
   a. Seal test all pneumatic plugs prior to using them in the actual test.
   b. Lay one length of pipe on the ground and seal both ends with the pneumatic plugs to the tested.
   c. Pressurize the sealed pipe to 5 psig.
   d. The pneumatic plugs are acceptable if they remain in place without bracing.
5. Testing Sewer Pipeline:
   a. After the sewer pipe has been cleaned and the pneumatic plugs checked, place the plugs in the sewer line at each manhole and inflate them.
   b. Introduce low pressure air into the sealed sewer pipeline until the air pressure reaches 4 psig greater than the average groundwater pressure.
   c. Allow a minimum of 2 minutes for the air pressure to stabilize to a minimum of 3.5 psig greater than the groundwater pressure.
   d. After the stabilization period, disconnect the air hose from the control panel to the air supply.
   e. The pipeline will be acceptable if the pressure decrease is not greater than 1/2 psig in the time
   stated in the following table.

TABLE 1

Pipe Diameter (inches)	Minimum Time (min:sec)	Length for Min. Time (feet)	Time for Longer Lengths* (sec)
4	1:53	597	.190L
6	2:50	398	.427L
8	3:47	298	.760L
10	4:43	239	1.187L
12	5:50	199	1.709L
15	7:05	156	2.671L
18	8:30	133	3.846L
21	9:55	114	5.235L
24	11:20	99	6.837L
27	12:45	88	8.653L
30	14:10	80	10.683L
33	15:35	72	12.926L
36	17:00	66	15.384L

*Applies to pipe runs greater than those listed in column 3.
L = Actual length of pipe being tested.

6. Test Results:
   a. If the installation fails the low pressure air test, determine the source of leakage.
   b. Replace all defective materials and/or workmanship and repeat low pressure test at no additional cost to the Owner.
   c. Repairs shall only be made with prior approval of the Engineer in accordance with a method acceptable to the Engineer.

C. Alignment Tests - Gravity Sewers:
   1. Perform tests for the correctness of horizontal and vertical alignment on each and every length of gravity sewer pipeline between manholes.
   2. Beam a source of light, acceptable to the Engineer, through the pipe line and directly observe the light in the manhole at the opposite end of each test section.

D. Deflection Tests:
   1. Deflection test all PVC pipe. Deflection not to exceed 5%.
   2. Perform test by using a deflectometer.
   3. Maximum deflection: 5 percent.
   4. Testing limits and test gauge diameter for plastic pipe:
      a. Acceptance limit for deflection tests of installed flexible sewer pipe, listed in Table 2 shall be 5% of average inside diameter. A test shall be conducted after a minimum of thirty days following installation.

TABLE 2 - PVC Materials

D	3034	Solid Wall	4" - 15"
F	679	Solid Wall	18" - 36"
F	789	Solid Wall	4" - 18"
F	794	Ribbed Wall	18" - 48"
F	949	Corrugated	4" - 8"

b. The deflection gauge diameter (G) for this test shall be determined by the following formula:

G = .929 D inches (nominal)

where D is the average inside diameter given in the applicable ASTM standard. In the cases where inside diameters are not given they shall be determined by the following formula:

D = D'- 2(1.06 t) inches

where t = the minimum solid wall thickness
D' = the average outside diameter

c. All PVC pipe is to be gauged and the results are to be recorded and the owner is to be provided written results.

d. Limits of installed deflection for other flexible pipe materials shall not exceed the above for PVC.

E. Force Main Test:

1. Pressure Test:

a. Perform testing in accordance with Section 4 of AWWA Standard C600, latest edition, at a pressure equal to 150 percent of the design operating total dynamic head.

b. 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 blowoffs are not available at high points for relcasing air the Contractor shall make the necessary excavations, backfilling and taps at such points and shall plug said holes after completion of the test.

c. 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. Perform a pressure test for all other piping systems at 1-1/2 times maximum system pressure, or at the maximum working pressure of the piping system, or at a pressure indicated in the appropriate Sections of this Specification.

d. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period on buried pipelines exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline the section shall be considered as having failed the test. All pipes within structures and chambers and all flanged joints shall be no visible leakage.

e. 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.

f. Tests shall be hydrostatic.

2. Connection to Work by Others:

a. If work involves connection of pipe lines to pipes or structures provided by others, pressure test pipe lines prior to making the connection.

b. After successfully passing the pipe line pressure test, make the necessary connections to the work by others, and pressure test the connection.

c. The connection shall be pressurized to the pipe line test pressure, for a minimum of 4 hours. The connection shall have no visible leakage.

d. Correct any leakage at no cost to the Owner and retest until connection passes.

3. Cleaning: Perform all specialized cleaning as specified or required by system

END OF SECTION

SECTION 02750 - STORM DRAINAGE

PART 1.0 - GENERAL

1.1 REFERENCES

A. General Requirements Division 1 apply to this section.

B. Refer to other divisions of these specifications, other sections in this division and drawings for related work, which may affect the work of this section.

C. The contract drawings indicate and show limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other and both shall be followed to properly complete the work.

1.2 SCOPE OF WORK

A. Without limiting the generality thereof, the work under this section consists of furnishing all labor, equipment, supplies, services and materials and performing all operations in connection with the installation of the building under drainage systems and the storm drainage system, including piping, pipe end sections and connection to building roof drains and all related work required for the storm drainage system as indicated on the drawings and as specified herein.

1.3 RELATED WORK IN OTHER SECTIONS

A. The following is a list of related work items that are specified or included under Sections of these specifications as indicated.

1) Section 02218 - Earth Trench Excavation and Backfill.

1.4 LAWS AND REGULATIONS

A. All work shall be accomplished in accordance with regulations of local, county and state agencies as they apply.

B. Secure all necessary permits from municipal, county and state departments having jurisdiction prior to the start of construction and furnish proof of acceptance upon completion of the work.

1.5 GRADES AND ELEVATIONS

A. The drawings indicate the alignment, invert and finished grade elevations of all structures and utilities. The Owner's Representative, however, may make such adjustments in grades and alignment as are found necessary in order to avoid

interference and to adapt the utilities and piping to other special conditions encountered.

1.6 SUBMITTALS

A. Submit shop drawings for all storm drainage items, described or indicated on the drawings for approval prior to ordering.

PART 2.0 - PRODUCTS

2.1 PRODUCTS

A. Piping for site drainage work shall be of the following materials:

1) Reinforced Concrete Pipe (Type II Portland Cement)

a) This pipe shall conform to the requirements of AASHTO M170, except as follows: Wall A thickness will be allowed in Class III pipe only. When the plans call for reinforced concrete pipe capable of withstanding an ultimate load greater than 3750D, the design requirements of Class V shall be met with further provision that the pipe will withstand the ultimate D load of a 4,000 D.

b) Basis of acceptance of concrete pipe shall conform to AASHTO M170, Section 5.1.1 test requirements shall be as provided in Section 10.3.1 and 10.5 with the further provision that the pipe will withstand an additional ten (10) percent of the D load specified or brought to destruction. Permissible variation in pipe tolerances shall conform to AASHTO M170, Section 11.

Table 1 - Minimum Strength Requirements

D-Load to Produce the Ultimate Load = Class	D-Load to Produce a 0.01 Inch Crack	AASHTO Designation Class
1,500 D	1,000	II
2,000 D	1,350	III
3,000 D	2,000	IV
3,750 D	3,000	V
4,000 D	-	-

c) Unless a different class is specified on the plans, reinforced concrete pipe shall meet the requirements of AASHTO Class IV designations.

d) Workmanship and finish shall conform to AASHTO M170, Section 12. Pipe shall be subject to rejection on account of failure

to conform to any of the specification requirements of AASHTO M170, Section 15.

e) Markings on pipe shall conform to AASHTO M170, Section 16.

f) Joints shall conform to AASHTO M198, Type A rubber gaskets.

2) Polyethylene Pipe

a) The products supplied under this specification shall be high-density polyethylene corrugated exterior/smooth interior pipe. Four (4) through ten (10) inch diameters shall meet all requirements of AASHTO M252 with the addition that the pipe have a smooth interior liner. Twelve (12) to thirty-six (36) inch diameters shall conform to AASHTO M204 Type S. Forty-two (42) and forty-eight (48) inch diameters shall have minimum pipe stiffness' of 20 and 17 psi, respectively, at 5% deflection; and shall meet all other requirements of AASHTO M294.

B. Structures (Type II Portland Cement)

1) Precast Concrete Sections shall conform to AASHTO M 199 (ASTM C 478).

2) Clay brick shall conform to the requirements of AASHTO M 91, Grade MS. The use of concrete brick will not be permitted.

3) Concrete Masonry Units shall conform to the requirements of ASTM C 139 and shall have a minimum compressive strength of 3,000 pounds per square inch when tested by the method in AASHTO T 140.

4) Castings shall be gray iron conforming to AASHTO M 105. Unless otherwise specified, all gray iron casting shall be Class 30.

PART 3.0 - EXECUTION

3.1 CONSTRUCTION

A. Site and Trench Excavation, Fill and Backfill

1) Perform all pavement replacement, repair and patching, as specified under bituminous pavement sawcut and patch.

2) Trench widths shall be sufficient to permit proper installation of the work and bottoms of trenches shall be evenly graded. The maximum allowable width of trench for pipe shall be as indicated on the details. Excavations

below required depths shall be refilled with crushed stone and compacted. Immediately after trench excavations have been carried to the required grades, the exposed surface of the existing bottom shall be cleaned of all loose disturbed materials. Where the trench bottom is below the water level or within saturated earth materials, bedding below the storm drain shall be made with a minimum of twelve (12) inches of crushed stone. Pipe beds in bedding material shall be rounded to accommodate the bottom quadrant of the pipe and to provide full support and uniform bearing for the entire length of the pipe barrel.

3) Control and pitch the grading to prevent water from running into the excavated areas of the site or drain, or to prevent damage to other structures or work already accomplished.

4) Furnish all pumping and other dewatering equipment necessary to keep excavated areas dry during construction. Water shall not be conducted onto adjacent property except in existing watercourses.

5) After piping and structures have been installed, tested, inspected and approved by the Owner's Representative, crushed stone bedding material as specified shall be carefully hand placed and hand tamped in six (6) inch layers, under, around and to the spring line of the pipe. After this, the sand blanket shall be carefully placed in six (6) inch layers to a level one (1) foot above the top of the piping. The remaining excavation shall be backfilled with approved backfill materials, compacted in one (1) foot layers loose measure. Backfill shall be compacted to not less than 95 percent of the ASTM maximum dry densities as specified herein.

6) Obtain information from the Owner and proper authorities concerning locations of existing utilities within the scope of this work in order to avoid damage to such utilities. The Owner will not be responsible for any such damage. Restore any structure and repair any resultant damage without additional cost to the Owner.

   a) Rules and regulations governing the respective utilities shall be observed. Active utilities shall be adequately protected from damage and shall not be removed or relocated except as indicated or directed. Inactive and abandoned utilities shall be reported in writing to the Owner's Representative and shall be removed, plugged or capped as directed.

7) Excavations shall be adequately sheeted, shored and braced as necessary to permit proper execution of the work and to protect all slopes and earth banks. Sheet piling shall be installed if required to prevent cave-ins or settlement and to protect workmen, adjacent structures and utilities.

Shoring and piling may be removed as the backfilling progresses, but only when banks are safe against caving.

8) Excavation of earth, boulders of rock beyond indicated or authorized limits shall be refilled at no additional expense to the Owner with gravel compacted to 95 percent of the maximum dry density at optimum moisture content, or crushed stone, as required by the Owner's Representative.

- End of Section -

SECTION 02930 - LOAMING AND SEEDING

PART 1.0 - GENERAL

1.1 REFERENCES

A. General Requirements Division 1 apply to this section.

B. Refer to other divisions of these specifications, other sections in this division and drawings for related work, which may affect the work of this section.

C. The contract drawings indicate and show limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other and both shall be followed to properly complete the work.

1.2 SCOPE OF WORK

A. The contractor shall furnish all labor, materials, tools and equipment necessary to prepare the subgrade, place and spread loam, fine grade loam; and soil conditioning, lime and fertilize, seed, water and maintain and cut the temporary grass cover. Soil conditioning, lime, fertilizer, water and maintenance of the permanent grass cover will be by others.

1.3 AREAS TO BE LOAMED AND SEEDED

A. Areas designated on the plans and as specified in the details.

1.4 QUALITY ASSURANCE

A. The following recommendations shall be obtained from the County Agricultural Agent by others.

1) Grass seed and fertilizers specified herein shall be verified as to acceptability by the City of Portsmouth.

1.5 SUBMITTALS

A. A copy of the grass seed, fertilizers and loam shall be furnished to the Owner's Representative for approval prior to any loaming and seeding.

PART 2.0 - MATERIALS

2.1 LOAM

A. Loam shall consist of loose friable topsoil with no admixture of refuse or material toxic to plant growth. Loam shall be generally free from stones, lumps, stumps, or similar objects larger than one (1) inch in greatest diameter or length, subsoil, roots and weeds. The term as used herein shall mean that portion of the soil profile defined technically as the "A" horizontal by the Soil Science Society of America. The minimum and maximum pH value shall be from 5.5 to 7.6. Loam shall contain a minimum of three (3) percent and a maximum of ten (10) percent of organic matter as determined by loss by ignition. Not more than sixty-five (65) percent shall pass a No. 200 sieve as determined by the wash test in accordance with ASTM D 1140. In no instance shall more than 20% of that material passing the No. 4 sieve consist of clay size particles.

2.2 SOIL CONDITIONERS AND FERTILIZER

A. Soil conditioning and fertilizing material shall be of the recommended kinds and from acceptable sources.

B. Lime shall be applied at the minimum rate of three (3) tons per acre or more if recommended by the County Agricultural Agent based on soils analysis.

2.3 SEED

A. A grass seed mixture containing the following seed requirements shall be used.

	Pounds/Acre	Germination Minimum	Purity Min.
General Cover			
Creeping Red Fescue[c]	50	85%	96%
Kentucky Blue Grass[b]	50	85%	97%
	100		
Slope Seed (used on all slopes greater than or equal to 3:1)			
Creeping Red Fescue[c]	40		
Perennial Ryegrass[a]	35	90%	98%
Red Top	5		
Alsike Clover	5	90%[c]	97%[c]
Birdsfoot Trefoil[d]	5	80%[c]	98%
	90		

[a]Ryegrass shall be a certified fine-textured variety such as Pennfine, Fiesta, Yorkcity, Diplomat or equal.
[b]Bluegrass shall be a certified variety such as Merion, Baron, Majestic Touchdown, Nugget, Ram One, or equal.

[c]Fescue varieties shall include – Creeping Red and/or Hard Reliant, Scaldis, Koket, or Jamescity.

[d] Empire variety (preferred) Inoculum specific to birdsfoot trefoil must be used with this mixture. The inoculum shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality and the ability to transform nitrogen from the air into soluble nitrates and to deposit them in the soil. The inoculum shall not be used later than the date indicated on the container or later than specified. The inoculum shall be subject to approval.

[e] Includes not more than ten (10) percent hard seed for alsike clover and not more than twenty-five (25) percent hard seed for birdsfoot trefoil.

B. For temporary protection of disturbed areas, seed shall be applied at the following rates:

Annual Rye	40 lbs/acre

C. In no case shall the weed content exceed one (1) percent by weight. All seed shall comply with state and federal seed laws.

PART 3.0 - EXECUTION

3.1 PREPARATION FOR SEEDING

A. Finish Grading

1) After rough grading of the subgrade has been completed and approved, the subgrade surface shall be scarified to a depth of four (4) inches. Then furnish and install a layer of loam providing a rolled four (4) inch thickness. Any depressions, which may occur during rolling, shall be filled with additional loam, regraded and rerolled until the surface is true to the finished lines and grades. The contractor shall supply all loam necessary to complete the work under this section.

2) All large stiff clods, lumps, brush, roots, debris, glass, stumps, litter and other foreign material as well as stones over one (1) inch in diameter or length shall be removed from the loam and disposed of off site.

3) The loam shall be prepared to receive seed by removing stones and grading to eliminate water pockets and irregularities prior to placing seed. Finish grading shall result in straight uniform grades and smooth, even surfaces without irregularities to low points.

4) All stones over one-half (½) inch in diameter remaining on the surface after raking shall be removed.

5) Shape the areas to the lines and grades required. The contractor's attention is directed to the scheduling of loaming and seeding of graded areas to permit sufficient time for the stabilization of these areas.

6) All areas disturbed by construction within the property lines and not covered by structures, pavement, or bark mulch shall be loamed and seeded.

7) Limestone shall be thoroughly incorporated into the loam layer in order to provide a pH value of 5.5 to 6.5.

8) Fertilizer shall be spread on the top layer of loam at the rate of 500 pounds per acre and worked into the surface.

3.2 SOIL CONDITIONERS AND FERTILIZERS

A. Soil conditioners and fertilizer shall be applied at the recommended rates and shall be thoroughly worked into the loam. Loam shall be raked until the surface is finely pulverized, smooth and even and then compacted to an even surface conforming to the required lines and grades with approved rollers weighing between four and one half (4 ½) pounds and five and one half (5 ½) pounds per inch of width.

3.3 SEEDING

A. Seed shall be sown at the rates indicated above. Sowing shall be done on a calm, dry day. Immediately before seeding, the soil shall be lightly raked. One half (1/2) the seed shall be sown in one direction and the other half at right angles to the original direction. It shall be lightly raked into the soil to a depth not over one quarter (1/4) inch and rolled with a hand roller weighing not over 100 pounds per linear foot of width.

Hay mulch shall be applied immediately after seeding at a rate of one and one half (1.5) to two (2) tons per acre. Mulch that blows or washes away shall be replaced immediately and anchored using appropriate techniques.

The surface shall be watered and kept moist with a fine spray as required, without washing away the soil, until the grass is well established. Any areas, which are not satisfactorily covered with grass, shall be reseeded and all noxious weeds removed.

A. Unless otherwise approved, seeding shall be done during the approximate periods of early Spring to May 20 and August 10 to September 30, when soil conditions and weather are suitable for such work.

3.4 TEMPORARY PLANTINGS

A. For temporary plantings after September to early Spring and for temporary protection of disturbed areas.

1) Following above slope, loam depth and grading requirements.

2) Fertilizer shall be spread and worked into the surface at a rate of six hundred (600) pounds per acre.

3) Mulching shall be applied at the rate of three (3) tons/acre.

4) Follow above seeding rates and procedures.

3.5 MAINTENANCE AND PROTECTION

A. Maintenance shall include watering as specified, weeding, removal of stones and other foreign objects over one half (½) inch in diameter which may appear and the first two (2) cuttings of grass no closer than ten (10) days apart. The first cutting shall be accomplished when the grass is from two and one half (2 ½) to three (3) inches high. All bare or dead spots which become apparent shall be properly prepared, limed and fertilized and reseeded as many times as necessary to secure a good growth. The entire area shall be maintained, watered and cut until final acceptance.

B. To be acceptable, seeded areas shall consist of a uniform stand of at least ninety (90) percent established permanent grass species, with uniform count of at least one hundred (100) plants per square foot.

C. The Owner's Representative shall determine whether maintenance shall continue in any part.

D. After all necessary corrective work and clean up has been completed and maintenance instructions have been received by the Owner, the Owner's Representative will certify in writing the acceptance of the lawns.

- End of Section -

SECTION 03300 – STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117 Tolerances for Concrete Construction and Materials

ACI 214 Evaluation of Strength Test Results of Concrete

ACI 301 Structural Concrete

ACI 304R Measuring, Mixing, Transporting, and Placing Concrete

ACI 304.2R Placing Concrete by Pumping Methods

ACI 305R Hot Weather Concreting

ACI 306.1 Cold Weather Concreting

ACI 308 Curing Concrete

ACI 309R Consolidation of Concrete

ACI 315 Details and Detailing of Concrete Reinforcement

ACI 347R Formwork for Concrete

ACI SP-2 ACI Manual of Concrete Inspection

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82Steel Wire, Plain, for Concrete Reinforcement

ASTM A 496 Steel Wire, Deformed, for Concrete Reinforcement

ASTM A 615/A 615M Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM A 706/A 706M Low-Alloy Steel Deformed Bars for Concrete Reinforcement

ASTM A 934/A 934M Epoxy-Coated Prefabricated Steel Reinforcing Bars

ASTM C 31/C 31M Making and Curing Concrete Test Specimens in the Field

ASTM C 33 Concrete Aggregates

ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens

ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C 94 Ready-Mixed Concrete

ASTM C 138 Unit Weight, Yield, and Air Content (Gravimetric) of Concrete

ASTM C 143 Slump of Hydraulic Cement Concrete

ASTM C 150 Portland Cement

ASTM C 171 Sheet Materials for Curing Concrete

ASTM C 172 Sampling Freshly Mixed Concrete

ASTM C 173 Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C 227 Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)

ASTM C 231 Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 260 Air-Entraining Admixtures for Concrete

ASTM C 295 Petrographic Examination of Aggregates for Concrete

ASTM C 441 Effectiveness of Mineral Admixtures or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to Alkali-Silica Reaction

ASTM C 494 Chemical Admixtures for Concrete

ASTM C 595 Blended Hydraulic Cements

ASTM C 618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete

ASTM C 881 Epoxy-Resin-Base Bonding Systems for Concrete

ASTM C 920 Elastomeric Joint Sealants

ASTM C 989	Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1017	Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1064	Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1116	Fiber-Reinforced Concrete and Shotcrete
ASTM C 1240	Silica Fume for Use in Hydraulic-Cement Concrete and Mortar
ASTM D 512	Chloride Ion in Water
ASTM D 516	Sulfate Ion in Water
ASTM D 1179	Fluoride Ion in Water
ASTM D 1190	Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1339	Sulfite in Water
ASTM D 1751	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3867	Nitrite-Nitrate in Water

1.2 DEFINITIONS

a. "Blending size" is an aggregate that complies with the quality requirements in ASTM C 33 and paragraph entitled "Aggregates" and as modified herein and can be blended with coarse and fine aggregate to produce a well graded combined grading.

b. "Cementitious material" as used herein shall include portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.

c. "Design strength" (f'c) is the specified compressive strength of concrete to meet structural design criteria.

d. "Mixture proportioning" is a description of the proportions of a concrete mixture that were selected to enable it to meet the performance durability requirements, constructability requirements, and the initial and life-cycle cost goals.

e. "Mixture proportions" is the concrete supplier's by-mass proportions to replicate the mixture design.

f. "Pozzolan" is a silicious or silicious and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

g. "Field test strength" (fcr) is the required compressive strength of concrete to meet structural and durability criteria. Determine (fcr) during mixture proportioning process.

1.3 SUBMITTALS

Submit the following:

Shop Drawings

Reinforcing steel

Reproductions of contract drawings are unacceptable.

Product Data

Materials for curing concrete

Joint sealants

Joint forms

Synthetic reinforcing fibers

Non-shrink grout

Epoxy Resin for Anchors

Preformed joint filler

Design Data

Mixture design;

Test Reports

Aggregates

Cement

Certificates

Concrete placement

Field testing technician and testing agency

Mixture designs

QAQC Plan

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until, forms, reinforcement, embedded items, and reinforcement connections are in place and ready for concrete placement. ACI 301 for job site storage of materials. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed.

1.5.1 PLACING CONCRETE

Concrete shall be deposited by shute, bucket, tremie or concrete pump. The methods and equipment used shall be subject to approval.

1.6 QUALITY ASSURANCE

1.6.1 Concrete Mixture Design

The contractor shall submit a QAQC plan indicating how they are going to monitor and control the project concrete, including provision to ensure the concrete delivered to the site does meet the specifications and showing that the contractor has adequate control over the ready mix concrete supplier to ensure each truck load meets specifications. At least 30 days prior to concrete placement, submit proportions for a concrete mixture for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, aggregate, fly ash, (or slag pozzolans), silica fume, ground slag, polypropylene fibers; and applicable reference specifications. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submittal shall clearly indicate where each mixture will be used when more than one mix design is submitted. The mixture shall be prepared by an accredited laboratory experienced in this field and under the direction of a licensed/registered civil engineer, who shall sign all reports and designs. The concrete shall be sufficiently stiff for uniform placement on the proposed slope without sagging.

1.6.2 Drawings

1.6.2.1 Reinforcing Steel

ACI 315. Provide bending and cutting diagrams, assembly diagrams, splicing placement and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Only complete drawings will be accepted. Shop drawings for slope pavement reinforcing are not required.

1.6.3 Certificates

1.6.3.1 Materials for Curing Concrete

Submit proposed materials and methods for curing concrete.

1.6.3.2 Concrete Placement

a. Submit a list of equipment and methods proposed for use in placing concrete. Include pumping or conveying equipment including type, size and material for pipe, and the maximum length and height concrete will be pumped. No field adjustments shall be made to the approved mixture design to facilitate pumping.

b. Contractor Quality Control personnel assigned to supervise concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inpsector, Level II

Concrete Transportation Construction Inspector or Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Official and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.6.3.3 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Engineer prior to performing any work.

a. Testing work on concrete under this contract shall be performed by an ACI Concrete Field Testing Technician Grade 1 or Grade 2 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs shall include requirements for written and performance examinations as stipulated in ACI SP-2.

b. Testing agencies that perform testing services on concrete materials shall meet the requirements of ASTM C 1077.

1.6.3.4 Mixture Designs

Provide a detailed report of materials and methods used, test results, and the field test strength (fcr) for concrete required to meet durability requirements.

PART 2 - PRODUCTS

2.1 CONCRETE

2.1.1 NH DOT AAA

Provide a NHDOT standard AAA concrete mix with a maximum water/cement ration of 0.40 and 5 to 9% air content, fiber reinforcement and 28-day design strength to produce concrete of minimum design strength (f'c) of 5000 psi.

2.1.2 NH DOT AA

Provide a NHDOT standard AA concrete mix with a maximum water/cement ration of 0.44 and 5 to 9% air content, fiber reinforcement and 28-day design strength to produce concrete of minimum design strength (f'c) of 4000 psi.

2.2 MATERIALS

2.2.1 Cement

ASTM C 150 Portland	ASTM C 595 Blended	
Type I	Type IP or IS	For general use in construction.
Type II	Type IP(MS) or Type IS(MS) Type II (LA) Type II (LH)	For general use in construction where concrete is exposed to moderate sulfate or alkali action or where moderate heat of hydration is required. ASTM C 595 (blended hydraulic cements): add the suffix MS or MH where either moderate sulfate resistance or moderate heat of hydration, respectively, is required.
Type III	None	For use when high early strength is required.

ASTM C 150, Type II and/or ASTM C 595, Type IP(MS) or IS(MS) and ASTM C 1157, Type MS blended cement except as modified hercin. The tricalcium aluminate (C_3A) content shall not be less than 4 percent to provide protection for the reinforcement and shall not be more than 10 percent to obtain concrete that is resistant to sulfate attack. Blended cements shall consist of a mixture of ASTM C 150 cement and one of the following materials: ASTM C 618 pozzolan or fly ash, or ASTM C 989 ground granulated blast-furnace slag. Use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.2.1.1 Fly Ash and Pozzolan

ASTM C 618, Type F, except that the maximum allowable loss on ignition shall be 6 percent for Types F. Add with cement.

2.2.1.2 Ground Iron Blast-Furnace Slag

ASTM C 989, Grade 120.

2.2.1.3 Silica Fume

ASTM C 1240.

2.2.2 Water

Water shall comply with the requirements and Table 2 optional requirements of ASTM C 94 and the chloride and sulfate limits in accordance with ASTM D 512 and ASTM D 516. Mixing water shall not contain more than 500 parts per million of chlorides as Cl and not more than 100 parts per million of sulfates as SO_4. Water shall be free from injurious amounts of oils, acids, alkalies, salts, and organic materials.

2.2.3 Aggregates

ASTM C 33, except as modified herein.

a. The combined aggregates in the mixture (coarse, fine, and blending sizes) shall be well graded from the coarsest to the finest with not more than 18 percent nor less than 8 percent, unless otherwise permitted, of the combined aggregate retained on any individual sieve with the exceptions that the No. 50 may have less than 8 percent retained, sieves finer than No. 50 shall have less than 8 percent retained, and the coarsest sieve may have less than 8 percent retained. Use blending sizes where necessary, to provide a well graded combined aggregate. Reports of individual aggregates shall include standard concrete aggregate sieve sizes including 1 1/2 inches, one inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100.

b. Provide aggregates for exposed concrete from a consistent source, ASTM C 227. Do not provide aggregates that react deleteriously with alkalies in cement. Refer to appendix, paragraph entitled "Test Method C227" of ASTM C 33 for expansion limits. Provide aggregate containing no deleterious material properties as identified by ASTM C 295.

c. Where a size designation is indicated, that designation indicates the nominal maximum size of the coarse aggregate. The largest feasible nominal maximum size aggregate specified in ASTM C 33, Class 4S shall be used. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

d. Aggregate may contain materials deleteriously reactive with alkalies in the cement, if cement contains less than 0.60 percent alkalies (percent Na_2O plus .658 percent K_2O). Provide a material such as fly ash, slag, or silica fume as specified to be effective in preventing harmful expansion due to alkali-aggregate reaction by ASTM C 441.

e. Where historical data is used, provide aggregates from the same sources having the same size ranges as those used in the concrete represented by historical data.

f. Marine aggregate may be used when conforming to ASTM C 33 and if it originates from the up-current side of the land mass and it has been washed by the fresh water so that the total chloride and sulfate content of the concrete mixture does not exceed the limits defined herein.

2.2.4 Nonshrink Grout

A non-metallic non-shrink (no volume decrease) grout obtaining a minimum 28 day compression strength of 5,000 psi, conforming to ASTM C 1107. The grout shall be formulated consistent with the surface orientation and application.

ASTM C 1107.

2.2.5 Admixtures

a. Provide chemical admixtures that comply with the requirements shown below and in accordance with manufacturer's recommendations, and appropriate for the climatic conditions and the construction needs. Do not use calcium chloride or admixtures containing chlorides from other than impurities from admixture ingredients.

b. Provide minimum concentrations of corrosion-inducing chemicals as shown in Table 2 below. For concrete that may be in contact with prestressing steel tendons, the concentration shall not exceed 60 percent of the limits given in Table 2. For the concentration in grout for prestressing ducts, do not exceed 25 percent of the limits in Table 2.

Table 2 - Limits on Corrosion-Inducing Chemicals

Chemical*	Limits, Percent**	Test Method
Chlorides	0.10	ASTM D 512
Fluorides	0.10	ASTM D 1179
Sulphites	0.13	ASTM D 1339
Nitrates	0.17	ASTM D 3867

* Limits refer to water-soluble chemicals

** Limits are expressed as a percentage of the mass of the total cementitious materials.

c. Provide anti-washout admixtures for underwater placement with a proven record of performance and compatible with the chosen cement.

d. The total alkali content shall not increase the total sodium-oxide equivalent alkali content of the concrete by more than 0.5 lb/yd3.

2.2.5.1 Air Entraining Admixture

Provide air entraining admixtures conforming to ASTM C 260.

2.2.5.2 Accelerating

ASTM C 494, Type C.

2.2.5.3 Retarding

ASTM C 494, Type B, D, or G.

2.2.5.4 Water Reducing

ASTM C 494, Type A, E, or F.

2.2.5.5 High Range Water Reducer (HRWR)

ASTM C 494, Type F and ASTM C 1017.

2.2.6 Materials for Forms

Provide wood, plywood, plastic lumber or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be free of raised grain, knotholes, or other surface defects. Plywood: PS-1, B-B concrete form panels or better when the surface is to be exposed. Steel form surfaces shall not contain irregularities, dents, or sags. Form material shall be sufficiently flat and rigid to meet specified construction tolerances.

2.2.7 Reinforcement

2.2.7.1 Reinforcing Bars

ACI 301 unless otherwise specified. ASTM A 615/A 615M. ASTM A 706/A 706M for bars to be welded.

2.2.7.2 Mechanical Reinforcing Bar Connectors

ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.

2.2.7.3 Wire

ASTM A 82 or ASTM A 496.

2.2.7.4 Fiber-Reinforced Concrete

Provide fiber-reinforced concrete in accordance with ASTM C 1116, Type III, synthetic fiber-reinforced concrete, and as follows. Synthetic reinforcing fibers shall be 100 percent virgin

polypropylene fibrillated fibers. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 50 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. A minimum of 1.5 pounds of fibers per cubic yard of concrete shall be used. Fibers shall be added at the batch plant.

2.2.8 Materials for Curing Concrete

2.2.8.1 Impervious Sheeting

ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap non-woven geotextile.

2.2.8.2 Pervious Sheeting

AASHTO M182.

2.2.9 Expansion/Contraction Joint Filler

ASTM D 1751 or ASTM D 1752, 1/2 inch thick, unless otherwise indicated.

2.2.10 Joint Sealants

2.2.10.1 Horizontal Surfaces, 3 Percent Slope, Maximum
ASTM D 1190 or ASTM C 920, Type M, Class 25, Use T.

2.2.10.2 Vertical Surfaces Greater Than 3 Percent Slope
ASTM C 920, Type M, Grade NS, Class 25, Use T.

2.2.11 Epoxy Resin for Anchors

ASTM C 881 Provide Type V. Provide Grade 1 or 2 for horizontal surface and Grade 3 for vertical surfaces. Provide Class A if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

PART 3 - EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probably, equipment and material shall be at the placing site to provide windbreaks, shading

fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water (excluding tremie seals). Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

3.1.1.2 Preparation of Rock

Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semi-detached or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Engineer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer or mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.

3.2 FORMS

a. ACI 301. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch, except on slope pavement, unless otherwise indicated.

b. Provide formwork with clean-out openings to permit inspection and removal of debris. Formwork shall be gasketed or otherwise rendered sufficiently tight to prevent leakage of paste or grout under heavy, high-frequency vibration. Use a release agent that does not cause surface dusting. Limit reuse of plywood to no more than three times. Reuse may be further limited by the Engineer if it is found that the pores of the plywood are clogged with paste to the degree that the wood does not absorb the air or the high water-cementitious materials ratio concrete surface.

c. Patch form tie holes with a nonshrink patching material, or sealant, in accordance with the manufacturer's recommendations and subject to approval.

3.2.1 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer.

3.2.2 Removal of Forms and Supports

After placing concrete, forms shall remain in place for the time periods specified in ACI 347R. Prevent concrete damage during form removal. Plastic lumber slope pavement forms are to be left in place.

3.2.2.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C 39 test results of field-cured samples from a representative portion of the structure or other approved and calibrated non-destructive testing techniques show that the concrete has reached a minimum of 85 percent of the design strength.

3.3 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Remove rust, scale, oil, grease, clay, or foreign substances from reinforcing that would reduce the bond.

3.3.1 Reinforcement Supports

Place reinforcement and secure with plastic chairs, spacers, or plastic hangers (no steel within 3 inches of any exposed surface). Support reinforcement on the ground with plastic chairs supported on concrete or other noncorrodible, non-wood material below the bottom of concrete elevation

ASTM A 934/A 934M. Epoxy-coated bars shall be tied with plastic-coated tie wire; or other materials acceptable to the Engineer.

3.3.2 Splicing

As indicated. For splices not indicated, ACI 301. Do not splice at points of maximum stress.

3.3.3 Cover

Concrete cover for reinforcement shall be 2 inches to reinforcing bars unless otherwise noted. Placement tolerance shall be per ACI 347R and ACI 117.

3.3.4 Setting Miscellaneous Material

Place and secure anchors, bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete. Electrically isolate exposed steel work and its anchor systems from the primary steel reinforcement with at least 2 inches of concrete.

3.3.5 Construction Joints

Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

3.4 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C 94, ACI 301, and ACI 304R, except as modified herein. Batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances: 1 per cent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch tickets imprinted with mix identification, batch size, batch design and measured weights, moisture in the aggregates, and time batched for each load of ready mix concrete. When a pozzolan is batched cumulatively with the cement, it shall be batched after the cement has entered the weight hopper.

3.4.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

Adjust batch proportions to replicate the mixture design using methods provided in the approved quality assurance plan. Base the adjustments on results of tests of materials at the batch plant for use in the work. Maintain a full record of adjustments and the basis for each.

3.4.2 Mixing

ASTM C 94 and ACI 301. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, if both the specified maximum slump and water-cementitious material ratio are not exceeded. Field addition of water must be allowed for in the mix design. When water is added, an additional 30 revolutions of the mixer at mixing speed is required. If time of discharge exceeds time required by ASTM C 94 concrete shall be rejected. If the entrained air content falls below the specified limit the concrete shall be rejected. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.4.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.5 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water unless otherwise specified. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other or lifts for vertical construction.

3.5.1 Vibration

Comply with the requirements of ACI 309R and ASTM A 934/A 934M using vibrators with a minimum frequency of 9000 vibrations per minute (VPM). Use only high cycle or high frequency vibrators. Motor-in-head 60 cycle vibrators may not be used. For walls and deep beams, use a minimum of two vibrators with the first to melt down the mixture and the second to thoroughly consolidate the mass. Provide a spare vibrator at the casting site whenever concrete is placed. Insert and withdraw vibrators approximately 18 inches apart. Penetrate at least 8 inches into the previously placed lift with the vibrator when more than one lift is required. Extract the vibrator using a series of up and down motions to drive the trapped air out of the concrete and from between the concrete and the forms.

3.5.2 Pumping

ACI 304R and ACI 304.2R. Pumping shall not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment shall not exceed 2 inches. Do not use pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of coarse aggregate to 33 percent of the diameter of the pipe. Maximum size of well rounded aggregate shall be limited to 40 percent of the pipe diameter. Discharge horizontally from pump hoses to avoid segregations and loss of air content. Take samples for testing at both the point of delivery to the pump and at the discharge end. Air content tested at the pump hose discharge shall be within the specified limits.

3.5.3 Cold Weather

ACI 306.1. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 5 degrees F in any one hour and 50 degrees F per 24 hours after heat application.

3.5.4 Hot Weather

ACI 305R. Maintain required concrete temperature using Figure 2.1.5, "Effect of Concrete Temperatures, Relative Humidity, and Wind Velocity on the Rate of Evaporation of Surface

Moisture From Concrete" in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.6 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT

3.6.1 FINISHING FORMED SURFACES

Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117 and ACI 347R. These tolerances apply to the finished concrete surface, not to the forms themselves ;forms shall be set true to line and grade. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so tht the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas as the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

3.6.2 Defects

Repair formed surfaces by removing minor honeycombs, pits greater than one square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347R. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise indicated.

3.6.3 Not Against Forms (Top Surfaces)

Finish surfaces not otherwise specified with wood floats to even surfaces, and match adjacent finishes.

3.6.4 Formed Surfaces

3.6.4.1 Tolerances

ACI 347R and ACI 117 and as indicated.

3.6.4.2 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Patch tie holes and defects and completely remove fins.

3.7 FINISHES FOR HORIZONTAL CONCRETE SURFACES

3.7.1 Finish

ACI 301. Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.7.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. After the concrete has been placed, consolidated, struck off, and leveled, the surface shall be roughened with stiff brushes of rakes before final set.

3.7.1.2 Floated

Exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float shall begin when the surface has stiffened sufficiently to permit the operation.

3.7.1.3 Concrete Containing Silica Fume

Finish using magnesium floats or darbies.

3.7.1.4 Broomed

Perform a floated finish, then draw a broom or burlap belt across the surface to produce a coarse scored texture. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3.8 CURING AND PROTECTION

a. ACI 301 and ACI 308 unless otherwise specified. Prevent concrete from drying by misting surface of concrete. Begin curing immediately following final set (typically within 1 hour). Avoid damage to concrete from vibration created by pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, by rain or running water, adverse weather conditions, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. For concrete slabs or wide beams containing silica fume, fog spray and install wind breaks to ensure 100 percent relative humidity until wet curing is started.

b. Wet cure concrete using potable water for a minimum of 7 days. Do not allow construction loads to exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage.

3.8.1 Moist Curing

Remove water without erosion or damage to the structure.

3.8.1.1 Ponding or Immersion

Continually immerse the concrete throughout the curing period. Water shall not be 20 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.8.1.2 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.8.1.3 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.8.1.4 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.8.2 Curing Periods

Moist cure concrete using potable water for a minimum of 7 days. Continue additional curing for a total period of 21 days. Begin curing within one hour of finishing. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by the Engineer.

3.9 FIELD QUALITY CONTROL

3.9.1 Evaluation of Mixture Designs

a. Test the fresh concrete as follows:

(1) Slump in accordance with ASTM C 143.

(2) Air content in accordance with ASTM C 231 or ASTM C 173.

(3) Unit weight in accordance with ASTM C 138.

(4) For strength, cast 6 by 12 inch cylinders in accordance with ASTM C 31/C 31M.

3.9.2 Sampling

a. ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31/C 31M for making test specimens.

b. ASTM C 172. Collect samples of fresh concrete to perform tests specified, except that air content shall be checked on every truck load prior to any production discharge. Any concrete not meeting the specifications shall be rejected and shall be used on this project. ASTM C 31 for making test specimens.

c. Sample concrete on a random basis except where a batch appears to be deficient and the test can be used to verify the observed deviation. Identify samples so taken in a manner that they can be segmented from other tests. Obtain at least one sample for each 50 cubic yards, or fraction thereof, of each design mixture of concrete placed in any one day. When the total quantity of concrete with a given design mixture is less than 50 cubic yards, perform one set of tests.

3.9.3 Testing

3.9.3.1 Slump Tests

ASTM C 143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved high range water reducing (HRWR) admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 10 cubic yards (maximum) of concrete.

3.9.3.2 Temperature Tests

a. Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions below 50 degrees F and above 80 degrees F for each batch (minimum) or every 10 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

b. Determine temperature of each composite sample in accordance with ASTM C 1064. When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40 degrees F for more than 3 successive days, concrete shall be delivered to meet the following minimum temperature at the time of placement:

(1) 55 degrees F for sections less than 12 inches in the least dimension

(2) 50 degrees F for sections 12 to 36 inches in the least dimension

(3) 45 degrees F for sections 36 to 72 inches in the least dimension

(4) 40 degrees F for sections greater than 72 inches in the least dimension

c. The minimum requirements may be terminated when temperatures above 50 degrees F occur during more than half of any 24 hour duration. The temperature of concrete at time of placement shall not exceed 90 degrees F.

3.9.3.3 Compressive Strength Tests

ACI 214 tests for strength - conduct strength tests of concrete during construction in accordance with the following procedures:

a. Mold and cure six 6 by 12 inch cylinders from each sample taken in accordance with ASTM C 31/C 31M. Prevent evaporation and loss of water from the specimen.

b. Test cylinders in accordance with ASTM C 39. Test one cylinder at 3 days, two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. The compressive strength test results for acceptance shall be the average of the compressive strengths from the two specimens tested at 28 days. If one specimen in a test shows evidence of improper sampling, molding or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result. If both specimens in a test show any defects, the Engineer may allow the entire test to be discarded.

c. If the average of any three consecutive strength test results is less than the specified strength (f'c) or the minimum test strength (fcr) for durability, whichever is higher, by more than 500 psi, take a minimum of three core samples in accordance with ASTM C 42, from the in-place work represented by the low test results. Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

d. Strength test reports shall include location in the work where the batch represented by a test was deposited, batch ticket number, time batched and sampled, slump, air content (where specified), mixture and ambient temperature, unit weight, and water added on the job. Reports of strength tests shall include detailed information of storage and curing of specimens prior to testing.

e. Final reports shall be provided within 7 days of test completion.

3.9.3.4 Air Content

ASTM C 173 or ASTM C 231 for normal weight concrete. Make air content tests on each truckload before any concrete is placed in the formwork. Take air content tests from planned composite samples or from samples taken in accordance with ASTM C 172 at the point of concrete placement.

3.9.4 Standard Molded and Cured Strength Specimens

When the averages of all sets of three consecutive compressive strength test results equal or exceed the design compressive strength (f'c) or the required field test strength (fcr) whichever is higher, and no individual strength test falls below the specified compressive strength (f'c) or the required field durability strength (fcr) by more than 500 psi, whichever is higher.

3.9.5 Non-Destructive Tests

Non-destructive tests may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria.

3.9.6 Core Tests

When the average compressive strengths of the representative cores are equal to at least 85 percent of the design strength (f'c) or the required average test strength (fcr), whichever is higher, and if no single core is less than 75 percent of t he specified strength (f'c) or the required average field test strength (fcr), whichever is higher, strength of concrete is satisfactory.

-- End of Section --

SECTION 03400 – PRECAST CONCRETE BRIDGE

PART 1 - GENERAL

1.1 REFERENCES

Section 03300 Structural Concrete

Where applicable, the latest editions of the following standards shall form a part of this specification to the extent referenced. The publications are referenced to in the text of this guide specification by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

Standard Specifications for Highway Bridges

Guide Specifications for Structural Design of Sound Barriers

Standard Specification for Transportation Materials and Methods of Sampling and Testing

ACI INTERNATIONAL (ACI)

ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete

ACI 211.3 Guide for Selecting Proportions for No-Slump Concrete

ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete

ACI 305R Hot Weather Concreting

ACI 306R Cold Weather Concreting

ACI 309R Consolidation of Concrete

ACI 318 Building Code Requirements for

Structural Concrete

ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary

ACI 517.2R Accelerated Curing of Concrete at Atmospheric Pressure

AMERICAN WELDING SOCIETY (AWS)

AWS D 1.1 Structural Welding Code - Steel

AWS D 1.4 Structural Welding Code - Reinforcing Steel

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

Manual of Standard Practice

Placing Reinforcing Bars

NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)

NPCA QC Manual Quality Control Manual for Precast Concrete Plants

NPCA Selected ASTM Standards ASTM Standards for Precast Concrete

1.2 GENERAL

Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete units similar to that indicated in the project specifications or drawings for at least 5 years and shall be an approved supplier of precast concrete by NH DOT.

Description

1.1. Type This work shall consist of furnishing and constructing a culvert bridge system in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or as established by the Engineer.

Design

1.2. Specifications The precast elements are designed in accordance with the "Standard Specifications for Highway Bridges" 17th Edition, adopted by the American Association of State Highway and Transportation Officials, 2002.

Materials

1.3 Materials The concrete and reinforcing for the precast elements shall be in conformance with Section 03300.

1.4 Steel Hardware

Bolts and threaded rods for connections shall conform to ASTM A 307. Nuts shall conform to AASHTO M292 (ASTM A194) Grade 2H. All bolts, threaded rods and nuts used in connections shall be mechanically zinc coated in accordance with ASTM B695 Class 50.

Structural Steel for connection plates, connection fasteners and plate washers shall conform to AASHTO M 270 (ASTM A 709) Grade 36, ASTM A307 and shall be hot dip galvanized as per AASHTO M111 (ASTM A123).

Inserts for detached headwall connections shall be AISI Type 304 stainless steel, F-58 Expanded Coil inserts as manufactured by Dayton/Richmond Concrete Accessories, or equal. Coil rods and nuts used in headwall connections shall be AISI Type 304 stainless steel. Washers used in headwall connections shall be either AISI

Type 304 stainless steel plate washers or AASHTO M270 (ASTM A709) Grade 36 plate washers hot dip galvanized as per AASHTO M111 (ASTM A123).

2. Manufacture of Precast Elements Subject to the provisions of Section 5, below, the precast element dimension and reinforcement details shall be as prescribed in the plan and shop drawings provided by the manufacturer.

2.1. Forms The forms used in manufacture shall be sufficiently rigid and accurate to maintain the required precast element dimensions within the permissible variations given in Section 5 of these specifications. All casting surfaces shall be of a smooth material.

2.2. Placement of Reinforcement

Placement of Reinforcement in Precast Bridge Units - The cover of concrete over the outside circumferential reinforcement shall be 2 inches minimum. The cover of concrete over the inside circumferential reinforcement shall be 1 1/2 inches minimum, unless otherwise noted on the shop drawings. The ends of the longitudinal distribution reinforcement shall be not more than 3 inches and not less than 1 1/2 inches from the ends of the bridge unit.

Placement of Reinforcement for Precast Headwalls - The cover of concrete over the longitudinal and transverse reinforcement shall be 2 inches minimum. The clear distance from the end of each precast element to the end of reinforcing steel shall not be less than ½ inch nor more than 3 inches.

2.3. Curing The precast concrete elements shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength in 28 days or less. Any one of the following methods of curing or combinations thereof shall be used:

Steam Curing - The precast elements may be low-pressure steam cured by a system that will maintain a moist atmosphere. Concrete shall not be subjected to steam or hot air until after the concrete has attained its initial set. Steam, if used, shall be applied within a suitable enclosure, which permits free circulation of the steam in accordance with ACI 517.2R. If hot air is used for curing, precautions shall be taken to prevent moisture loss from the concrete. The temperature of the concrete shall not be permitted to exceed 150 deg. F.

Water Curing - The precast elements may be water cured by any method that will keep the sections moist.

Membrane Curing - A sealing membrane conforming to the requirements of ASTM Specification C309 may be applied and shall be left intact until the required concrete compressive strength is attained. The concrete temperature at the time of application shall be within +/- 10 degrees F of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.

2.4. Storage, Handling & Delivery

Storage

Precast concrete bridge elements shall be lifted and stored in "as-cast" position.

The precast elements shall be stored in such a manner to prevent cracking or damage. Store elements using timber supports as appropriate. The units shall not be moved until the concrete compressive strength has reached a minimum of 2500 psi, and they shall not be stored in an upright position.

Handling

Handling devices shall be permitted in each precast element for the purpose of handling and setting.

Spreader beams may be required for the lifting of precast concrete bridge elements to preclude damage from bending or torsion forces.

Delivery

Precast concrete elements must not be shipped until the concrete has attained the specified design compressive strength, or as directed by the design Engineer.

Precast concrete elements may be unloaded and placed on the ground at the site until installed. Store elements using timber supports as appropriate.

2.5. Quality Assurance The Precaster shall demonstrate adherence to the standards set forth in the NPCA Quality Control Manual. The Precaster shall meet either Section 4.6.1 or 4.6.2

Certification: The Precaster shall be certified by the Precast/Prestressed Concrete Institute Plant Certification Program or the National Precast Concrete Association's Plant Certification Program prior to and during production of the products covered by this specification.

Qualifications, Testing and Inspection

The Precaster shall have been in the business of producing precast concrete products similar to those specified for a minimum of five years. He shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the Precaster to produce quality products consistent with industry standards.

The Precaster shall show that the following tests are performed in accordance with the ASTM standards indicated. Tests shall be performed as indicated in Section 6 of these specifications.

Air Content: C231 or C173

Compressive Strength: C31, C39, C497

The Precaster shall provide documentation demonstrating compliance with this section at regular intervals or upon request.

The Owner may place an inspector in the plant when the products covered by this specification are being manufactured.

2.6 Submittals

Submit the following:

Design Drawings and Documents, including design and construction criteria, including an engineer's certification that they have reviewed and concur with the foundation design on the bid documents, or offer an alternative equivalent foundation design with equivalent capacity, anti-deterioration and anti-scour performance for this site, all stamped by a NH Professional Engineer.

Shop Drawings

Reinforcing steel

Reproductions of contract drawings are unacceptable.

Product Data

Concrete Mix Design

QAQC Plan

3. Permissible Variations

3.1. Bridge Units

Internal Dimensions - The internal dimension shall vary not more than 1% from the design dimensions nor more than 1-1/2 inches whichever is less.

Slab and Wall Thickness - The slab and wall thickness shall not be less than that shown in the design by more than 1/4 inch. A thickness more than that required in the design shall not be cause for rejection.

Length of Opposite Surfaces - Variations in laying lengths of two opposite surfaces of the bridge unit shall not be more than 1/2 inch in any section, except where beveled ends for laying of curves are specified by the purchaser.

Length of Section - The underrun in length of a section shall not be more than 1/2 inch in any bridge unit.

Position of Reinforcement - The maximum variation in position of the reinforcement shall be ± 1/2 inch. In no case shall the cover over the reinforcement be less than 1 1/2 inches for the outside circumferential steel or be less than 1 inch for the inside circumferential steel as measured to the external or internal surface of the bridge. These tolerances or cover requirements do not apply to mating surfaces of the joints.

Area of Reinforcement - The areas of steel reinforcement shall be the design steel areas as shown in the manufacturer's shop drawings. Steel areas greater than those required shall not be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the ASTM Specification for that type of reinforcement.

3.2. Headwalls

Wall Thickness - The wall thickness shall not vary from that shown in the design by more than 1/2 inch.

Length/ Height of Wall sections - The length and height of the wall shall not vary from that shown in the design by more than 1/2 inch.

Position of Reinforcement - The maximum variation in the position of the reinforcement shall be ± 1/2 inch. In no case shall the cover over the reinforcement be less than 1 1/2 inches.

Size of Reinforcement - The permissible variation in diameter of any reinforcing shall conform to the tolerances prescribed in the ASTM Specification for that type of reinforcing. Steel area greater than that required shall not be cause for rejection.

4. Testing/ Inspection

4.1. Testing

Type of Test Specimen - Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing, a minimum of 3 cylinders shall be taken for each lot of bridge elements. (A lot is defined as the precast elements made using the same concrete mix during a single day's production.) For core testing, one core shall be cut from each of 3 precast elements selected at random from each group of 15 or fewer elements made using a single concrete mix in the same day's production. Each lot shall be considered separately for the purpose of testing and acceptance.

Compression Testing - Cylinders shall be made and tested as prescribed by the ASTM C 39 Specification. Cores shall be obtained and tested for compressive strength in accordance with the provisions of the ASTM C42 Specification.

Acceptability of Cylinder Tests - When the average compressive strength of all cylinders tested is equal to or greater than the design compressive strength, and not more than 10% of the cylinders tested have a compressive strength less than the design concrete strength, and no cylinder tested has a compressive strength less than 80% of the design compressive strength, then the lot shall be accepted. When the compressive strength of the cylinders tested does not conform to these acceptance criteria, the acceptability of the lot may be determined as described in section 6.1.4, below.

Acceptability of Core Tests - The compressive strength of the concrete in a lot is acceptable when the average core test strength is equal to or greater than the design concrete strength. When the compressive strength of a core tested is less than the design concrete strength, the precast element from which that core was taken may be re-cored. When the compressive strength of the re-core is equal to or greater than the design concrete strength, the compressive strength of the concrete in that lot is acceptable.

When the compressive strength of any recore is less than the design concrete strength, the precast element from which that core was taken shall be rejected. Two precast elements from the remainder of the lot shall be selected at random and one core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the compressive strength of

the remainder of that group is acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the group shall be rejected or, at the option of the manufacturer, each precast element of the remainder of the group shall be cored and accepted individually, and any of these elements that have cores with less than the design concrete strength shall be rejected.

Plugging Core Holes - The core holes shall be plugged and sealed by the manufacturer in a manner such that the elements will meet all of the test requirements of this specification. Precast elements so sealed shall be considered satisfactory for use.

Test Equipment - Every manufacturer furnishing precast elements under this specification shall furnish all facilities and personnel necessary to carry out the test required.

4.2. Inspection The quality of materials, the process of manufacture, and the finished precast elements shall be subject to inspection by the purchaser.

5. Joints The bridge units shall be produced with flat butt ends. The ends of the bridge units shall be such that when the sections are laid together they will make a continuous line with a smooth interior free of appreciable irregularities, all compatible with the permissible variations in section 5, above. The joint width between adjacent precast units shall not exceed 3/4 inches.

6. Workmanship/ Finish The bridge units, and headwalls shall be substantially free of fractures. The ends of the bridge units shall be normal to the walls and centerline of the bridge section, within the limits of the variations given in section 5, above, except where beveled ends are specified. The faces of the headwalls shall be parallel to each other, within the limits of variations given in section 5, above. The surface of the precast elements shall be a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth, steel form finish unless they exceed 0.5" deep or exceed 1"x1" area.

7. Repairs Precast elements may be repaired, if necessary, because of imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the purchaser, the repairs are sound, properly finished and cured, and the repaired section conforms to the requirements of this specification.

8. Rejection The precast elements shall be subject to rejection on account of any of the specification requirements. Individual precast elements may be rejected because of any of the following:

8.1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed one half the thickness of the wall.

8.2. Defects that indicate proportioning, mixing, and molding not in compliance with these specifications.

8.3. Honeycombed or open texture.

8.4. Damaged ends, where such damage would prevent making a satisfactory joint.

9. Marking Each bridge unit shall be clearly marked by waterproof paint. The following shall be shown on the inside of the vertical leg of the bridge section:
   Bridge Span X Bridge Rise
   Date of Manufacture
   Name or trademark of the manufacturer

10. Installation Preparation To ensure correct installation of the precast concrete bridge system, care and caution must be exercised in forming the support areas for bridge units, headwall elements. Exercising special care will facilitate the rapid installation of the precast components.

10.1. Footings

Do not over excavate foundations unless directed by site soil engineer to remove unsuitable soil.

The bridge units shall be installed on cast-in-place concrete footings. A keyway shall be formed in the top surface of the bridge footing as required by the precast manufacturer.

The footings shall be given a smooth float finish and shall reach a compressive strength of 4,000 psi before placement of the bridge elements. Backfilling shall not begin until the footing has reached the full design compressive strength without written approval from the Engineer.

The footing surface shall be constructed in accordance with grades shown on the plans. When tested with a 10-foot straight edge, the surface shall not vary more than 1/4 inch in 10 feet.

11. Installation

11.1. General The installation of the precast concrete elements shall be as required by the precast manufacturer's designer.

Construction equipment weight restrictions: In no case shall equipment operating in excess of the design load (HS20 or HS25) be permitted over the bridge units unless approved by precast manufacturer's designer.

In the immediate area of the bridge units, the following restrictions for the use of heavy construction machinery during backfilling operations apply:

- No construction equipment shall cross the bare precast concrete bridge unit.
- After the compacted fill level has reached a minimum of 4 inches over the crown of the bridge, construction equipment with a weight of less than 10 tons may cross the bridge.
- After the compacted fill level has reached a minimum of 1 foot over the crown of the bridge, construction equipment with a weight of less than 30 tons may cross the bridge.

- After the compacted fill level has reached the design cover, or 2 feet minimum, over the crown of the precast concrete bridge, construction equipment within the design load limits for the road may cross the precast concrete bridge.

11.2. Leveling Pad/ Shims The bridge units shall be set on shims specified by the precast manufacturer's designer.

11.3. Placement of Bridge Units

The bridge units shall be placed as shown on the Engineer's plan drawings. Special care shall be taken in setting the elements to the true line and grade. The joint width between adjacent precast units shall not exceed 3/4 inches.

It is imperative that any lateral spreading of the bridge elements be avoided during and after their placement. Generally, horizontal cable ties are shipped in the larger bridge elements to prevent this spreading. If, due to site restrictions, these ties must be removed prior to placement of the bridge element, the contractor must provide hardwood wedges on site. These hardwood wedges are placed in the keyway outside the legs of the bridge elements, and smaller shims and wedges are added before complete release of the bridge element from the crane.

Placement of Headwalls

The wingwalls and headwalls shall be placed as shown on the plan drawings. Special care shall be taken in setting the elements to the true line and grade.

11.4. Waterproofing/ Joint protection and Subsurface Drainage

External Protection of Joints - The butt joint made by two adjoining bridge units shall be covered with a minimum 7/8" x 1 3/8" preformed bituminous joint sealant and a minimum of a 9-inch wide joint wrap, or approved equivalent. The surface shall be free of dirt before applying the joint material. A primer compatible with the joint wrap to be used shall be applied for a minimum width of nine inches on each side of the joint. The joint shall be covered continuously from the bottom of one bridge section leg, across the top of the bridge and to the opposite bridge section leg. Any laps that result in the joint wrap shall be a minimum of six inches long with the overlap running downhill.

In addition to the joints between bridge units, the joint between the end bridge unit and the headwall shall also be sealed as described above. If precast wingwalls are used, the joint between the end bridge unit and the wingwall shall be sealed with a 2'-0" strip of filter fabric. Also, if lift holes are formed in the bridge units, they shall be primed and covered with a 9" x 9" square of joint wrap.

During the backfilling operation, care shall be taken to keep the joint wrap in its proper location over the joint.

11.5. Grouting

Grouting shall not be performed when temperatures are expected to go below 35° for a period of 72 hours.

Fill the bridge-foundation keyway with non-metallic, non-shrink cement grout with a minimum 7-day compressive strength of 5000 psi. Vibrate as required to ensure that the entire key around the bridge element is completely filled. If bridge elements have been set with temporary ties (cables, bars, etc.) grout must attain a minimum compressive strength of 1500 psi before ties may be removed.

All grout shall have a maximum aggregate size of ¼ inch.

Lifting and erection anchor recesses shall be filled with grout.

11.6. Backfill

Do not perform backfilling during wet or freezing weather.

No backfill shall be placed against any structural elements until they have been approved by the Engineer.

Placing and Compacting Backfill

Dumping for backfilling is not allowed any nearer than 3 ft from the bridge leg.

The fill must be placed and compacted in layers not exceeding 8 inches. The maximum difference in the surface levels of the fill on opposite sides of the bridge must not exceed 2 feet.

The backfill shall be compacted to a minimum density of 95% of the Standard Proctor, as required by AASHTO T-99.

Soil within 1 foot of concrete surfaces should be hand-compacted. Elsewhere, compaction shall be in accordance with the precast manufacturer's designer.

Backfill against a waterproofed surface shall be placed carefully to avoid damage to the waterproofing material.

-- End of Section --

SECTION 04400 - STONE MASONRY

PART 1- GENERAL

1.1 REFERENCES

A. Refer to other divisions of these specifications, other sections in this division, and drawings for related work, which may affect the work of this section.

B. The Contract Drawings indicate and show limits of construction for this project. These specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work.

1.2 DESCRIPTION OF WORK

A. Work Included: The Contractor shall provide the labor, materials and equipment necessary to complete the Work of this Section, including but not limited to the following:
1. Wall stone work including foundation, footing and backing concrete work.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. SECTION 02200 – Earthwork
2. SECTION 03300 – Structural Concrete

1.3 SUBMITTALS

A. Stone source information, proposed stone which will be exposed, including a representative color/shape/texture sample of about 10 to 20 pound size with the bid.

B. Concrete mix design.

1.4 QUALITY ASSURANCE

A. The Contractor is responsible for supplying quality stone meeting these specifications and the intent of the project. If the Contractor is not an experienced in stone masonry, it shall employ a stone mason to supervise stone placements and ensure quality stonework construction.

1.5 DELIVERY AND STORAGE

Store stone at the site in a safe and stable manner. Stone shall not be stacked more than 2 stones high. Provide construction fencing around the stock pile area and sufficient signage to warn the public to stay away and off the stored stone.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stone
Reuse existing granite wall blocks to the extent feasible. All imported stone shall be hard durable angular igneous rock, (granite, diorite or similar), closely matching the existing granite color, with a shape consistent with building a stable coursed stone wall, with at least 5 relatively flat quarry faced surfaces and preferably a slab or block form. The stone shall be free of oil, grease, paint or other bond inhibiting deposits. Granite curb stones may be acceptable for top face stone, but are not acceptable below the top course.

Stones with cracks or soft seams shall be considered as separate blocks, assuming that frost action will eventually open the cracks. Rounded stones will not be accepted. Stones shall be at least 5 inches wide at the narrowest point and imported wall stone (excluding chinking stone), shall be a minimum of 2 cubic feet in volume. Exposed faces shall be selected and placed to show the straightest, flattest face(s) free of defects to the extent possible (drill holes and tool marks are not considered defects).

Imported rock that will not be considered for this project includes, but is not limited to Gabbro, Pegmatite, Rye formation, Kittery formation, Eliot formation and Berwick formation. Rock containing multiple soft layers or fractures will not be permitted. If a quarry source is rejected by NHDOT as a concrete aggregate or riprap source, it is unlikely to be approved for this project.

B. Chinking Stone
Chinking stone shall be of the same color and quality as the wall stone and be selected to best match the size and shape of the voids/gaps beings filled. The Contractor shall maintain an adequate supply of chinking stone at the work site to allow for stone size and shape selection. Wall joints more than 2" wide shall be chinked.

C. Structural Concrete (wall and footings)
See Section 03300.

D. Incidental Mortar/Concrete
Field mixed mortar/concrete for filling voids, leveling cap stones or other small quantity incidental concrete, consisting of 1.5 parts Type II Portland cement, 2 parts clean sand, and 3 parts coarse aggregate. Alternatively, the Contractor may use premixed bags of concrete and mortar (which utilize Type II or Type IS cement).

PART 3 - EXECUTION

The wall construction shall be as indicated on the drawings, with neat tight stable stone placement. Exposed stones shall be selected and placed to show the straightest, flattest

face(s), free of defects to the extent possible. The joints between stones shall be staggered at least 8 inches, between adjacent courses, so as to provide optimum interlocking (excluding arch stonework). Only stone shall be exposed along the faces of the wall – footing and backing concrete shall not be visible above mean lower low water or above the exposed soil level. Stones shall not protrude more than 3" beyond adjacent stones at the joints and all working of exposed stone shall be by chipping (no exposed saw cut or grinder surfaces and no exposed drill holes over 1/2" diameter).

The stones shall be shaped and fit together to be stable in a dry set condition, however they may be mortar set and shall be supported with bonded cast-in-place concrete backing. The back side of stones shall be brush coated with a Portland cement/water slurry mixed to a pancake batter consistency, within 2 hours prior to placing the concrete backing. All stones shall be solidly placed and interlocked and any stone placement that allows a stone to rock or move by hand or foot pressure shall be reset. Contractor is responsible to control the concrete placements and/or provide temporary shoring such that the facing stones do not move or crack mortar joints during concrete placement. Stonework shall be adequately fit and chinked such that backing concrete is not visible.

- End of Section -

SECTION 04410 - STONE RIPRAP & REVETMENT

PART 1 - GENERAL

1.1 REFERENCES

Section 02373 Geotextile (12 oz)

1.2 SUBMITTALS

Submit the following:

Quarry stone source information. Indicate type of stone and include current photographs representative of the intended stone for this project with adequate scale to show the stone sizes. Stone supply shall be subject to inspection and approval by the Engineer as meeting specification prior to utilization.

1.3 DELIVERY, STORAGE, AND HANDLING

Handle delivered stone materials carefully to avoid damage to the property, including bulkhead, railings and pavements. Utilize an aggregate/sand bed to protect pavement during stone dumping and unloading.

1.4 QUALITY ASSURANCE

The Contractor is responsible to oversee all stone deliveries and placements to ensure all stone installed meets project specifications.

PART 2 - PRODUCTS

2.1 STONE

The material used for the revetment shall be rough quarry stone free of cracks, joints, weak seams or other defects. Stone shall be hard, durable, and of such quality that it will not disintegrate on exposure to ice, seawater, wave action or weathering. It shall also be chemically stable, capable of withstanding freezing and thawing, and suitable in all other respects for the intended use. A potential stone supply shall have stone with less than 30% loss in an LA Abrasion Test (ASTM C 535); however the stone source will also be subjected to inspection by the Contractor and the Engineer to confirm the large stone is also free of weakness and defects. Disputed quality stones will be subjected to a 10 foot stone on stone drop test with the disputed stone being dropped onto a similar size or larger stone, at no additional cost to the Owner. See Contract Drawings for sizes and additional requirements. Armor stone shall be angular and roughly rectangular/block-like in shape. Rounded stones are not acceptable and thin wedge like stones are only acceptable as chinking stones. Potentially acceptable stone includes granite, diorite, basalt, quartzite,

gneiss, syenite. The following rock is unlikely to be approved; schist, gabbro, pegmatite, shale, slate, sandstone, limestone.

2.1.1 Slope Revetment

Toe Stones: Minimum 3'x3'x3'
Slope Armor Stones: Minimum 3'x2'x2'
Slope Underlayer Stone: 4" to 12" with 6" average

2.1.2 Pier Rirap

Pier Stone: 9" to 30" with 15" average
In layer 3.5 ft thick

2.1.3 General Rirap

Pier Stone: 7" to 18" with 12" average
In layer 1.5 ft thick

PART 3 - EXECUTION

3.1 PLACING

Before commencing stone placement, remove debris, including timbers, concrete and other materials which might damage the geotextile. Provide adequate ballast on generally horizontal geotextile and proper fastening on sloping and vertical geotextile to secure it in the intended locations until the stone work is complete. Provide crushed stone bedding over geotextile (minimum necessary) if sharp pointed or sharp edge armor or underlayer stone is being placed with a sharp edge/point toward the geotextile.

The rock riprap and revetment shall be placed by equipment on the surfaces and to the depths and dimensions specified. The rock shall be delivered and placed in such a manner that will insure that the stone work in-place will be dense and compact mass with the largest armor stones uniformly distributed and firmly in contact with the smaller stones and chinking (quarry spalls) filling the voids between the larger rock. Hand placement of revetment chinking stone shall be completed to insure a final surface which is tight and solid and with no voids greater than six inches (6") across present between rocks. Rock will be placed starting at the lowest elevation of a toe as shown on the drawings.

Each revetment stone shall be carefully set on the stone below, so that 3/4 of the area of each exposed surface stone shall be approximately parallel to the slope lines as shown. Adjacent stones shall be selected for size and shape and laid in contact and fit as close as possible so as to produce a reasonable minimum of voids. Individual stones shall be placed in a manner to provide maximum interlocking. Stones shall not rock or tip and shall have at least three points of bearing on stones below. Stones shall be tested for rocking or

tipping prior to placement of the next row of stones. Placing small stones in joints from the top to prevent rocking or tipping (chinking) shall not be done.

See Contract Drawings for additional requirements.

-- End of Section --

SUPPLEMENTAL INFORMATION
GEOTECHNICAL REPORT

John Turner Consulting, Inc.
19 Dover Street
Dover NH, 03820

Mr. Duncan Mellor
Waterfront Engineers LLC
3 Linda Lane
Stratham, NH 03885

09-GEO-047
Maplewood Ave Bridge Reconstruction Engineering and Design
Portsmouth, NH

Attached are the boring logs for the borings completed on Tuesday October 27 and Thursday October 30, 2009. Two half days were required for the project due to an inability of the Portsmouth Police Department to provide an officer to control traffic in the afternoon of Tuesday October 27, 2009. Boring B1 and B4 were both located on the East end of the bridge, with B2 and B3 on the West end, each in the center of the lane. All location distances were taken from the nearest culvert opening in the eastbound lane. In addition, borings were only taken in the eastbound lane due to a sewer line, electrical lines, and a fiber optics line in the westbound lane. All soil and rock classification descriptions are based on field visuals. Samples for further testing or review remain at John Turner Consulting, Inc.

Respectfully Submitted,
John Turner Consulting, Inc.

Kyle Urso
Staff Engineer

BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
PHONE: 603-749-1841
FAX: 603-516-6851

CLIENT:	Waterfront Engineers LLC	BORING #:	B1
PROJECT:	Maplewood Ave, Portsmouth, NH	LOCATION:	77' East of Beginning of Arch
PROJECT NO:	09-GEO-047	SURFACE ELEVATION:	
		DATE:	27-Oct-09
TYPE OF BORING:	SSA/ Switched to casing at 15'	GROUNDWATER OBSERVATIONS	
DRILLING CO:	Great Works Test Boring	DATE: / DEPTH: / TIME:	
DRILLER:	Willie Aiken	27-Oct-09 / 10' / 10:00am	
JTC REP.:	Kyle Urso		

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	PEN (N)
0				Asphalt	7"	27-50/4.5"	50+
	S-1	1-3	9"	Dark Brown, Dry, Silt, some sand, trace gravel			
				Dark Brown, Moist, Silt, some sand, trace gravel		3-4-3-4	7
	S-2	3-5	13"				
5	S-3	5-7	10"	Dark Brown, Moist, Silt, some sand, trace gravel		3-2-3-6	5
	S-4	7-9	14"	Dark Brown, Moist, Silt, some sand, trace gravel		4-4-2-3	6
10	S-5	10-12	7"	Dark Brown, Wet, Silt, some sand, trace gravel		7-2-4-4	6
				Drilled through course sand, with gravel	13'		
15	S-6	15-16.5'	6"	Brownish Gray, Wet, fine-course Sand, some gravel		11-35-12-50/3"	47
				Gray, Wet, Silt and fine Sand, trace gravel	16'		
				Auger Refusal @ 16.5'			

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made. Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
PHONE: 603-749-1841
FAX: 603-516-6851

CLIENT:	Waterfront Engineers LLC	BORING #:	B2 Page 1 of 2
PROJECT:	Maplewood Ave, Portsmouth, NH	LOCATION:	28' West of Culvert opening
		SURFACE ELEVATION:	
PROJECT NO:	09-GEO-047	DATE:	27-Oct-09
TYPE OF BORING:	SSA/ Switched to casing at 10'	GROUNDWATER OBSERVATIONS	
DRILLING CO:	Great Works Test Boring	DATE: / DEPTH:	TIME:
DRILLER:	Willie Aiken	27-Oct-09 / None	Upon Completion
JTC REP.:	Kyle Urso		

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	PEN (N)
0	S-1	0-2	15"	Asphalt	7"	20-41-27-18	68
				Dark Brown, Moist, Silt, some sand, trace gravel			
	S-2	2-4	2"	Rock Restricted Recovery-trace silt and fractured rock		12-16-8-9	24
5	S-3	5-7	9"	Dark Brown, Moist, Silt; some sand, trace gravel		4-3-30-50/2"	33
	S-4	7-9	3"	Boulder at 7, could not drill through, moved 3' North			
				Dark Brown, Moist, Silt, some sand, trace gravel		6-4-7-9	11
10	S-5	10-12	11"	Dark Brown, Moist, Silt, some sand, trace gravel		3-2-1-3	3
				Gray silt, trace gravel			
				(Trace wood in tube, may have drilled through old wood tie			
				or buried stump-strong smell of organics)			
15	S-6	15-17	0"	No Recovery		1-2-1-1	3
	S-7	17-19	6"	Wet, Gray, Clay-strong organic smell	17	6-2-3-2	5
				Boring incomplete-Time Restrictions			
				Continue 10/30			

REMARKS: We had no Officer to control traffic so drilling had to terminate for the day. We will continue drilling from where we left on Friday October 30, 2009

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made. Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
PHONE: 603-749-1841
FAX: 603-516-6851

CLIENT:	Waterfront Engineers LLC	BORING #:	B2 Page 2 of 2
PROJECT:	Maplewood Ave, Portsmouth, NH	LOCATION:	31' West of Culvert opening
		SURFACE ELEVATION:	
PROJECT NO:	09-GEO-047	DATE:	30-Oct-09
TYPE OF BORING:	SSA/Switched to Casing @ 22'	GROUNDWATER OBSERVATIONS	
DRILLING CO:	Great Works Test Boring	DATE: / DEPTH: / TIME:	
DRILLER:	Willie Aiken	30-Oct-09 / 20'	
JTC REP.:	Kyle Urso		

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	PEN (N)
20	S-8	20-22	20"	Gray, Wet, Clay-strong smell of organics		3-3-9-12	12
	S-9	22-24	4"	Gray, Wet, Sand & Gravel with some clay		3-6-10-10	16
				Weathered Rock	24.5'		
25				Drilled through 4' of weathered Rock with tri-cone bit			
				Boring Terminated @ 28.5' (weathered rock)			

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
PHONE: 603-749-1841
FAX: 603-516-6851

CLIENT:	Waterfront Engineers LLC	BORING #:	B3
PROJECT:	Maplewood Ave, Portsmouth, NH	LOCATION:	60' West of Culvert opening
		SURFACE ELEVATION:	
PROJECT NO:	09-GEO-047	DATE:	30-Oct-09

		GROUNDWATER OBSERVATIONS		
TYPE OF BORING:	SSA/Switched to Casing @ 15'	DATE:	DEPTH:	TIME:
DRILLING CO:	Great Works Test Boring	30-Oct-09	6'	10:15am
DRILLER:	Willie Aiken			
JTC REP.:	Kyle Urso			

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	PEN (N)
0				Asphalt	7"		
	S-1	1-3	5"	Dark Brown, Moist silt and sand, some gravel		50/5"	50+
				Drilled through Cobbles			
		3-5	12"	Dark Brown, Moist Silt and Sand, some gravel, trace weathered rock		9-16-12-5	28
5	S-2	5-7	8"	Dark Brown, Moist, Silt and Sand, some gravel		3-4-4-5	8
	S-3	7-9	18"	Dark Brown, Wet Silt and Sand, some gravel	8'	5-5-5-6	10
				Brownish Orange, Wet, fine-coarse Sand			
10	S-4	10-12	15"	Brownish Orange, Wet, fine-coarse Sand		10-14-10-11	24
		12-14	3"	Brownish Orange Wet, Fine Sand and Gravel, little silt		12-7-5-4	12
					14.5'		
15	S-5	15-17	14"	Gray, Wet, Clay with some sand and gravel-strong smell of organics		1-1-2-5	3
	S-6	17-19	7"	Gray, Wet, Clay with and and gravel-strong smell of organics	18'	12-50/5"	50+
				Weathered Rock			
				Drilled through 3' of weathered rock with tri-cone bit			
				Boring Terminated @ 21.0' (weathered rock)			

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made. Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
PHONE: 603-749-1841
FAX: 603-516-6851

CLIENT:	Waterfront Engineers LLC	BORING #:	B4 (LEDGE PROBE)
PROJECT:	Maplewood Ave, Portsmouth, NH	LOCATION:	152' East of culvert opening
		SURFACE ELEVATION:	
PROJECT NO:	09-GEO-047	DATE:	30-Oct-09
TYPE OF BORING:	Ledge Probe	GROUNDWATER OBSERVATIONS	
DRILLING CO:	Great Works Test Boring	DATE: / DEPTH: / TIME:	
DRILLER:	Willie Aiken	30-Oct-09	
JTC REP.:	Kyle Urso		

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	PEN (N)
0				Asphalt	7"		
5							
				Drilled through 3' Boulder			
10					11'		
				Clay-strong smell of organics			
					14'		
				Weathered Rock			
15				Drilled through 3' of weathered Rock with tri-cone bit			
				Ledge Probe Refusal at 17'			

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made. Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%).

Please mail the completed form and required material to:

New Hampshire Division of Historical Resources
State Historic Preservation Office
Attention: Review & Compliance
19 Pillsbury Street, Concord, NH 03301-3570

DHR Use Only	
R&C #	_____
Log In Date	____ / ____ / ____
Response Date	____ / ____ / ____
Sent Date	____ / ____ / ____

Request for Project Review by the New Hampshire Division of Historical Resources

☐ This Project is funded by the **American Recovery and Reinvestment Act of 2009**

X This is a new submittal ☐ This is additional information relating to DHR Review #:_____

GENERAL PROJECT INFORMATION

Project Title Maplewood Ave Culvert Replacement and North Mill Pond Restoration

Project Location Maplewood Avenue, Portsmouth, New Hampshire

Tax Map & Lot # _____N/A_____

NH State Plane Geographic Coordinates: Easting_1225050 Northing_212550 (project surveyor) WGS84 Datum
(see RPR Manual and R&C FAQ's for help accessing this data)

Lead Federal Agency
(Agency providing funds, licenses, or permits) __ Army Corp SPGP _____

Permit or Job Reference #_____ None yet _____

State Agency and Contact (if applicable) __ DES Wetlands Bureau
Permit or Job Reference #_____ None yet _____

APPLICANT INFORMATION

Applicant Name _ City of Portsmouth, Public Works Phone Number__(603) 766-1421

Street Address 680 Peverly Hill Road
City _ Portsmouth State_NH____ Zip_03801_____ Email DSAllen@PW.cityofportsmouth.com

CONTACT PERSON TO RECEIVE RESPONSE

Name/Company Duncan Mellor, PE, Waterfront Engineers LLC Phone Number__603-772-3706

Street Address 3 Linda Lane
City Stratham State_NH Zip__03885 Email __dmellor@waterfrontengineers.com

Please refer to the Request for Project Review manual for direction on completing this form. Submit one copy of this project review form for each project for which review is requested. Include a self-addressed stamped envelope to expedite review response. Project submissions will not be accepted via facsimile or e-mail. This form is required. Review request form must be complete for review to begin. Incomplete forms will be sent back to the applicant without comment. Please be aware that this form may only initiate consultation. For some projects, the Division of Historical Resources (DHR) may require additional information to complete our review. All items and supporting documentation submitted with a review request, including photographs and publications, must be retained by the DHR as part of its review records. Items to be kept confidential should be clearly identified. For questions regarding the DHR review process, please visit our website at: http://www.nh.gov/nhdhr/review or contact the R&C Specialist at 603.271.3558.

PROJECT BOUNDARIES AND DESCRIPTION

PROJECTS CANNOT BE PROCESSED WITHOUT THIS INFORMATION

REQUIRED

X Attach the relevant portion of a 7.5' USGS Map (photocopied or computer-generated) ***indicating the defined project boundary.***

X Attach a detailed written description of the proposed project. Include: (1) a narrative description of the proposed project; (2) site plan; (3) photos and description of the proposed work if the project involves rehabilitation, demolition, additions, or alterations to existing buildings or structures; and (4) a photocopy of the relevant portion of a soils map (if accessible) for ground-disturbing projects.

Architecture

Are there any buildings or structures within the project area? X Yes ☐ No work is replacement of culvert and stone seawall reconstruction
If yes, submit all of the following information:

Approximate age(s): Walls last rebuilt circa 1896. See attached drawing

☐ Photographs of ***each*** building located within the project area along with a photo key. Include streetscape images if applicable. (Digital photographs are accepted. All photographs must be clear, crisp and focused)

☐ DHR file review conducted on _____/_____/_____

Please note that as part of the review process, the DHR may request an architectural survey or other additional information.

Archaeology

Does the proposed undertaking involve ground-disturbing activity? X Yes ☐ No
If yes, submit all of the following information:

X Project specific map and/or preliminary site plan that fully describes the project boundaries and areas of proposed excavation.

X Description of current and previous land use and disturbances.

X Any available information concerning known or suspected archaeological resources within the project area.

Please note that as part of the review process, the DHR may request an archaeological survey or other additional information.

DHR COMMENT *This Space for Division of Historical Resources Use Only*

☐ No Potential to cause Effects ☐ Additional information is needed in order to complete our review

☐ No Adverse Effect ☐ No Historic Properties Affected ☐ Adverse Effect

Comments:_____

If plans change or resources are discovered in the course of this project, you must contact the Division of Historical Resources as required by federal law and regulation.

Authorized Signature: _____ Date: _____

NH DHR Review Request Form Project Information

Maplewood Ave Culvert Replacement and North Mill Pond Restoration

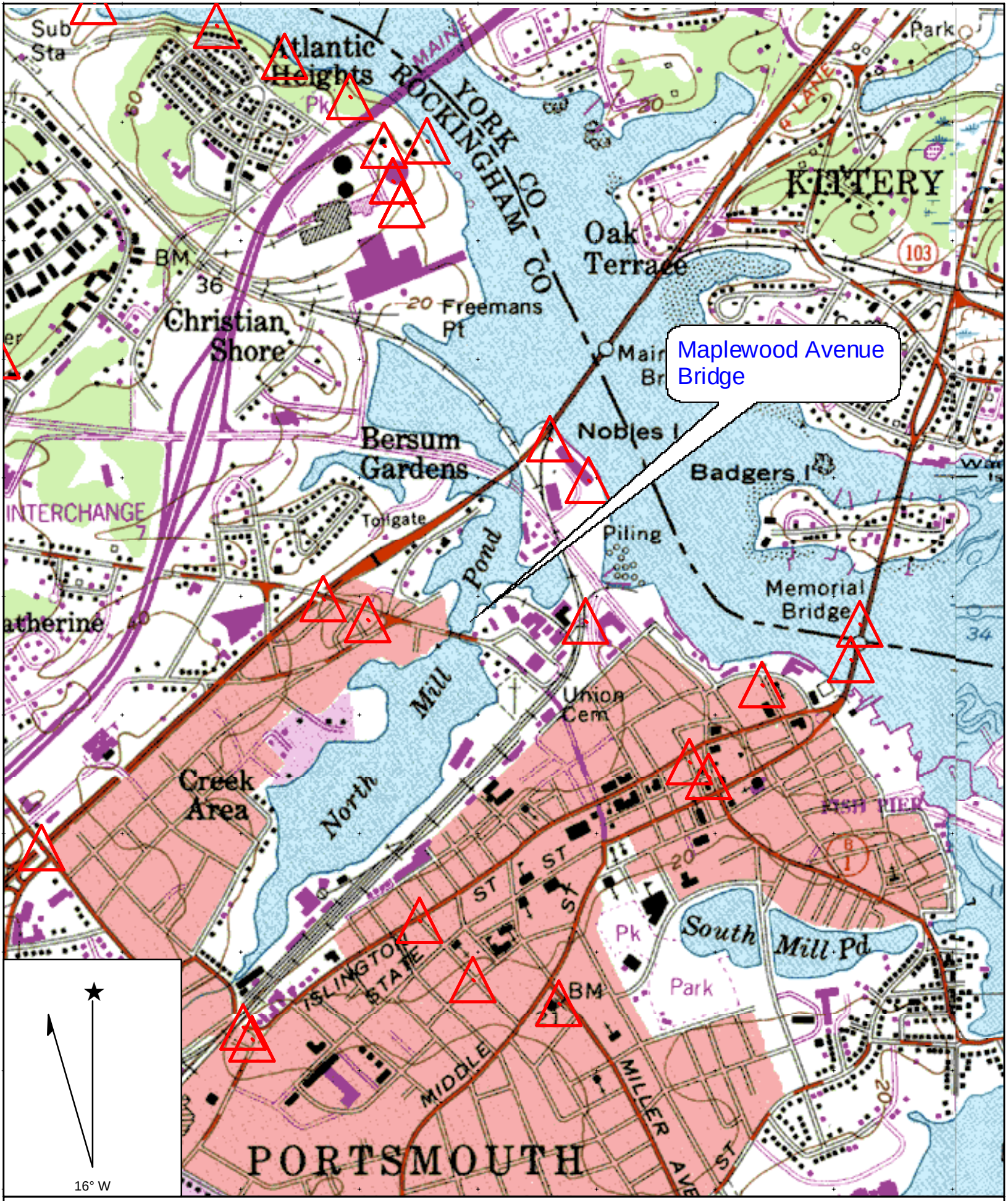
Nov. 4, 2009

The project involves replacement of a failing arch culvert and adjacent seawalls along Maplewood Avenue where it crosses North Mill Pond (tidal) within the Piscataqua River Estuary in Portsmouth. There are no buildings within the work area and no known archeological sites in this project area. We have included a vicinity map, an aerial photo site plan and site photos to aid your review. The seawalls are being replaced in the same location as the existing walls and will be rebuilt with the existing granite stone exterior.

The existing walls will be dismantled to provide access to the single arch culvert, which will be removed and replaced with a precast concrete three barrel arch culvert with granite facing. This culvert enlargement will help restore tidal flows in and out of North Mill Pond and provide improved small boat access. The existing sewer main which presently penetrates the arch culvert (partially blocking flow and small boat access) will be relocated to just outside the seawall and be buried in the bottom.

From review of City archives, we located an 1896 drawing depicting reconstruction of the Maplewood Avenue crossing (attached) with a change from five culvert openings to the present single arch culvert (resulting in reduced tidal flow). The project intent is to add back additional culvert openings to enhance tidal flow, within the historical context of multiple culvert openings which existed prior to 1896. Due to later land filling, the location of some of the original culverts is no longer feasible and the proposed wider culverts will be located at the existing culvert location.

The ground disturbance involved is excavation for the culverts, walls and utilities. The soils map for this location shows the area as “W” water and “699” Urban Land at the eastern end and “799” Urban Land – Canton Complex at the western end (see attached soils map). The actual shoreline soils are shoreline mud, sand, gravel, stones with some man made debris such as concrete and asphalt pavement.



Name: PORTSMOUTH
Date: 10/30/2009
Scale: 1 inch equals 1000 feet

Location: 043° 04' 49.60" N 070° 45' 51.30" W
Caption: Maplewood Avenue Bridge Reconstruction project

Copyright (C) 2002, Maptech, Inc.

NTS

SITE PLAN

WATERFRONT ENGINEERS LLC

3 LINDA LANE
STRATHAM, NH 03885
(603) 772-3706

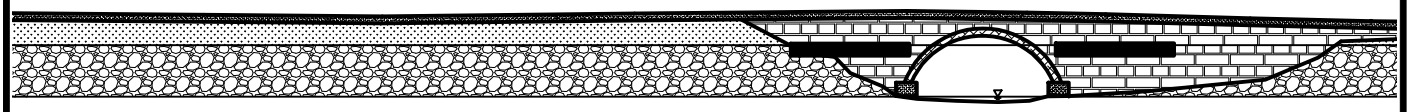
www.waterfrontengineers.com

MAPLEWOOD AVE. CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

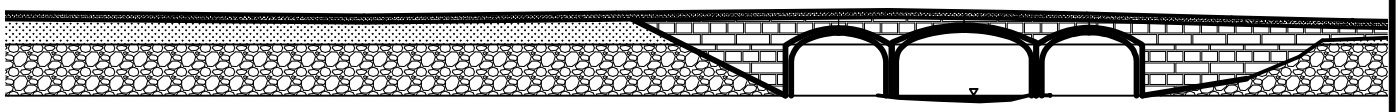
PORTSMOUTH
NEW HAMPSHIRE
ROCKINGHAM COUNTY
PORTSMOUTH HARBOR
NOV. 2, 2009

APPLICANT:
CITY OF PORTSMOUTH
680 Peverly Road
Portsmouth, NH

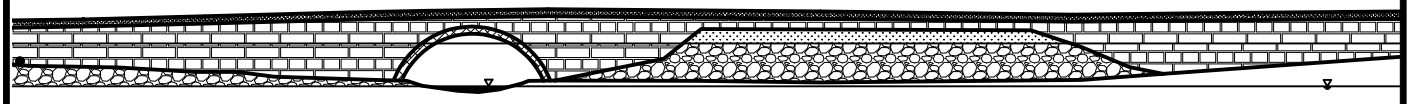
SHEET 1 OF 2



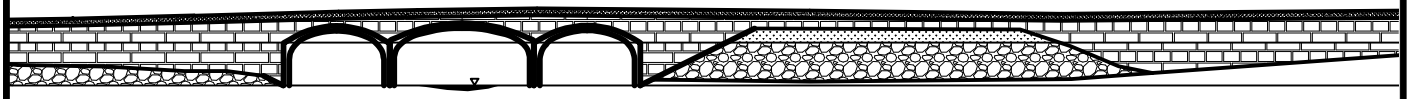
EXISTING NORTH ELEVATION



PROPOSED NORTH ELEVATION



EXISTING SOUTH ELEVATION



PROPOSED SOUTH ELEVATION

40 0 40 80

(FEET)

ELEVATIONS

WATERFRONT ENGINEERS LLC

3 LINDA LANE
STRATHAM, NH 03885
(603) 772-3706

www.waterfrontengineers.com

MAPLEWOOD AVE. CULVERT REPLACEMENT AND NORTH MILL POND RESTORATION

PORTSMOUTH
NEW HAMPSHIRE
ROCKINGHAM COUNTY
PORTSMOUTH HARBOR
NOV. 2, 2009

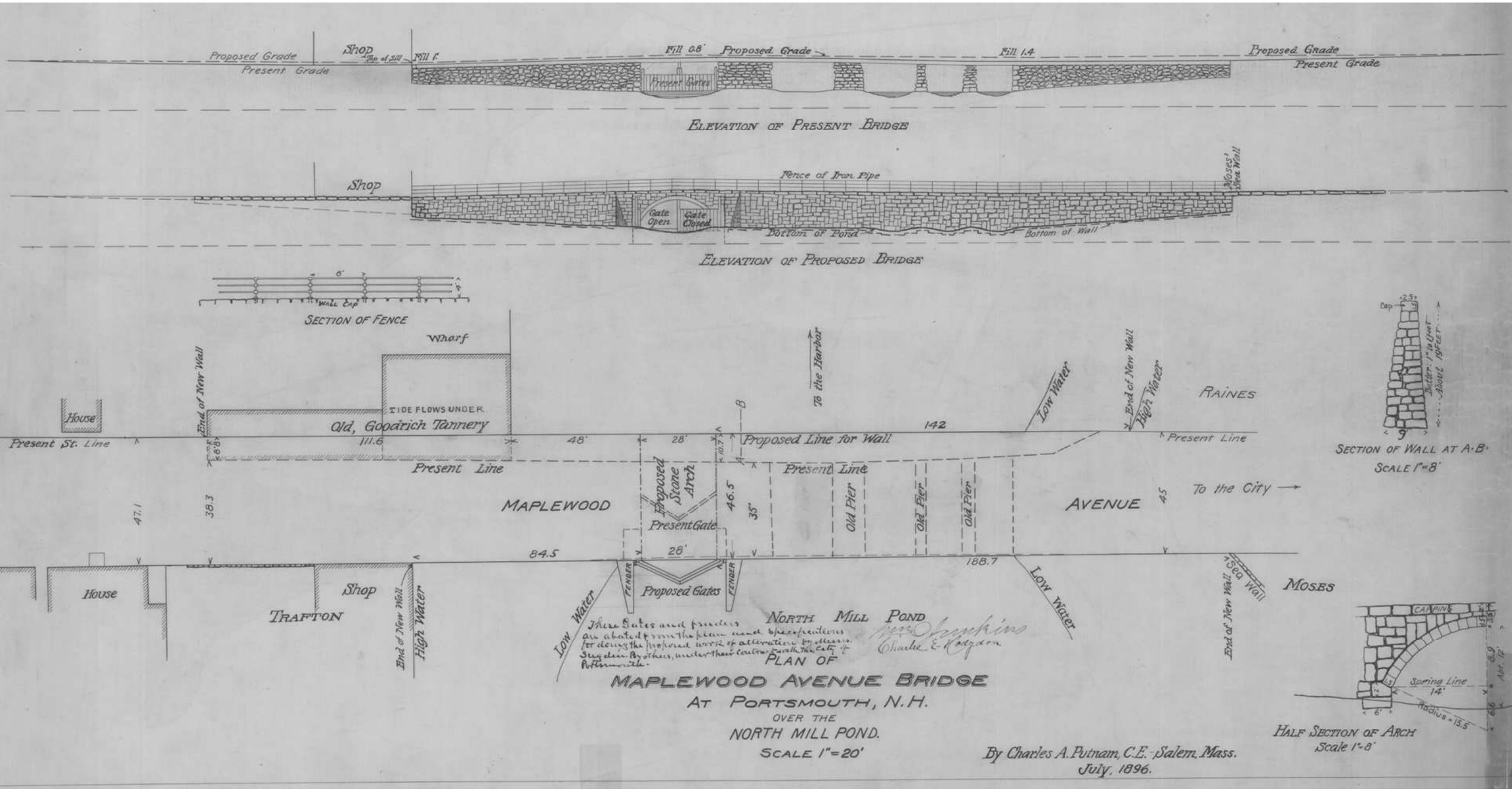
APPLICANT:
CITY OF PORTSMOUTH
680 Peverly Road
Portsmouth, NH

MAPLEWOOD AVE. CULVERT REPLACEMENT & NORTH MILL POND RESTORATION

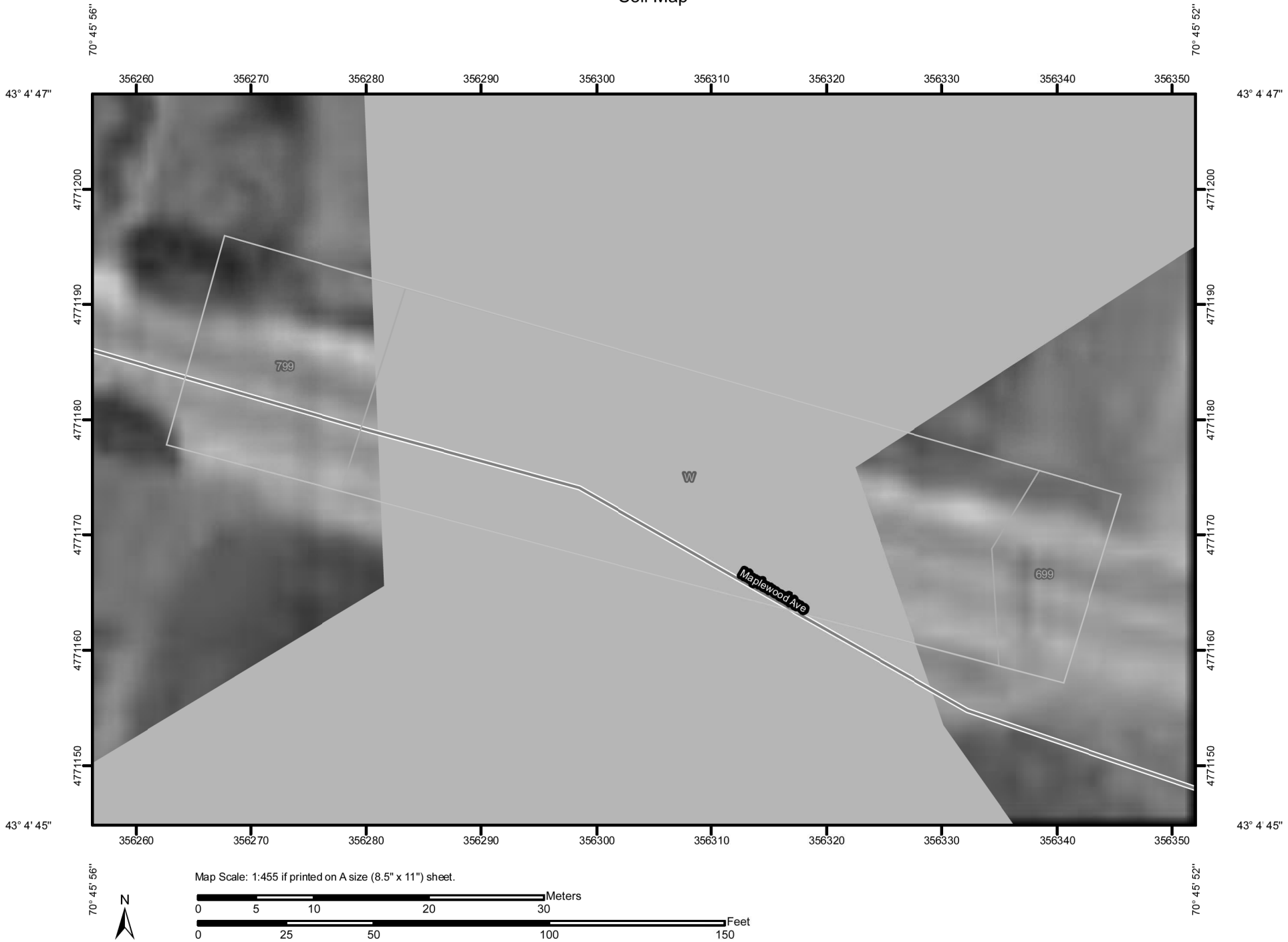
PHOTO 1 Overall view of culvert and wall looking north. Taken 10-21-09 by D. Mellor

PHOTO 2 Southeastern section of wall looking northeast. Taken 10-14-09 by D. Mellor

PHOTO 3 Wall and culvert looking southwest, note abandoned sewer line to be removed. Taken 10-14-09 by D. Mellor


Proposed Grade
Present Grade
Shop
Top of Sill
Fill 1'
Fill 0.8'
Proposed Grade
Present Gates
Fill 1.4
Proposed Grade
Present Grade
ELEVATION OF PRESENT BRIDGE
Shop
Fence of Iron Pipe
Moses' Sea Wall
Gate Open
Gate Closed
Bottom of Pond
Bottom of Wall
ELEVATION OF PROPOSED BRIDGE
6'
Walk
Exp
SECTION OF FENCE
Wharf
End of New Wall
TIDE FLOWS UNDER
Old, Goodrich Tannery
House
Present St. Line
6'8"
111.6
48'
28'
10.7'
B
A
Proposed Line for Wall
142
Present Line
To the Harbor
Low Water
End of New Wall
High Water
RAINES
Present Line
Present Line
Proposed Stone Arch
46.5
35'
Old Pier
Old Pier
Old Pier
MAPLEWOOD
AVENUE
45
To the City
47.1
38.3
Present Gate
84.5
28'
188.7
House
Shop
TRAFTON
End of New Wall
High Water
FENDER
Proposed Gates
FENDER
Low Water
Low Water
End of New Wall
Sea Wall
MOSES
NORTH MILL POND
These Gates and fenders are abated from the plans and specifications for doing the proposed work of alterations by Messrs. Snyder Bros. under their contract with the City of Portsmouth.
Wm Hopkins
Charles E. Hodgdon
PLAN OF
MAPLEWOOD AVENUE BRIDGE
AT PORTSMOUTH, N.H.
OVER THE
NORTH MILL POND.
SCALE 1"=20'
By Charles A. Putnam, C.E. Salem, Mass.
July, 1896.
Cap
2.5'
Batter 1" to foot
Abort 19 FEET
9'
SECTION OF WALL AT A·B·
SCALE 1"=8'
CAPPING
Spring Line
14'
Radius = 15.5
6'
8.9'
Abt. 12'
HALF SECTION OF ARCH
Scale 1"=8'

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:455 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 11, Oct 27, 2009

Date(s) aerial images were photographed: 8/24/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Rockingham County, New Hampshire (NH015)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
699	Urban land	0.0	9.4%
799	Urban land-Canton complex, 3 to 15 percent slopes	0.1	20.5%
W	Water	0.3	70.0%
Totals for Area of Interest		**0.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If

intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Rockingham County, New Hampshire

699—Urban land

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent

Minor Components

Not named

Percent of map unit: 15 percent

799—Urban land-Canton complex, 3 to 15 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 42 to 46 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 120 to 160 days

Map Unit Composition

Urban land: 55 percent
Canton and similar soils: 20 percent
Minor components: 25 percent

Description of Canton

Setting

Parent material: Till

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Land capability (nonirrigated): 2e

Typical profile

0 to 2 inches: Gravelly fine sandy loam
2 to 22 inches: Gravelly fine sandy loam
21 to 60 inches: Loamy sand

Minor Components

Udorthents

Percent of map unit: 5 percent

Boxford and eldridge
Percent of map unit: 4 percent

Chatfield
Percent of map unit: 4 percent

Scituate and newfields
Percent of map unit: 4 percent

Squamscott and scitico
Percent of map unit: 4 percent
Landform: Marine terraces

Walpole
Percent of map unit: 4 percent
Landform: Depressions

W—Water

Map Unit Setting
Elevation: 200 to 2,610 feet

Map Unit Composition
Water: 100 percent

RECEIVED NOV 09 2009

Please mail the completed form and required material to:

New Hampshire Division of Historical Resources
State Historic Preservation Office
Attention: Review & Compliance
19 Pillsbury Street, Concord, NH 03301-3570

DHR Use Only
R&C # 1457
Log In Date ___/___/___
Response Date ___/___/___
Sent Date ___/___/___

Request for Project Review by the New Hampshire Division of Historical Resources

☐ This Project is funded by the American Recovery and Reinvestment Act of 2009

X This is a new submittal ☐ This is additional information relating to DHR Review #:_____

GENERAL PROJECT INFORMATION

Project Title Maplewood Ave Culvert Replacement and North Mill Pond Restoration

Project Location Maplewood Avenue, Portsmouth, New Hampshire

Tax Map & Lot # _____N/A_____

NH State Plane Geographic Coordinates: Easting_1225050 Northing_212550 (project surveyor) WGS84 Datum
(see RPR Manual and R&C FAQ's for help accessing this data)

Lead Federal Agency
(Agency providing funds, licenses, or permits) __ Army Corp SPGP _____

Permit or Job Reference #_____ None yet _____

State Agency and Contact (if applicable) __ DES Wetlands Bureau
Permit or Job Reference #_____ None yet _____

APPLICANT INFORMATION

Applicant Name _ City of Portsmouth, Public Works Phone Number__(603) 766-1421

Street Address 680 Peverly Hill Road
City _ Portsmouth State_NH____ Zip_03801____ Email DSAllen@PW.cityofportsmouth.com

CONTACT PERSON TO RECEIVE RESPONSE

Name/Company Duncan Mellor, PE, Waterfront Engineers LLC Phone Number__603-772-3706

Street Address 3 Linda Lane
City Stratham State_NH Zip__03885 Email __dmellor@waterfrontengineers.com

Please refer to the Request for Project Review manual for direction on completing this form. Submit one copy of this project review form for each project for which review is requested. ✓ Include a self-addressed stamped envelope to expedite review response. Project submissions will not be accepted via facsimile or e-mail. This form is required. Review request form must be complete for review to begin. Incomplete forms will be sent back to the applicant without comment. Please be aware that this form may only initiate consultation. For some projects, the Division of Historical Resources (DHR) may require additional information to complete our review. All items and supporting documentation submitted with a review request, including photographs and publications, must be retained by the DHR as part of its review records. Items to be kept confidential should be clearly identified. For questions regarding the DHR review process, please visit our website at: http://www.nh.gov/nhdhr/review or contact the R&C Specialist at 603.271.3558.

PROJECT BOUNDARIES AND DESCRIPTION

PROJECTS CANNOT BE PROCESSED WITHOUT THIS INFORMATION

REQUIRED

X Attach the relevant portion of a 7.5' USGS Map (photocopied or computer-generated) ***indicating the defined project boundary.***

X Attach a detailed written description of the proposed project. Include: (1) a narrative description of the proposed project; (2) site plan; (3) photos and description of the proposed work if the project involves rehabilitation, demolition, additions, or alterations to existing buildings or structures; and (4) a photocopy of the relevant portion of a soils map (if accessible) for ground-disturbing projects.

Architecture

Are there any buildings or structures within the project area? X Yes ☐ No work is replacement of culvert and stone seawall reconstruction

If yes, submit all of the following information:

Approximate age(s): Walls last rebuilt circa 1896. See attached drawing

☐ Photographs of ***each*** building located within the project area along with a photo key. Include streetscape images if applicable. (Digital photographs are accepted. All photographs must be clear, crisp and focused)

☐ DHR file review conducted on _____/_____/_____

Please note that as part of the review process, the DHR may request an architectural survey or other additional information.

Archaeology

Does the proposed undertaking involve ground-disturbing activity? X Yes ☐ No

If yes, submit all of the following information:

X Project specific map and/or preliminary site plan that fully describes the project boundaries and areas of proposed excavation.

X Description of current and previous land use and disturbances.

X Any available information concerning known or suspected archaeological resources within the project area.

Please note that as part of the review process, the DHR may request an archaeological survey or other additional information.

DHR COMMENT *This Space for Division of Historical Resources Use Only*

☐ No Potential to cause Effects ☒ Additional information is needed in order to complete our review

☐ No Adverse Effect ☐ No Historic Properties Affected ☐ Adverse Effect

Comments: Complete Inventory Form for the culvert. Consultant list available at www.nh.gov/nhdhr.

If plans change or resources are discovered in the course of this project, you must contact the Division of Historical Resources as required by federal law and regulation.

Authorized Signature: Nadine Peterson 271-6628 Date: 11/10/09

U.S. Department of Homeland Security

United States Coast Guard

Commander
First Coast Guard District

One South Street
Battery Park Building
New York, NY 10004-1466
Staff Symbol: dpb
Phone: (212) 668-7165
Fax: (212) 668-7967

16211/NV-765
North Mill Pond/NH//

December 8, 2009

Mr. Duncan Mellor, PE
Waterfront Engineers LLC
3 Linda Lane
Stratham, NH 03885

Re: Maplewood Ave Culvert Replacement over North Mill Pond

Dear Mr. Mellor:

This is in response to your letter dated December 1, 2009 asking whether the Coast Guard will require a permit for the referenced bridge project. We have examined the North Mill Pond with regard to its status as a navigable water of the United States for purposes of Coast Guard bridge jurisdiction.

Our examination indicates that there is factual support for concluding that the waterway at the project location is a navigable water of the United States for purposes of general Coast Guard jurisdiction. However, the North Mill Pond at the bridge location has been designated an Advance Approval waterway pursuant to Title 33 CFR 115.70 obviating the need for a formal Coast Guard bridge permit.

Future bridge projects along the same waterway will have to be independently evaluated before they may be considered for Advance Approval. Also, this Advance Approval determination is valid for five years from the date of this letter and if construction does not commence within this time period, you must contact this office for reaffirmation of this authorization. Our approval also does not relieve the applicant of the responsibility to ensure compliance with any applicable federal, state or local requirement for the proposed action.

Although this project will not require a bridge permit other areas of Coast Guard jurisdiction apply. The following stipulations must be met:

a. The lowest portion of the superstructure of the bridges across the waterways should clear the 100-year flood height elevation, if feasible.

b. The requirement to display permanent navigation lights at these bridges is waived. This waiver may be rescinded at anytime in the future should nighttime navigation through either bridge be increased to a level determined by the District Commander to warrant lighting (generally four or more passages per week between the hours of sunset and sunrise).

c. Upon completion of construction, the bridge owner shall submit "as built" drawings showing clearances through the bridge and sufficient data to permit this office to prepare a completion report. This report is used for Coast Guard and other mariner publications.

d. Any spillage of oil or oil-based products during construction must be promptly reported to the Coast Guard by calling 1-800-424-8802.

If you have any questions, please feel free to contact me at the above telephone number.

Sincerely,

Gary Kassof
Bridge Program Manager
First Coast Guard District
By direction of the District Commander

STANDARD DREDGE AND FILL APPLICATION

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
WETLANDS BUREAU

Maplewood Avenue Culvert Replacement and North Mill Pond Restoration

Portsmouth, New Hampshire

December 23, 2009

Prepared For

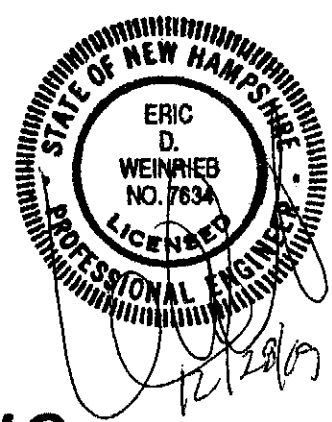
City of Portsmouth
Department of Public Works
680 Peverly Hill Road
Portsmouth, New Hampshire 03801

Prepared By

Waterfront Engineers LLC
3 Linda Lane
Stratham, New Hampshire 03885

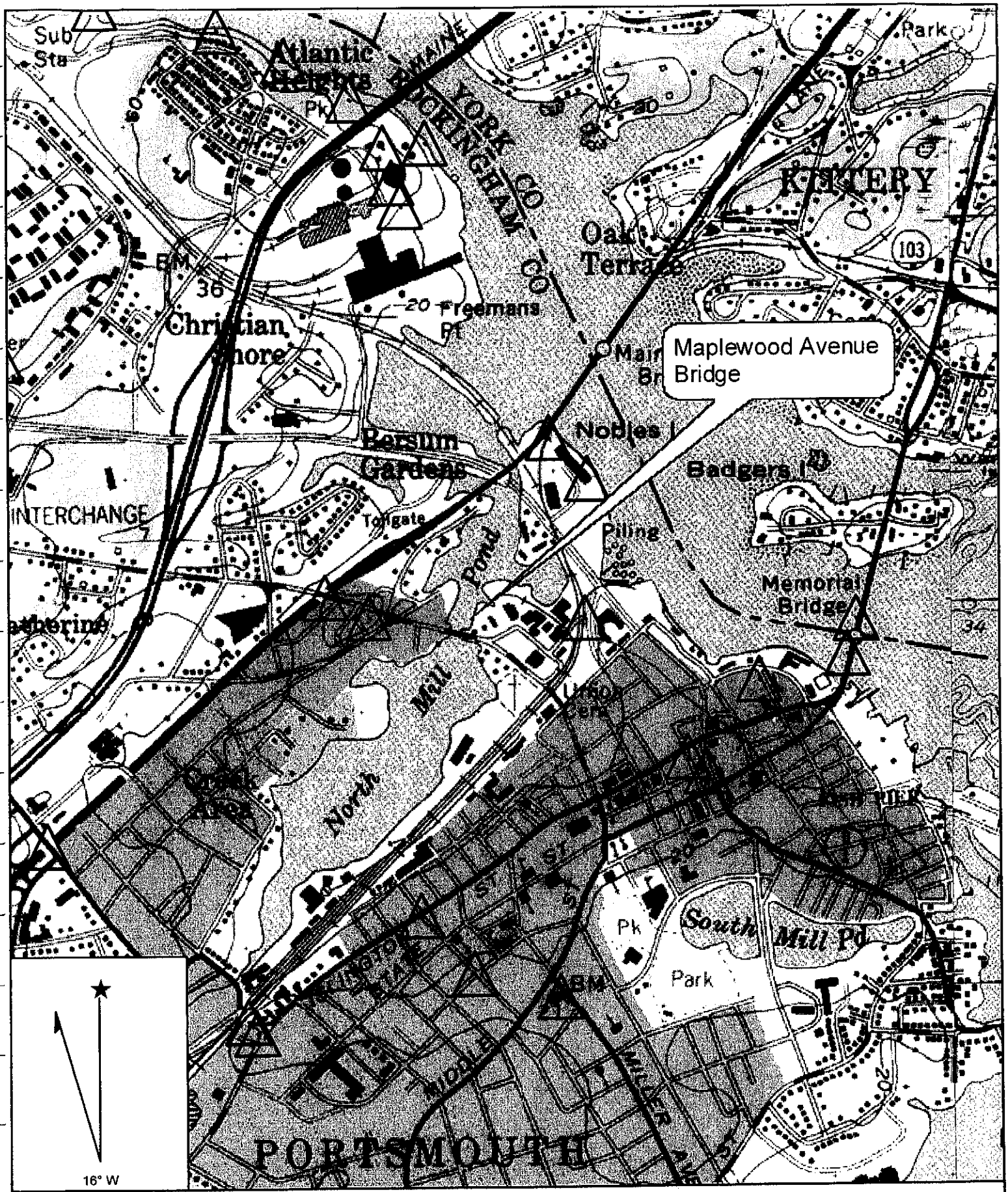
In association with:
Altus Engineering, Inc.
133 Court Street
Portsmouth, New Hampshire 03801

Haight Engineering, PLLC
181 Watson Road
Dover, New Hampshire 03820



Maplewood Ave Culvert Replacement and North Mill Pond Restoration, Portsmouth, New Hampshire

TABLE OF CONTENTS



Name: PORTSMOUTH
Date: 10/30/2009
Scale: 1 inch equals 1000 feet

Location: 043° 04' 49.60" N 070° 45' 51.30" W
Caption: Maplewood Avenue Bridge Reconstruction project

Copyright (C) 2002, Maptech, Inc.

DEPARTMENT OF ENVIRONMENTAL SERVICES
WETLANDS BUREAU
29 Hazen Drive, PO Box 95
Concord, NH 03302-0095
Phone: (603) 271-2147 Fax: (603) 271-6588
Website: www.des.nh.gov/wetlands Email: wetmail@des.nh.gov

Standard Dredge and Fill Application Form

The Standard Dredge and Fill application package to be submitted to DES consists of:

1. Application form (this document).
2. Checklist(s) with required information attached. ("Checklist for Submission of your Standard Dredge and Fill Application," and if appropriate, "Compensatory Mitigation Information and Checklist").

Type or print clearly -- missing information may result in your application review being delayed if it is considered administratively incomplete. If you are completing this as a Word version on your computer, use your **tab key** to move through the document to enter data in the appropriate areas.

If you have questions about any terms used, check the Definitions section of the Instructions.

1.	Name of Landowner* (last, first, middle initial)	Owner daytime phone number	Owner fax number	Owner email
	CITY OF PORTSMOUTH	(603) 766-1421	(603) 427-1539	DSAllen@PW.cityofportsmouth.com

* If there are multiple landowners, please attach a separate page with the names of all landowners, and documentation as to the one person who represents the interests of the entire group.

Landowner (permanent) mailing address or PO Box	Town/City (owner mailing address)	State	Zip code
1 JUNKINS AVENUE	PORTSMOUTH	NH	03801

2.	Name of Applicant, if not the landowner	Applicant phone number	Applicant fax number	Applicant email
	SAME	( )	( )	
	Applicant street address	Applicant town/city	State	Zip code

3.	Company and Name of Agent	Agent phone number	Agent fax number	Agent email
	WATERFRONT ENGINEERING, LLC	(603) 772-3706	( )	dmellor@waterfrontengineers.com

Agent Street mailing address or PO Box	Town/City (agent mailing address)	State	Zip code
3 Linda Lane	Stratham	NH	03885

4.	Location(s) of the proposed work (fill in below)						
	Maplewood Avenue right-of-way as it crosses North Mill Pond in Portsmouth						
	Street address(es) or nearest intersection(s)	between 203 and 230 Maplewood Avenue					
	Town/City	Portsmouth	Tax map	123	Block	n/a	Lot number(s)	n/a

5.	For projects classified as minor or major impact, are there any vernal pools located on the subject property? If "Yes," identify and label the location(s) of vernal pool(s) on the project plans.	Circle one: No

6.	Based on information obtained from the Natural Heritage Bureau (NHB), are there any state or federal threatened or endangered species or exemplary natural communities on the subject property? Provide the NHB file number: **NHB09-2253** and attach the documentation (letter/memo & map) Natural Heritage information can be obtained at www.nhnaturalheritage.org. Click on "Services" for links to: 1) the DataCheck web tool, or 2) a hard copy form to obtain the required letter and map from NHB. If you do not have Internet access, you may contact NHB directly at (603) 271-2215 x 323 for information about obtaining the required documentation.	**Circle one:** **No**
7.	If there are any state or federal threatened or endangered species or exemplary natural communities located on the subject property, please provide a letter from NHB stating that the applicant has consulted with NHB. The letter should indicate either there is no impact, or include NHB guidelines for preventing or mitigating impacts.	

8. Jurisdictional areas(s) where work is proposed; check box(es) below. Check the definitions in the instructions for additional information. ***(If your resource type is not listed, contact DES for guidance):***

Nontidal wetland: swamp, wet meadow, etc.		Bank of surface water body	X	Intermittent (seasonal) stream		Name of water body from USGS topographic map: **North Mill Pond**	
Vernal pool		Lake or pond		Perennial stream or river		Tributary to: Piscataqua River	
Upland tidal buffer zone	X	Sand dune		Tidal wetland		Prime Wetland Buffer (within 100 feet of prime wetland)	
Freshwater marsh		Bog/fen (peatland)		Atlantic Ocean		Municipally designated prime wetland	

9.	**Provide a brief description** of all proposed work including: 1) the **size of the impact area** (square feet) in the resource, 2) the size (in acres) of the entire parcel(s), and 3) the compensatory mitigation proposed, if applicable, per Env-Wt 302.03(c). Attach a separate page if you are not completing this using a computer. **SEE ATTACHED**	
10.	Does the project require compensatory mitigation to offset unavoidable impacts to wetlands? If **Yes**, attach a copy of the completed **Mitigation Checklist.**	**No**
11.	Have you requested a waiver of any wetland rules per Env-Wt 204? If **Yes**, attach your waiver request to this application.	**No**
12.	Is there any DES emergency authorization associated with this property? Are you aware of any DES enforcement issues related to this property? If **Yes**, provide the file number(s): _____	**No**
13.	Explain why it is necessary to impact a wetland or other jurisdictional area to construct your project. **SEE ATTACHED**	

14.	Explain why your project design proposes less environmental impact on areas in DES Wetlands jurisdiction than other alternatives. What other alternatives were considered? (Attach a separate page if you are not completing this expandable box on a computer) **SEE ATTACHED**

15. Amount of Impact Proposed By Jurisdictional Area

Indicate whether **permanent** or **temporary** impacts. This information is necessary to calculate the fee and classify your project. Leave box blank if not applicable to your proposed project.

Jurisdictional area	Impact Type (indicate whether temporary or permanent)			
	Dredge	**Fill**	**Structure**	**Total**
Wetlands				0 sq. ft.
Impacts to very poorly drained soils (only required for pond construction)				0 sq. ft.
Prime wetland				0 sq. ft.
Vernal pool				0 sq. ft.
Prime Wetland Buffer (within 100 feet of designated prime wetland)				0 sq. ft.
Stream or River				sq. ft.
Bank of stream or river				8,656 sq. ft.
Bed of perennial stream				linear feet
				sq. ft.
Thread of Intermittent Stream				linear feet
Bank of Lake (for beach construction & replenishment, bank stabilization)				
Shoreline (see following page for how to calculate this average length)				0 linear feet
Dredge/fill within bank				0 sq. ft.
Dredge/fill within bank				0 cubic yards
Lake or Pond (below full lake elevation) Impacts for docks and structures listed in item 15 are entered below.				
Shoreline subject to impacts				0 linear feet
				0 sq. feet
Dredge or fill of lakebed				0 cubic yards
				0 sq. ft.
Sand dune				0 sq. ft.
Tidal wetland				sq. ft.
Upland tidal buffer zone				23,615 sq. ft.
Developed (choose one or both, as appropriate)				19,881 sq. ft.

16. Calculate and provide length of shoreline frontage.
Shoreline frontage is the average of two distances, 1) the actual natural navigable shoreline footage, and 2) a straight line drawn between property lines, both of which are measured at the normal high water line.

(a) Pin to pin distance (linear feet)	(b) Actual natural navigable shoreline (from pin to pin)	(a) + (b) = 2	Shoreline frontage (linear feet)

17. Enter the information below if you are proposing any **docking structures.** Your plans must show proposed and existing docking structures.

Docking structures (proposed)	Square Feet
Surface area of all **permanent** structures:	
Surface area of all **seasonal** structures:	

18. Other DES Permitting Requirements

YES Have you addressed requirements of Comprehensive Shoreland Protection Act (CSPA), RSA 483-B?
If your property is in the "protected shoreland" -- the area that is within 250 feet of a fourth order stream, a designated river, a lake or pond 10 acres or greater in size (on the DES *Official List of Public Waters)*, or tidal water, you will need to comply with the requirements of the Comprehensive Shoreland Protection Act (CSPA).

What is considered "protected shoreland"? To determine if your property is located in "protected shoreland," go to www.des.nh.gov/cspa or the following websites:

- A "fourth order" or larger stream or river (www.des.nh.gov/cspa).
- Any river or river segment designated as protected under the N.H. Designated Rivers Program, RSA 483 (www.des.nh.gov/rivers/).
- Public waters (www.des.nh.gov/Dam/)
- Tidal waters.

As of July 1, 2008, projects that involve construction, excavation, or filling within the protected shoreland, require a DES Shoreland Permit, unless the work is specifically permitted under a Wetlands Permit, OR exempted under Rule Env-Wq 1406.03 or Env-Wq 1406.04 (see des.nh.gov/rules/desadmin_list.htm#env-wq1400), and a DES Alteration of Terrain permit 50,000 square feet if any part of disturbance is within the protected shoreland. For more information: www.des.nh.gov/AOT/ and RSA 485-A:17.

NO Does this project require a DES Alteration of Terrain (AoT) permit? If yes, does this application and the other application reflect the same project area in its entirety?
Date of submittal to DES: _____
DES AoT File number: _____

NO Does this project require a DES Subdivision or Subsurface Disposal System permit(s)? If yes, does this application and the other application reflect the same project area in its entirety?
Date of Subsurface/Subdivision application submittal to DES: _____
DES Subsurface/Subdivision File number: _____

19. In accordance with RSA 482-A:3, XIV (b), I, **CITY OF PORTSMOUTH, NH**, hereby authorize DES to communicate all matters relative to this application electronically with the individual identified below at the email address identified below. I agree to send an electronic return/read receipt of all emails sent by the department and understand that the department will do the same. I also agree that DES will be notified immediately of any change in the email address identified below. Please note that DES limits the size of documents that can be received or stored electronically. Any submittals that have a file size over 5 MB must be provided in hard copy.

(Check one box only and supply email address)

☐ Landowner email: _____ ☐ Applicant email: _____

✔ Agent email: dmellor@waterfrontengineers.com

20. FILING FEE: A check or money order payable to the NH DES Wetlands Bureau must accompany this application. The minimum fee is $200. Minor and major impact projects are charged at the rate of: $0.20 per square foot of requested impact (if less than 1,000 square feet of impact is proposed, the minimum fee of $200 applies). All applications for shoreline structures shall include a base fee of $200. In addition, minor and major impact shoreline projects shall include fees charged at the rate of: $0.20 per square foot for requested dredge or fill impacts; $1 per square foot for requested seasonal docking structure; and $2 per square foot for requested permanent docking structure. The application will be considered administratively incomplete until the required fee is paid in full. **Attach the appropriate fee calculation worksheet(s).**

21. APPLICANT SIGNATURE. By signing this application, I am certifying that:

1) All abutters have been identified in accordance with the definition given in the instructions and I or my agent have/has sent notices to those abutters by Certified Mail.
2) I have read and provided the required information outlined in Env-Wt 302.04 and listed on the "Checklist for Submission of Your Standard Dredge and Fill Application," dated June 2008.
3) I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative.
4) I have reviewed the information being submitted and that to my knowledge the information is true and accurate.
5) I have submitted a copy of the application materials to the NH State Historic Preservation Officer.
6) Authorize the municipal conservation commission to inspect the site of the proposed project.
7) I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action.

	Peter Rice	12/23/09
Signature of applicant(s)	**Print applicant's name(s)**	**Date**
Signature of authorized agent (if applicable)	**Print agent name**	**Date**

22. TOWN CLERK SIGNATURE: I hereby certify that the applicant has filed five sets of all materials with the town/city of _____ as required by Chapter 482-A:3, and I have received and retained certified postal receipts (or copies) for all abutters identified by the applicant. Upon signing the application below, I will forward immediately by certified mail to the DES the original application materials, including the filing fee, and distribute the three copies to each of the following: the local governing body, the municipal planning board, if any, and the municipal conservation commission, if any. Town clerk retains one copy.

Signature of town/city clerk	**Date**

For DES Office Use Only:

Fee received (amount): _____ DES File # _____ Name on check: _____

_____ _____ _____ _____ _____

date of check date check received check# amount initials

Additional check: Date of check:_____ Date check received:_____ Check number:_____ Check amount:_____

The U.S. Army Corps of Engineers has reissued its New Hampshire Programmatic General Permit (PGP) effective June 28, 2007. The Corps is requiring the submission of a new Corps Secondary Impacts Checklist to be submitted with the DES wetland application. The Corps will review this information to assess direct, indirect (secondary impacts) and cumulative impacts. The Corps **Secondary Impacts Checklist,** Appendix B to the New Hampshire PGP, is attached to this DES wetland application. The PGP does not impose any obligation on DES to assess secondary impacts that does not already exist in state law.

PROJECT NARRATIVE:

The project involves replacement of a failing arch culvert and adjacent historic granite seawalls along Maplewood Avenue where it crosses North Mill Pond (tidal) within the Piscataqua River Estuary in Portsmouth (see Sheet 1 Vicinity Map). Since this work involves disassembly and reconstruction of the adjacent seawalls, it is proposed that the single barrel arch culvert, which restricts tidal flow, will be replaced with a three barrel arch culvert with significantly higher flow capacity. There is historical basis for the multiple culvert openings as the causeway had five tidal flow openings prior to its reconstruction in 1896.

The proposed work is summarized on the attached figures, the following project description and attached permit supplement. This project is funded under a NH DES Coastal Program/ NOAA tidal restoration grant.

PROJECT DESCRIPTION:

The project involves replacement of a failing arch culvert and adjacent seawalls along Maplewood Avenue where it crosses North Mill Pond (tidal) within the Piscataqua River Estuary in Portsmouth (see Sheet 1 Vicinity Map). Since this work involves disassembly and reconstruction of the adjacent seawalls, it is proposed that the single barrel arch culvert, which restricts tidal flow, will be replaced with a three barrel arch culvert (one 28 ft wide; two 20 ft wide) with significantly higher flow capacity.

The seawalls are being replaced in the same location as the existing walls and will be rebuilt using the existing exterior historical stone. The short section of wall at the southeast portion of the project area will be rebuilt approximately 3 feet farther offshore than the existing location in order to allow standard sidewalk widths. It is proposed that fallen cut granite block stones at the toe of the walls in the intertidal zone and water will be retrieved for reuse, including two granite blocks partially embedded in mortar and blocking low tide flow at the south end of the culvert. The wall and culvert replacements will require replacement of the sidewalks and road pavement along the work area and temporary utility relocation during construction.

The existing failing walls are owned by the City and consist of stone range masonry construction with a concrete cap and sidewalks. The walls range from about 4 to 18 feet high. The north elevation of the existing wall, on both sides of the culvert, has abandoned sewer pipelines penetrating the wall at a shallow angle with old poor quality brickwork around the pipes. These abandoned pipes and brickwork will be removed and replaced with the historical granite exterior. Since soil test borings indicate varied depths to bedrock, it is expected that the wall and culvert footings will be supported on buried foundation piles (see permit drawings).

On the south central project area of shoreline, the existing stone riprap is unraveled and appears to have slid down the slope, exposing the soils to erosion near high water level. In this area the existing stone riprap will be rebuilt, incorporating larger toe and armor stone over a graded stone base with a geotextile filter layer. The upper portion of slope above the reach of the tide will be planted with a conservation seed mix.

The existing sewer main pipe (gravity sewer) passes through the present arch culvert, partially blocking water flow at high tide and restricting small boat access. It is proposed that the sewer main will be moved down using an inverted siphon design and will be buried outside the culverts along the toe of the wall in order to make it accessible for repair and replacement in the future. The installation of the sewer inverted siphon will cause temporary resource area impacts, but is self-mitigating due to the tidal flow restoration and small boat access improvement. Where the sewer main crosses the bank, the existing riprap will be removed and then reinstalled, and existing concrete will be removed and replaced with stone riprap.

ANTICIPATED CONSTRUCTION SEQUENCE:

It is anticipated that the walls and culverts will be primarily rebuilt from the landside; however sewer inverted siphon installation and culvert footing work will likely occur in the water at low tides. Excavation for the wall footings will be performed in the dry at low tide water levels with silt fence erosion controls in place when ever feasible, however the low elevation of the culvert footings and sewer crossing will require work in the wet in the lower tidal zone.

The sewer inverted siphon would likely be installed first, then the culvert and wall footings. The culvert footings will be in the tidal flow and will extend below water level. The base and back side of the excavation will be stabilized with crushed stone/riprap and the piles and concrete footing will be placed. Next the precast concrete culvert sections would be installed, then the stone walls with concrete backing, and installation of associated slopes and stone riprap. At street level, the sidewalks will be replaced, including utility reinstallation, railings, granite curbs, catch basins and repaving. Last the erosion and turbidity controls will be removed.

PROJECT IMPACTS AND MITIGATION:

This project is receiving funding under a NH DES Coastal Program/ NOAA tidal restoration grant with the intent to reduce the tidal constriction at the Maplewood Avenue crossing, improving tidal flow with additional culverts and improving small boat access by rerouting the existing sewer main. Archive research has also shown that the

Maplewood Avenue crossing is a historical stone structure which originally had multiple culverts, thus the proposed reconstruction will utilize three culverts and reuse the existing granite to maintain the historical context, while providing improved tidal flow and small boat access to North Mill Pond.

Relocation of the southeast section of seawall three feet offshore will permanently impact approximately 200 SF of non-vegetated muddy gravel intertidal zone. This is offset by a significant increase in intertidal/subtidal area resulting from historic fill removal in and around the widened culverts. The existing natural bottom culvert has an area of 1,025 SF. The new culvert layout will provide 3,100 SF of natural bottom, resulting in a net increase of 2,075 SF of natural bottom intertidal/subtidal area. Following a site visit in 2009, the UNH Jackson Lab staff commented that the existing culvert natural bottom is a rare and productive tidal rapid habitat with pronounced benthic communities rich in diversity and high in biomass. The regrading of the adjacent fill slopes just east of the new culverts will also remove historic fill and create additional high flow tidal rapid intertidal area.

The project will provide a direct net gain of high value intertidal and subtidal area at Maplewood Avenue while also providing improved tidal water exchange in North Mill Pond, expected to improve water quality and North Mill Pond habitats, estimated at 47 acres by the UNH Jackson Lab.

SUPPLEMENTAL INFORMATION:

Wt 302.03 Avoidance and Minimization:

This project has been designed to avoid resource areas and minimize adverse impacts and is receiving funding under a NH DES Coastal Program/ NOAA tidal restoration grant with the intent to reduce the tidal constriction at the Maplewood Avenue crossing, improving tidal flow with additional culverts and improving small boat access by rerouting the existing sewer main. The walls will primarily be replaced in the present locations, avoiding or minimizing impacts to the adjacent resource areas, using the existing durable granite with a concrete foundation and backing, for a longer life cycle. The existing arch culvert will be replaced with a three barrel arch culvert with significantly higher flow capacity.

Archive research has also shown that the Maplewood Avenue crossing is a historical stone structure which originally had multiple culverts, thus the proposed reconstruction will utilize three culverts and reuse the existing granite to maintain the historical context, while providing improved tidal flow and small boat access to North Mill Pond.

Relocation of the southeast section of seawall three feet offshore will permanently impact approximately 200 SF of non-vegetated muddy gravel intertidal zone. This is offset by a significant increase in intertidal/subtidal area resulting from historic fill removal in and around the widened culverts. The existing natural bottom culvert has an area of 1,025 SF. The new culvert layout will provide 3,100 SF of natural bottom, resulting in a net increase of 2,075 SF of natural bottom intertidal/subtidal area. Following a site visit in 2009, the UNH Jackson Lab staff commented that the existing culvert natural bottom is a rare and productive tidal rapid habitat with pronounced benthic communities rich in diversity and high in biomass. The regrading of the adjacent fill slopes just east of the new culverts will also remove historic fill and create additional high flow tidal rapid intertidal area.

The project will provide a direct net gain of high value intertidal and subtidal area at Maplewood Avenue while also providing improved tidal water exchange in North Mill Pond, expected to improve water quality and North Mill Pond habitats, estimated at 47 acres by the UNH Jackson Lab.

Replacement of the seawall will be performed in a controlled manner, with silt fence erosion control measures in place where feasible. Due to the strong tidal current at this site, a turbidity curtain to enclose the work area is not feasible. The work will be performed above water level to the extent possible by working portions of the wall and slope exposed above tide level.

Wt 302.04(a) Responses:

1) *The need for the proposed impact:*

The existing seawalls and culvert are in poor condition and are unstable. The seawalls support a public road which is a primary entry and egress route for the City and buried utilities causing environmental and safety concerns if the walls or culvert should fail.

2) The alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site:

This project has been designed to avoid resource areas and minimize adverse impacts. The wall will be replaced in the present location, avoiding impacts to the adjacent resource areas. It is also proposed that the wall will be rebuilt with durable granite stone with a concrete foundation and backing, for a longer life cycle and with materials that are environmentally friendly.

Stone riprap slopes would be an alternative to the existing walls, however riprap slopes would result in significant fill of intertidal areas and may not be approvable by the New Hampshire Division of Historical Resources.

A long span or trestle bridge also would be an alternative to the existing walls, however the existing walls and culvert are historical (rebuilt in 1896) and likely would not be approved by the New Hampshire Division of Historical Resources.

3) *The type/classification of the wetlands involved:*

No tidal wetlands impacted. The project does involve tidal surface waters and the tidal buffer zone. See the attached wetlands report for more details.

4) *The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters:*

The site is the shoreline of the tidal Piscataqua River in an historical urban area and the intertidal beach is not pristine as it contains urban debris including broken glass, pavement fragments, brick, etc. The shoreline area is similar to adjacent shoreline areas. There are no tidal wetlands being impacted.

5) *The rarity of the wetlands, surface water, sand dunes, or tidal buffer zone area:*

The shoreline area is not rare and is a typical developed high density urban area, and the site is characteristic of the adjacent developed shoreline banks. There are no wetlands or sand dunes and the tidal buffer consists of a City street, urban fill and buildings. The intertidal beach is not pristine as it contains urban debris including broken glass, pavement fragments, brick, etc. The natural bottom of the

culvert is reported by the UNH Jackson Lab to be rare tidal rapid habitat (man-made) and this project proposes to significantly increase the area of the tidal rapid with the additional culverts.

6) *The surface area of wetlands that will be impacted:*
No wetland impacts.

7) *The impact on plants, fish and wildlife:*
The NHB review did not find any potential impacts that might be caused by this project.

8) *The impact of the proposed project on public commerce, navigation and recreation:*
The proposed project will have no adverse impact on public commerce, navigation or recreation. The proposed culvert reconstruction will improve public safety, navigation and recreation.

9) *The extent to which a project interferes with the aesthetic interests of the general public:*
The proposed wall and culvert reconstruction will reuse the existing granite blocks and will be aesthetically pleasing and in keeping with the historical city.

10) *The extent to which a project interferes with or obstructs public rights of passage or access:*
None. The proposed wall and culvert reconstruction includes improved sidewalks, bike lanes and reduces navigational restrictions.

11) *The impact upon abutting owners pursuant to RSA 482-A:11,II:*
The project does not propose any significant change in the exiting use or appearance of this site. There will be some temporary equipment noise associated with the construction while the walls and culverts are replaced, however this site is in an urban area and along city streets and work will primarily occur during normal work hours.

12) *The benefit of a project to the health, safety, and well being of the general public:*
The project will benefit the general public in that it will improve public safety and prevent possible road collapse and possible impacts to utilities and water quality than might result from wall or culvert collapse. The tidal flow improvements are expected to improve water quality, habitat value and recreational opportunities in North Mill Pond.

13) *The impact of the proposed project on quantity or quality of surface and ground water:*
The proposed project will not adversely impact the surface, bay or groundwater

flow and the project will benefit surface water quality and tidal habitats.

14) *The potential of a proposed project to cause or increase flooding, erosion or sedimentation:*

This project will not cause an increase in flooding, erosion or sedimentation. The wall location matches existing conditions and best management practices will be taken during construction to reduce any potential erosion or sedimentation.

15) *The extent to which a project that is located in surface waters reflect or redirects current or wave energy which might cause damage or hazards*:

The wall location matches existing conditions and this is a sheltered location and wave conditions will be infrequent. The tidal currents will not be redirected.

16) *The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights:*

This wall is an existing historical use which affects a very small portion of the river frontage. Similar structures are located all along the Portsmouth shoreline. The abutters have similar seawall shorelines. This project will have a significant net benefit to the wetland complex of North Mill Pond.

17) *The impact of the proposed project on the values and functions of the total wetland or wetland complex:*

This wall is an existing use which will not adversely impact the values and functions of the total wetland complex. There are no wetlands being adversely impacted. This project will have a significant net benefit to the wetland complex of North Mill Pond.

18) *The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks or sites eligible for such publication:*

The proposed project was submitted to the NH Division of Historical Resources for section 106 review.

19) *The impact upon the value of areas named in acts of congress or presidential proclamations as national bays, national wilderness areas, national lakeshores and such areas may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries:*

Not applicable.

20) *The degree to which a project redirects water from one watershed to another:*

This project does not redirect any water from on watershed to another.

Wt 302.04(c) Responses:

1) *The extent to which a project impacts beach or tidal flat sediment replenishment and movement of sediments along a shore:*

The project is replacement of existing walls and a culvert and it will not significantly change beach or tidal flat sediment replenishment or movement along this low energy shoreline.

2) *The impact on a tidal wetland's ability to dissipate wave energy and storm surge:*

The wall location matches existing conditions and this is a sheltered location and wave conditions will be infrequent.

3) *The impact of project runoff on salinity levels in tidal environments:*

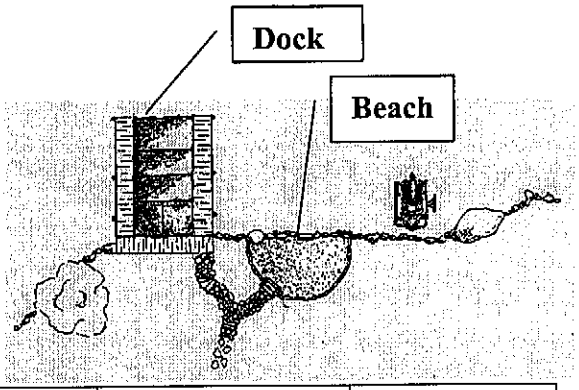
This project does not change existing runoff and salinity conditions.

Wt 304.04 Setback from Property Lines Response:

This is a reconstruction of an existing shoreline structure and the direct abutters have been notified about this application and are requested to provide abutter consent.

Calculating the Appropriate Application Fee to be Submitted with a Standard Dredge and Fill Application

Worksheet B



Use this worksheet for the following **shoreline structure** projects:

- Construction or modifications of seasonal or permanent docking facilities.
- Dredge or fill within lake bed
- Excavation, fill or construction within the banks of surface water body.

	For Minor and Major Impact Projects:	Fee calculation rate and square feet of impact	Fee (subtotals and total)
1	**Base application fee**		**$200**
2a	**Total square feet of <u>new</u> impacts to wetland, bank, and other jurisdictional areas**	3,734 sq. ft.	
2b	**Multiply line 2a by $0.20 fee per square foot of new impacts to determine the** ADDITIONAL fee for wetlands, bank or other jurisdictional area		**$ 746.80**
3a	**Total square feet of dredge and fill of surface waters**	8,656 sq. ft.	
3b	**Multiply line 3a by $0.20 fee per square foot of impact to determine the** ADDITIONAL fee for surface water dredge and fill.		**$ 1,731.20**
4a	**Total square feet of proposed seasonal docking structure**	0 sq. ft.	
4b	**Multiply line 4a by $1 fee per square foot of impact to determine the** ADDITIONAL fee for seasonal structure(s):		$ 0.00
5a	**Total square feet of proposed permanent docking structure**	0 sq. ft.	
5b	**Multiply line 5a by $2 fee per square foot of impact to determine the** ADDITIONAL fee for permanent structure(s):		$ 0.00
6	**Required Fee: Add lines 1, 2b, 3b, 4b, and 5b**		$ 2,678.00

US Army Corps of Engineers ®
New England District

U.S. Army Corps of Engineers
Programmatic General Permit (PGP)
(http://www.nae.usace.army.mil/reg/NHPGPpermit.PDF)
Appendix B - Required Information and Corps Secondary Impacts Checklist

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, see www.nae.usace.army.mil/reg/Application_PlanGuidelines.doc. Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

Required information for all projects:

- **8½"x 11" plans: Locus map, plan views of the entire property and project limits with existing and proposed conditions. On each plan show the NGVD 1929 equivalent for the project's vertical datum with the vertical units. Do not use local datum.**

Required information for Federal inland (Section 404) wetland/waterway fill projects:

- Complete the "Corps Secondary Impacts Checklist" provided on the following page;
- **Each plan should show the ordinary high water (OHW) line in the absence of a contiguous wetland.**
- National Wetlands Inventory Map(s) (www.fws.gov/nwi/) showing the impacted wetland system(s);
- For Minor/Major Impact Projects, delineate special aquatic sites (SAS) and special wetlands, including vernal pools [see General Condition (GC) 26].

Information typically required for stream crossing projects (perennial and intermittent unless otherwise specified):

- Rosgen classification for perennial streams. See Applied River Morphology, Dave Rosgen, 1996;
- PE stamp on all perennial stream projects when required by the State;
- Crossing impact analysis of hydraulic capacity, hydrogeomorphic compatibility, watershed size above a crossing, upstream and downstream direct and secondary impacts from a proposed crossing;
- Stream bank full, and bank dimensions, channel dimensions, extent of the floodplain prone area;
- Crossing impact assessment to wildlife and fisheries and aquatic organisms (pre- and post design) including direct and secondary impacts;
- Replacements: an analysis of current crossing compatibility, stability of upstream and downstream channel and bank, recent scour events, systems analysis on hydrology, ecological stability and sediment loading.

Required information for projects in tidal waters:

- **Each plan should show the mean high water (MHW), mean low water (MLW), mean lower low water (MLLW), high tide line (HTL) or other tidal datum;**
- Delineate special aquatic sites (SAS) and special wetlands (see GC 26); Show or state the size of the waterbody;
- Limits of any Federal Navigation Project (FNP) within 100' of the project area and State Plane Coordinates for the limits of the proposed work closest to the FNP;
- Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands and the areas below the HTL.

Required information for tidal water dredge projects:

- Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing. For projects

proposing open water disposal, applicants should contact the Corps as early as possible regarding sampling and testing protocols. Sediment sampling and testing without such contact would be at the applicant's risk;

- Any existing sediment grain size and bulk sediment chemistry data;
- Nature of material (e.g., silty sand);
- Any nearby projects;
- The area in square feet and volume of material to be dredged below HTL;
- Existing and proposed water depths;
- Type of dredging equipment to be used;
- Location of the disposal site (include locus sheet);
- Information on the location and nature of municipal or industrial discharges and occurrence of any contaminant spills in or near the project area;
- Shellfish survey;
- Identify and describe potential impacts to essential fish habitat (see GC 10);
- Delineation of submerged aquatic vegetation (e.g., eelgrass beds).

U.S. Army Corps of Engineers
Programmatic General Permit (PGP)
Appendix B
Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to "work" include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See PGP, GC 5 regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur upstream within 1 mile upstream in the watershed of an impaired water? See www.des.nh.gov/wmb/Section401/ to determine if there is an impaired water in the vicinity of your work area.*	✓	
2. Wetlands		
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200' of any proposed work?		✓
2.2 Are there proposed impacts to SAS, shellfish beds, special wetlands and vernal pools (see PGP, GC 26)? Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) website, www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage, specifically the book Natural Community Systems of New Hampshire.		
2.3 If wetland crossings are proposed, they are not adequately designed to maintain hydrology, sediment transport & wildlife passage.		
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)		✓
2.5 The overall project site is more than 40 acres.		✓
2.6 What is the size of the existing impervious surface area?		
2.7 What is the size of the proposed impervious surface area?		
2.8 What is the % of the impervious area (new and existing) to the overall project site?		
3. Wildlife	Yes	No
3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require a NHB determination.)		✓
3.2 Would work occur in an area identified by NH Fish and Game Department as "Highest Ranked Habitat by Ecological Condition in NH" (magenta areas on maps) or "Highest Ranked Habitat by Ecological Condition in biological region" (green areas on maps)? www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. The map is currently available as a PDF for download that can be zoomed in on.*		✓
3.3 Would work occur in an area identified as a "Conservation Focus Area" (purple areas). www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/conservation_focus.htm? The map is currently available as a PDF for download that can be zoomed in on.*		✓
3.4 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		✓
3.5 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		✓
3.6 If stream crossings are proposed, will they impede hydrology, sediment transport & wildlife passage. (Note: Stream crossings should be designed in accordance with the PGP, GC 21.)		✓
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	✓	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?		✓

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

MAPLEWOOD AVE. CULVERT REPLACEMENT & NORTH MILL POND RESTORATION

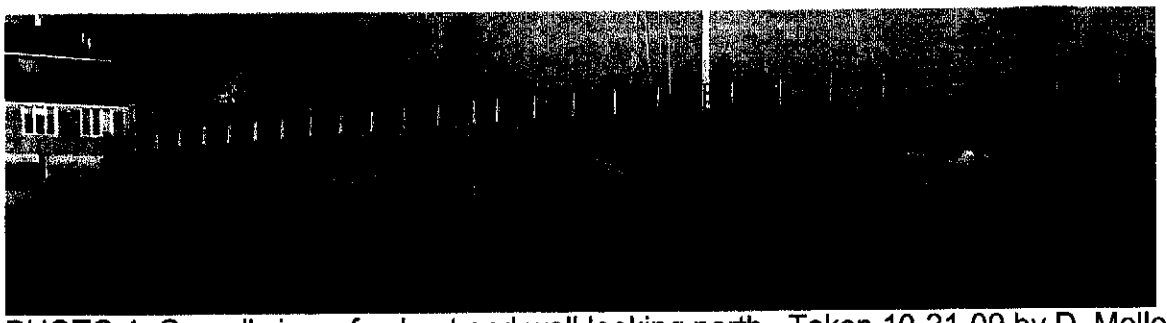


PHOTO 1 Overall view of culvert and wall looking north. Taken 10-21-09 by D. Mellor

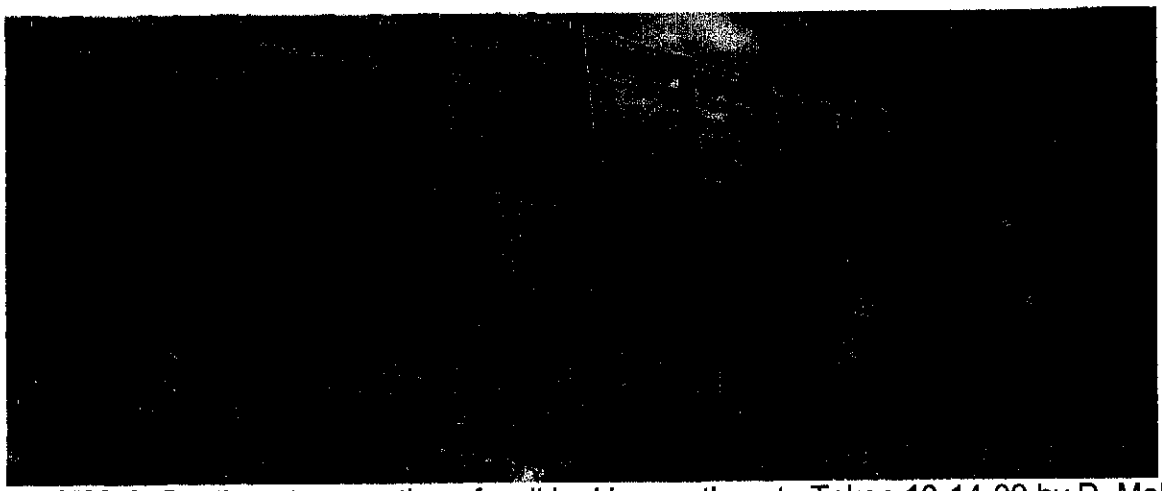


PHOTO 2 Southeastern section of wall looking northeast. Taken 10-14-09 by D. Mellor

PHOTO 3 Wall and culvert looking southwest, note abandoned sewer line to be removed. Taken 10-14-09 by D. Mellor

Michael Cuomo, Soil Scientist
6 York Pond Road, York, Maine 03909
(207) 363-4532

Duncan Mellor, P.E.
Waterfront Engineers, LLC
3 Linda Lane
Stratham, NH 03885

2 November 2009

Dear Mr. Mellor;

This report is in reference to the Maplewood Avenue culvert reconstruction project in Portsmouth, NH. To assist you in planning for this work, I have identified the boundary of the regulated wetlands and intertidal areas in the immediate vicinity.

Regulated wetlands were identified using the 1987 *Corps of Engineers Wetlands Delineation Manual*, as required by the federal government, State of New Hampshire, and City of Portsmouth. A single intertidal wetland was identified, which is identified on the existing conditions plan being prepared by James Verra and Associates, Inc. with the symbol 'E2EM1.' Map unit labels are from the *Classification of Wetlands and Deepwater Habitats of the United States* developed for the US Fish and Wildlife Service by Cowardin and others. E2EM1 denotes an estuarine intertidal emergent wetland with plants that persist in dormant state through the winter.

To meet the definition of a wetland in the 1987 Manual, a site must be vegetated with rooted plants under normal conditions, so E2EM1 is the only wetland as defined in the vicinity of the work area. However, there are other regulated intertidal areas which lack rooted plants. These are classified as wetlands by Cowardin, but are not regulated as wetlands. The State refers to these intertidal areas as 'waters of the State' and the federal regulators call these 'special aquatic sites.' These regulated intertidal areas are labeled 'E2AB4' and 'E2US1' on the existing conditions plan. Using the Cowardin classification system, E2AB4 indicates an estuarine intertidal aquatic bed with floating

Michael Cuomo, Soil Scientist
6 York Pond Road, York, Maine 03909
(207) 363-4532

plants. E2US1 denotes an estuarine intertidal are with an unconsolidated, predominantly un-vegetated bottom comprised of gravel and rubble.

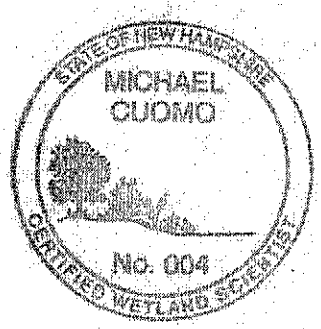
In departure from standard practice, the boundaries of the map units described above were not flagged in the field. Due to the nature of the site it was obvious the flags would quickly be washed away and become litter. I worked closely with the survey crew from James Verra and Associates and they recorded the locations which I indicated. I later worked with James Verra and Associates in the labeling of the map units on the existing conditions plan.

Please call if you have questions regarding this work.

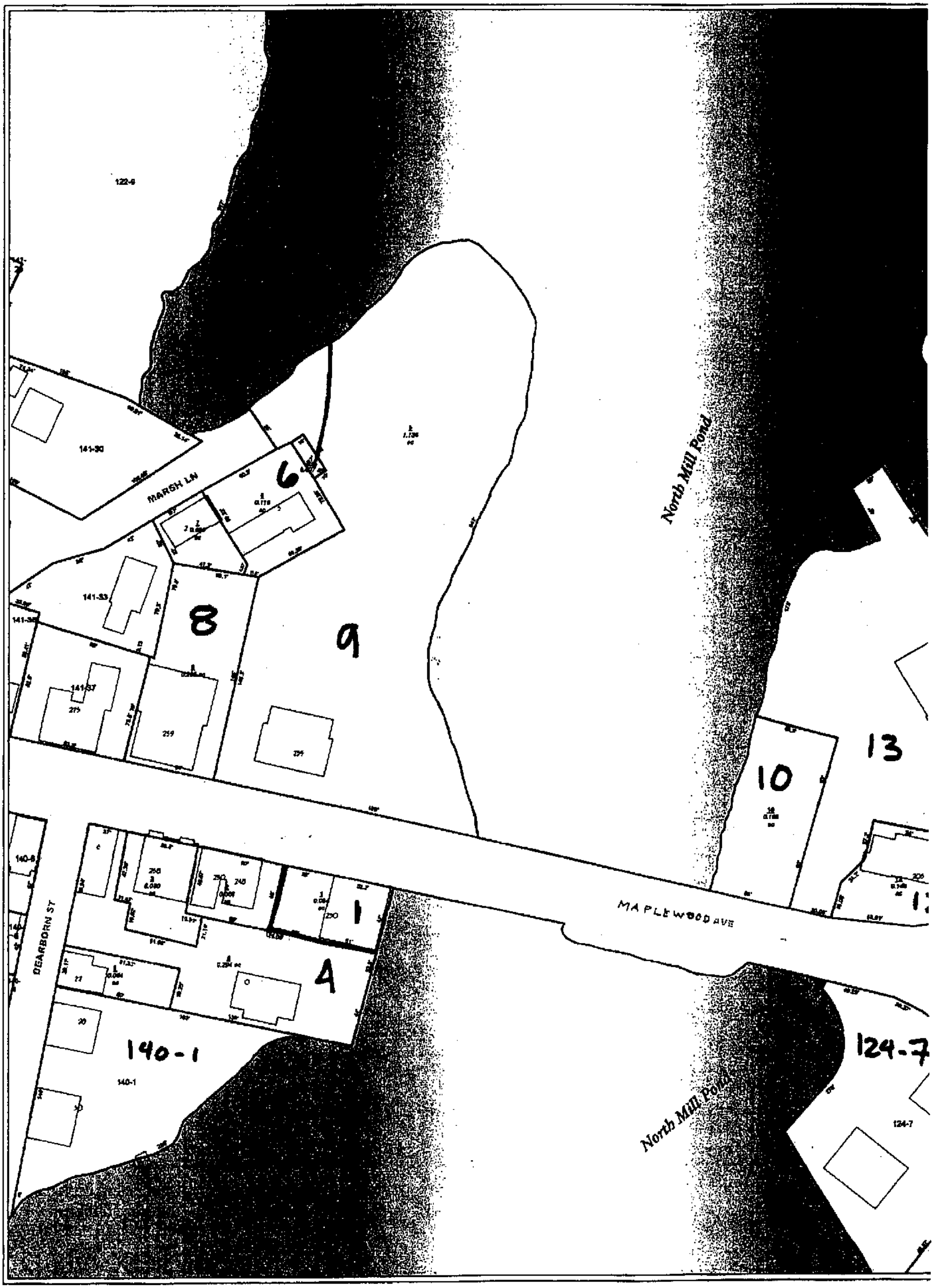
Sincerely,

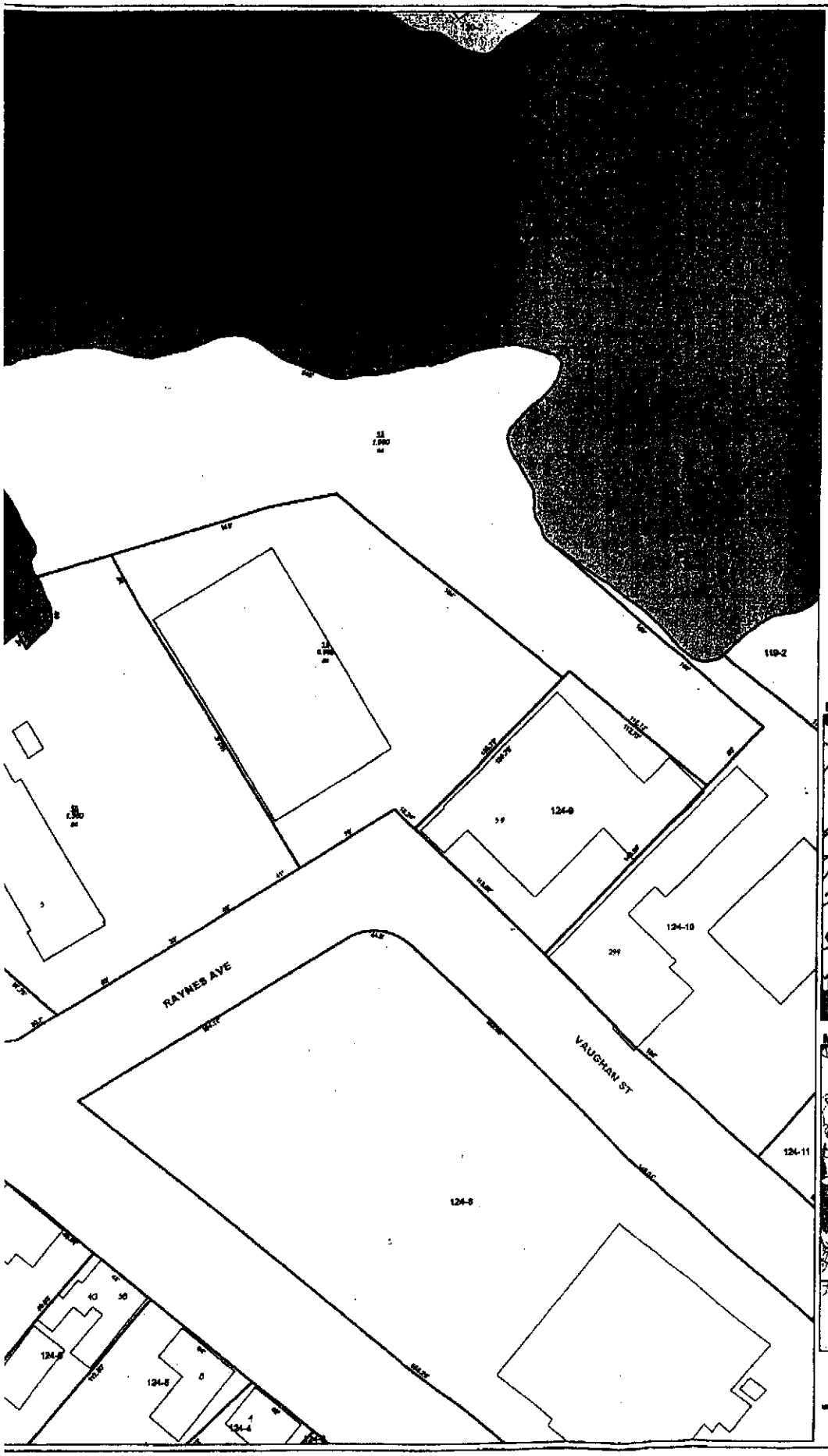
Michael Cuomo

Michael Cuomo
NH Wetland Scientist #004



Copy to: James Verra and Assoc., Inc.
Haight Engineering, LLC


122-9
141-30
MARSH LN
6
141-33
141-36
8
9
141-37
275
259
239
North Mill Pond
13
10
MAPLEWOOD AVE
DEARBORN ST
1
230
A
140-6
140-1
124-7
North Mill Pond



Partial Legend

See the cover sheet for the complete legend.

7-6A	Lot or lot-unit number
2.66 ac	Parcel area in acres (ac) or square feet (sf)
29	Address number
220-147	Parcel number from a neighboring map
60'	Parcel line dimension
SIMS AVE	Street name

Parcel/Parcel boundary
Parcel/ROW boundary
Water boundary
Structure (1994 data)
Parcel covered by this map
Parcel from a neighboring map (see other map for current status)

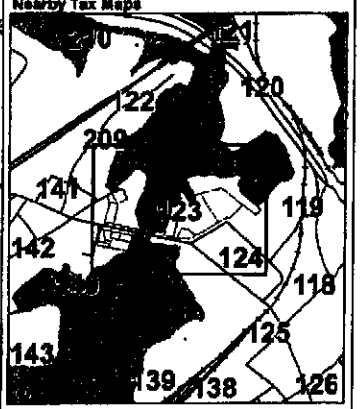
N

0 20 40 80 120 Feet

0 5 10 20 30 40 Meters

This map is for assessment purposes only. It is not intended for legal description or conveyance.
Parcels are mapped as of April 1.
Building footprints are 2008 data and may not represent current structures.
Streets appearing on this map may be paper (unbuilt) streets.
Lot numbers take precedence over address numbers. Address numbers shown on this map may not represent posted or legal addresses.

Nearby Tax Maps



Map Location

Portsmouth, New Hampshire
2009

Tax Map 123

ABUTTER LIST

MAPLEWOOD AVENUE CULVERT REPLACEMENT
AND NORTH MILL POND RESTORATION

PORTSMOUTH, NH

APPLICANT:		**City of Portsmouth** **Department of Public Works** **680 Peverly Hill Road** **Portsmouth, NH 03801**
	Tax Map/Lot #	**Owner of Record**
ABUTTERS:	**123/1**	**MRBT Enterprises, LLC** **140 Walker Bungalow** **Portsmouth, NH 03801**
	123/4	**Regan Electric Co. Inc.** **893 Woodbury Ave.** **Portsmouth, NH 03801**
	123/6	**Walter G. Ziebarth & Michelle White** **3 Marsh Lane** **Portsmouth, NH 03801**
	123/8	**Two Hundred Fifty-Nine** **Maplewood Holding Realty** **49 Basils Place** **Portsmouth, NH 03801**
	123/9	**Two Hundred Thirty-five** **Maplewood Ave. LLC** **1116 Ocean Boulevard** **Rye, NH 03870**
	123/9A	**City of Portsmouth** **PO Box 628** **Portsmouth, NH 03801**
	123/10 & 13	**31 Raynes, LLC** **c/o Dilorenzo Real Estate, LLC** **2219 Lafayette Road** **Portsmouth, NH 03801**

123/12	**Portsmouth Property Trust** **PE Spaulding Rev. Trust** **29 Horse Corner Road** **Chichester, NH 03258**
124/7	**Gideon Walker House Trust** **James H. Somes, Jr., Trustee** **154 Maplewood Avenue** **Portsmouth, NH 03801**
140/1	**Brian M. & Susan M. Regan** **30 Dearborn Street** **Portsmouth, NH 03801**

CIVIL ENGINEER:

Waterfront Engineers LLC
Duncan Mellor, PE
3 Linda Lane
Stratham, NH 03885

Altus Engineering, Inc.
Eric Weinrieb, PE
133 Court Street
Portsmouth, NH 03801

Haight Engineering, PLLC
Steve Haight, PE
181 Watson Road
Dover, NH 03820

7005 3110 0004 2291 5860

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here U.S.P.S.
12/23/2009

Sent To
Street, or PO
City, S
MRBT Enterprises, LLC
140 Walker Bungalow
Portsmouth, NH 03801
PS Form
Instructions

7005 3110 0004 2291 5877

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here U.S.P.S.
12/23/2009

Regan Electric Co. Inc.
893 Woodbury Ave.
Portsmouth, NH 03801
Instructions

7005 3110 0004 2291 5884

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here U.S.P.S.
12/23/2009

Walter G. Ziebarth
Michelle White
3 Marsh Lane
Portsmouth, NH 03801
for Instructions

7005 3110 0004 2291 5891

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 DEC 23 2009 Postmark Here U.S.P.S.
12/23/2009

Two Hundred Fifty-Nine
Maplewood Holding Realty
49 Basils Place
Portsmouth, NH 03801
Instructions

7005 3110 0004 2291 5907

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here U.S.P.S.
12/23/2009

Two Hundred Thirty-five
Maplewood Ave. LLC
1116 Ocean Boulevard
Rye, NH 03870
for Instructions

7005 3110 0004 2291 5914

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®
OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here U.S.P.S.
12/23/2009

City of Portsmouth
PO Box 628
Portsmouth, NH 03801
Instructions

7005 3110 0004 2291 5945

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

For delivery information visit our website at www.usps.com®

OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here 12/23/2009 USPS

Sent To
Portsmouth Property Trust
PE Spaulding Rev. Trust
Street, Apt. No., or PO Box
29 Horse Corner Road
City, State, ZIP+4
Chichester, NH 03258

PS Form 3800, August 2006 See Reverse for Instructions

7005 3110 0004 2291 5952

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

For delivery information visit our website at www.usps.com®

OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here 12/23/2009

Sent To
Gideon Walker House Trust
James H. Somes, Jr., Trustee
Street, Apt. No., or PO Box
154 Maplewood Avenue
City, State, ZIP+4
Portsmouth, NH 03801

PS Form 3800, August 2006 See Reverse for Instructions

7005 3110 0004 2291 5969

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

For delivery information visit our website at www.usps.com®

OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here 12/23/2009

Sent To
Brian M. & Susan M. Regan
Street, Apt. No., or PO Box
30 Dearborn Street
City, State, ZIP+4
Portsmouth, NH 03801

PS Form 3800, August 2006 See Reverse for Instructions

7005 3110 0004 2291 5921

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

For delivery information visit our website at www.usps.com®

OFFICIAL USE

Postage	$ $0.44
Certified Fee	$2.80
Return Receipt Fee (Endorsement Required)	$2.30
Restricted Delivery Fee (Endorsement Required)	$0.00
Total Postage & Fees	$ $5.54

0801 PORTSMOUTH, N.H. 03801 DEC 23 2009 Postmark Here 12/23/2009

Sent To
31 Raynes, LLC
c/o Dilorenzo Real Estate, LLC
Street, Apt. No., or PO Box
2219 Lafayette Road
City, State, ZIP+4
Portsmouth, NH 03801

PS Form 3800, August 2006 See Reverse for Instructions

ALTUS
ENGINEERING, INC.

Civil
Site Planning
Environmental
Engineering

133 Court Street
Portsmouth, NH
03801-4413

December 21, 2009

MRBT Enterprises, LLC
140 Walker Bungalow
Portsmouth, NH 03801

Re: Standard Dredge and Fill Application
Maplewood Ave Culvert Replacement and North Mill Pond Restoration
City of Portsmouth
Maplewood Avenue
Portsmouth, NH
Portsmouth Tax Map 123

Dear Abutter:

Under RSA 482-A, we are required to notify you that an application for a permit from the New Hampshire Department of Environmental Services, Wetlands Bureau is being submitted. This letter is to inform you, as an abutter to the above-referenced property, that an application for a permit will be filed with the NH DES Wetlands Bureau. The application involves reconstruction of stone seawalls in the same location and replacement of the existing culvert with three new culverts.

The plans that show the proposed project and wetlands impacts will be available for viewing during normal business hours at the office of the City Clerk Office, Portsmouth, New Hampshire, or at the office of the DES Wetlands Bureau, 29 Hazen Drive, Concord, N.H. (8 a.m. to 4 p.m.).

Regards,

Eric D. Weinrieb, P.E.
President

RMB/edw/4217.abut.ltr.doc

cc. City of Portsmouth, Dept. of Public Works

Tel: (603) 433-2335 Fax: (603) 433-4194 E-mail: Altus@altus-eng.com

ALTUS
ENGINEERING, INC.

Civil
Site Planning
Environmental
Engineering

133 Court Street
Portsmouth, NH
03801-4413

December 21, 2009

MRBT Enterprises, LLC
140 Walker Bungalow
Portsmouth, NH 03801

Re: Standard Dredge and Fill Application
Maplewood Ave Culvert Replacement and North Mill Pond Restoration
City of Portsmouth
Maplewood Avenue
Portsmouth, NH
Portsmouth Tax Map 123

Dear Abutter:

The NH DES Wetlands Bureau under rule Env-Wt 304.04 stipulates that the applicant must attempt to obtain written abutter consent for work on their property or in State Waters when within 20 feet of your property line. The City of Portsmouth has applied to the Wetlands Bureau for a permit to reconstruct the stone seawall in the same location and replace the existing culvert with three new culverts. The permit application package describing the proposed work is available for review at the Portsmouth City Clerk's Office, or at the DES Concord office.

We request your written consent for this proposed reconstruction work. Attached is a form letter you may utilize, or you may draft your own letter. Please forward the letter to

Mr. David Allen
Department of Public Works
City of Portsmouth
680 Peverly Hill Road
Portsmouth, NH 03801

Regards,

Eric D. Weinrieb, P.E.
President

RMB/edw/4217.abut.consent.ltr.doc

cc. City of Portsmouth, Dept. of Public Works

Mr. David Allen
Department of Public Works
City of Portsmouth
680 Peverly Hill Road
Portsmouth, NH 03801

Re: Maplewood Ave Culvert Replacement and North Mill Pond Restoration

Dear Mr. Allen,

As a legal representative of MRBT Enterprises, LLC, an abutter to the seawall and culvert to be rebuilt at Maplewood Avenue in Portsmouth, NH, I do offer my consent to the City for work within 20 feet of our common property line as required by the NH Department of Environmental Services, Wetlands Bureau rule Env-Wt 304.04.

Very truly yours,

_____
Name

_____
Title

_____
Date:

Printed from Internet by j Acct #: v1 on 12/9/2009

ROCKINGHAM COUNTY
REGISTRY OF DEEDS
030350
2001 MAY -4 PM 12:37

EASEMENT DEED

KNOW ALL MEN BY THESE PRESENTS, that 235 Maplewood Avenue LLC, 1116 Ocean Boulevard, Rye, County of Rockingham and State of New Hampshire, **grants** to the City of Portsmouth, 1 Junkins Avenue, Portsmouth, County of Rockingham and State of New Hampshire,

with quitclaim covenants,

A permanent easement over the following described property consisting of all the right, title and interest necessary for the development, maintenance and operation of the property for those uses determined to be in the public interest by the City Council of the City of Portsmouth. The interest conveyed hereby includes, but is not limited to, the right to develop, operate and maintain the property as a public park and the authority to adopt ordinances, rules and regulations with respect to the property to the same extent which the City may take such actions concerning property which it holds in fee title.

Responsibility for any environmental conditions existing as of the date of execution of this easement remain with the Grantor and its successors in title.

The premises over which this easement is granted are located at 235 Maplewood Avenue, Portsmouth, New Hampshire, and more fully described as follows:

Beginning at an iron rod set in the northerly sideline of Maplewood Avenue at a point which is 100 feet easterly from the southwesterly premises of the property of the grantor; thence running N 00° 38' 25" E 143.95 feet to an iron rod set; thence turning and running N 72° 40' 47" W 69.62 feet to an iron rod set, both bounds being by other land of the grantor; thence turning and running N 60° 05' 52" E by and along property now or formerly of Walter G. Ziebarth 68.38 feet to an iron rod set; thence turning and running N 31° 26' 50" W 72.26 feet to a point; thence turning and running S 58° 33' 10" W 10.00 feet; thence turning and running N 31° 26' 50" W 39± feet to the mean high water mark of the North Mill Pond; thence turning and running along the North Mill Pond 642± feet to a point in the northerly sideline of Maplewood Avenue; thence turning and running along the northerly sideline of Maplewood Avenue N 77° 15' 10" W 80± feet to the point of beginning.

Being a portion of the same premises conveyed to the grantor by deed of Joseph G. Sawtelle, Trustee of Dearborn Place Trust and Brian Nickerson, as Trustee of Laurel Development Trust dated December 31, 1996, and recorded in the Rockingham County Registry of Deeds at Book 3194, Page 1878, and being as shown on Easement Plan, Map 123, Lot 9, 235 Maplewood Avenue LLC to the City of Portsmouth, 235 Maplewood Avenue, Portsmouth, N.H., September, 2000.

Printed from Internet by j Acct #: v1 on 12/9/2009

235 Maplewood Avenue LLC

Dated: April 18, 2001 By: Caryl Sawtelle
Its Manager

STATE OF NEW HAMPSHIRE
ROCKINGHAM, SS.

Personally appeared Caryl J. Sawtelle, Manager of 235 Maplewood Avenue LLC, a New Hampshire Limited Liability Company, known to me, or satisfactorily proven, to be the person whose name is subscribed to the foregoing instrument and acknowledged that he/she executed the same for the purposes therein contained,

Before me,

Janet M LeTarte
~~Justice of the Peace~~/Notary Public

JANET M. LeTARTE
Notary Public
My Commission Expires
May 22, 2001

In accepting the foregoing easement, the City of Portsmouth agrees to indemnify the grantor from any losses for claims of third parties using the easement unless based on the negligence of the grantor.

City of Portsmouth

Dated: May 4, 2001 By:
Its Authorized Officer
Pursuant to vote of the City Council on March 12, 2001.

STATE OF NEW HAMPSHIRE
ROCKINGHAM, SS.

Personally appeared John P. Bohenko, authorized to accept said easement for the City of Portsmouth, known to me, or satisfactorily proven, to be the person whose name is subscribed to the foregoing instrument and acknowledged that he/she executed the same for the purposes therein contained,

Before me,

Justice of the Peace/~~Notary Public~~
Robert Sullivan

SITE TIDAL OBSERVATIONS:
MAPLEWOOD AVENUE AT NORTH MILL POND

As part of the Maplewood Avenue culvert replacement concept study, a limited swim by assessment of the site was performed and periodic tidal current measurements have been performed.

SITE OBSERVATIONS

The swim-by assessment found the culvert bed (natural) and north side seabeds are typically a gently sloping broken rock cobble to boulder bottom exposed to significant tidal current and containing a substantial density of marine life, such as Irish moss and sponges. At the south end of the culvert the bottom is also a broken rock cobble bottom, however there is a rapid drop off about 30 feet south of the culvert into a sub tidal pool at least 8 feet deep at low tide. Beyond the scour effects of the tidal acceleration by the culvert, the bottom trends to gravel, sand and mud substrates with significant urban debris, including tires, broken glass and pottery.

The existing culvert is a steel plate arch, likely inserted inside the 1896 arch culvert as a repair. The 1896 drawing indicates the stone arch culvert with a width of 28 feet and height of about 12 feet. The existing steel plate arch has a width of 25.5 feet to the steel and 2 ft by 5 ft concrete footings at each side encroaching into the culvert with about a 20.5 ft clear opening width between footings. The measured height of the culvert at the south end is 10.6 feet and significantly less than the height at the north end (to be confirmed by topo survey).

TIDES

Limited tidal height data has been collected by the University of New Hampshire Jackson Marine Lab on both the north and south sides of Maplewood Avenue. The tide gauges were installed above low tide level, so the data illustrate only the higher portion of the tidal curves. Low tide water level observed in the morning of October 21, 2009 indicated the low tide on the north side of Maplewood Ave. lagged about 15 minutes behind the predicted low tide at the Atlantic Heights NOAA tide station and had an observed elevation of -3.0 ft NGVD1929 (approximately 0.3 ft above low water level at Atlantic Heights). Low tide water level observed in the morning of October 20, 2009 indicated the low tide on the south (Mill Pond) side of Maplewood Ave. lagged about 1 hour and 15 minutes behind the predicted low tide at the Atlantic Heights NOAA tide station and had an observed elevation of -1.7 ft NGVD1929. The bathymetry at the south end of the culvert and the raised elevation of this portion of seabed controls the low tide level and apparent low tide lag in North Mill Pond.

The UNH tide data was compared to the nearby NOAA tide stations. Four days during the October UNH tide data were selected based on those days having Fort Point tide station observed high tides close to predicted high tides (many of

the October days had observed high tides significantly above predicted). For those days, the UNH high tide data was compared to the Fort Point (predicted and observed water levels) and Atlantic Heights (predicted water levels) NOAA tide station water levels. The comparisons, which included data adjustment to NGVD 1929 datum, indicated the high tide on the north side of Maplewood Avenue lags about 10 minutes behind the Atlantic Heights tide station, with a high tide level about 76% of the Atlantic Heights (variability 69% to 82%). Based on this limited comparison, we estimate Mean High Water (MHW) at about elevation 3.0 ft NGVD1929 and the Highest Observable Tide Line (highest predicted tide) at about elevation 4.3 ft NGVD1929.

The high tide south side of Maplewood Avenue (North Mill Pond) lags about 25 minutes behind the Atlantic Heights tide station, with a high tide level about 74% of the Atlantic Heights (variability 63% to 80%). Based on this limited comparison, we estimate Mean High Water (MHW) at about elevation 2.9 ft NGVD1929 and the Highest Observable Tide Line (highest predicted tide) at about elevation 4.2 ft NGVD1929. These elevations do appear to agree with observed wrack lines and staining on the walls.

Since only four days during the UNH October data collection showed predicted high tides close to observed high tides (based on Fort Point data showing many of the October days had observed high tides significantly above predicted); this comparison is only approximate and might differ significantly if more comparative data were available.

The FEMA 100 year flood elevation is listed for both sides of Maplewood Avenue as elevation 9.0 ft.

CURRENTS

Limited current measurements have been made in October 2009 while on site for other work as a basic check of tidal current speeds in the culvert. Measurements were taken with a simple hand held Davis Instruments pitot tube. These measurements were taken at a 3 inch water depth and were not corrected for salinity/density variation or tidal range and are only intended as a general check on current speeds.

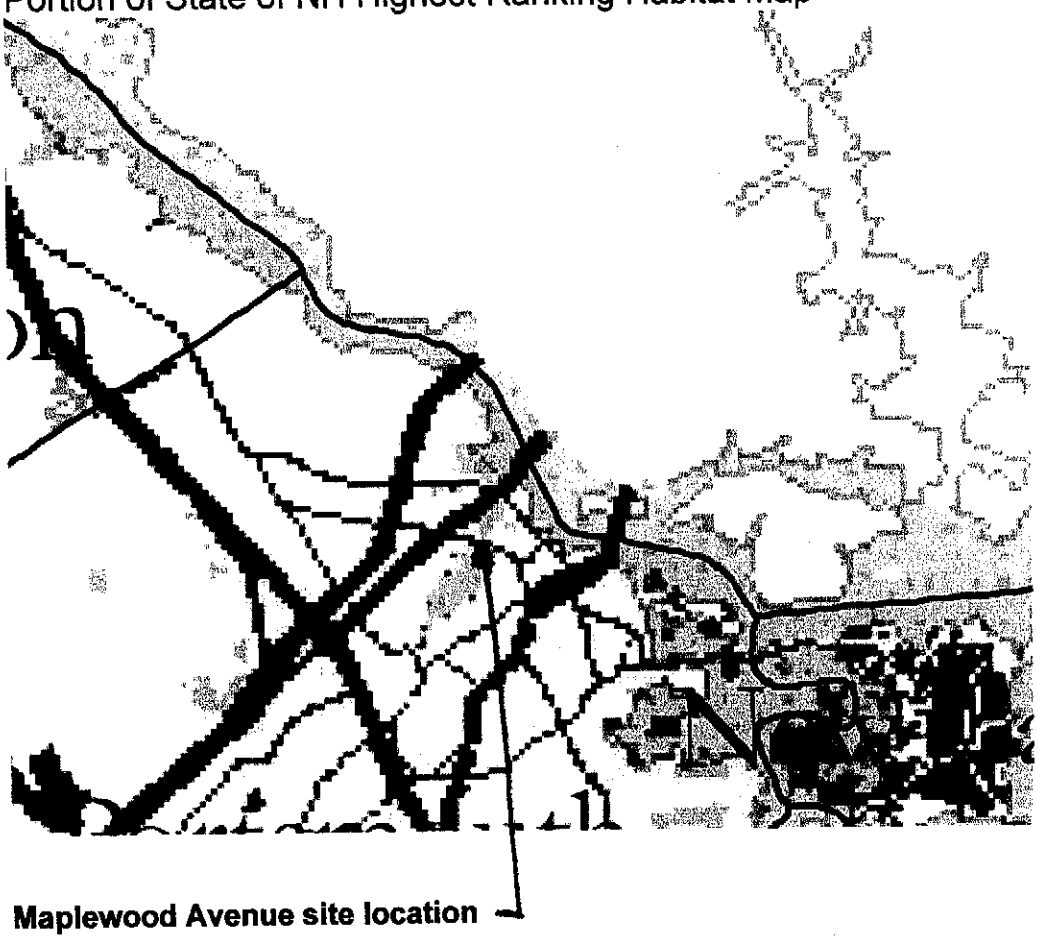
Low tide ebb flow was measured on Oct. 21 between 0825 and 0845 inside the culvert with a water depth of about 1.5 ft (some irregularity due to cobbles/boulders in culvert bed). The mid channel speed was surging between 3.0 and 3.5 knots (5 to 6 fps) for a width of about 16 feet and edge speed was about 2 knots (3 fps). Observed low tide was at about 0830, compared to a predicted low at Atlantic Heights of 0800, however the Fort Point tide station recorded about an a 12 minute lag between predicted low tide and observed low tide that morning. Low tide slack current in the culvert was observed at 0930 with observable flood flow by 0940.

On October 23 at 1300 the flood tide current was checked with a river tide height of +4.5 ft MLLW based on the predicted Atlantic Heights (National Gypsum dock) NOAA tide station. Measurements at the south end of the culvert found 3.9 to 4.3 knots (6.6 to 7.1 fps) at 2 feet from the culvert east edge, and 4.0 to 4.3 knots (6.8 to 7.3 fps) at 4 feet from the culvert east edge. A standing wave estimated at 1.5 ft high was observed at the western side of the outflow.

On October 30 at 1200 the ebb tide current was checked with a river tide height of +5.2 ft MLLW based on the predicted Atlantic Heights (National Gypsum dock) NOAA tide station. Measurements at the south end of the culvert found 3.0 knots (5.0 fps) at 5 feet from the culvert west edge, with a water level 10.6 ft below the sidewalk.

On November 9 at 1230 the flood tide current was checked with a river tide height of +3 ft MLLW based on the predicted Atlantic Heights (National Gypsum dock) NOAA tide station. Measurements at the south end of the culvert found 1.0 to 1.2 knots (1.7 to 2 fps) at 4 feet from the culvert east edge and 1.5 knots (2.5 fps) at the culvert center line.

Maplewood Ave Culvert Replacement and North Mill Pond Restoration, Portsmouth, New Hampshire
Portion of State of NH Highest Ranking Habitat Map



Maplewood Avenue site location

HIGHEST RANKED WILDLIFE HABITAT BY ECOLOGICAL CONDITION

HABITAT	TIER	LEVEL
Matrix Forests	1	Top 15% in NH by area
	2	Top 15% in Subsection by area
	3	Top 30% in Subsection by area
Pine Barrens	1	Top 10% in NH by area
	2	Top 50% in Subsection by area
Rocky Ridges/Talus Slopes	1	Top 10% in NH by area
	2	Top 50% in Subsection by area
Cliffs	1	Top 10% in NH by quantity
	2	Top 50% in Subsection by quantity
Grassland	1	Top 10% in NH by area

Highest Rank Habitat by Condition in NH

Highest Rank Habitat by Condition in Biologic Region

Biological region = TNC ecoregional subsection for terrestrial habitats or watershed group for wetlands and forest floodplains.

Supporting Landscapes

Wildlife Habitat not top-ranked

Developed Land Cover

NEW HAMPSHIRE NATURAL HERITAGE BUREAU

To: richard hackeman
altus engineering, inc.
133 court street
portsmouth, NH 03263

Date: 10/16/2009

From: NH Natural Heritage Bureau

Re: Review by NH Natural Heritage Bureau of request dated 10/16/2009

NHB File ID: NHB09-2253

Applicant: Eric Weinrieb, PE

Description: Maplewood Avenue at North Mill Pond
Portsmouth

Project Categories:
Bank Stablization: Rip-rap
Roads, Driveways, Bridges: Bridge
Roads, Driveways, Bridges: Culvert(s)
Water/Wastewater: Wetland restoration

The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

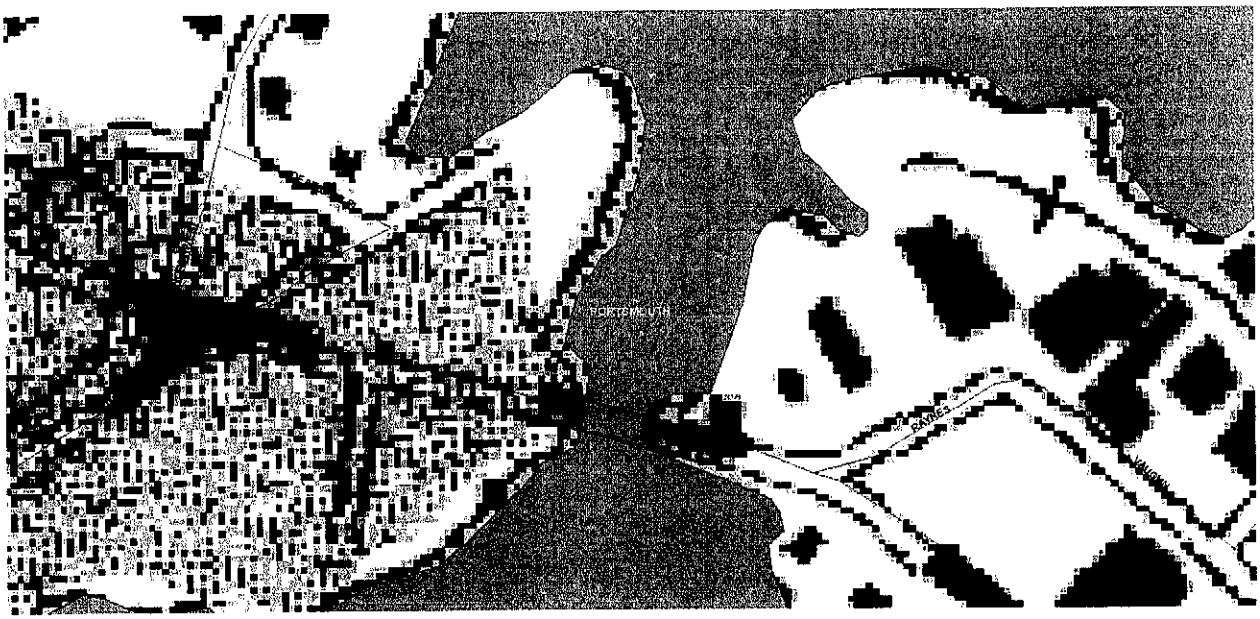
A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present

This review is valid through 10/16/2010.

Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

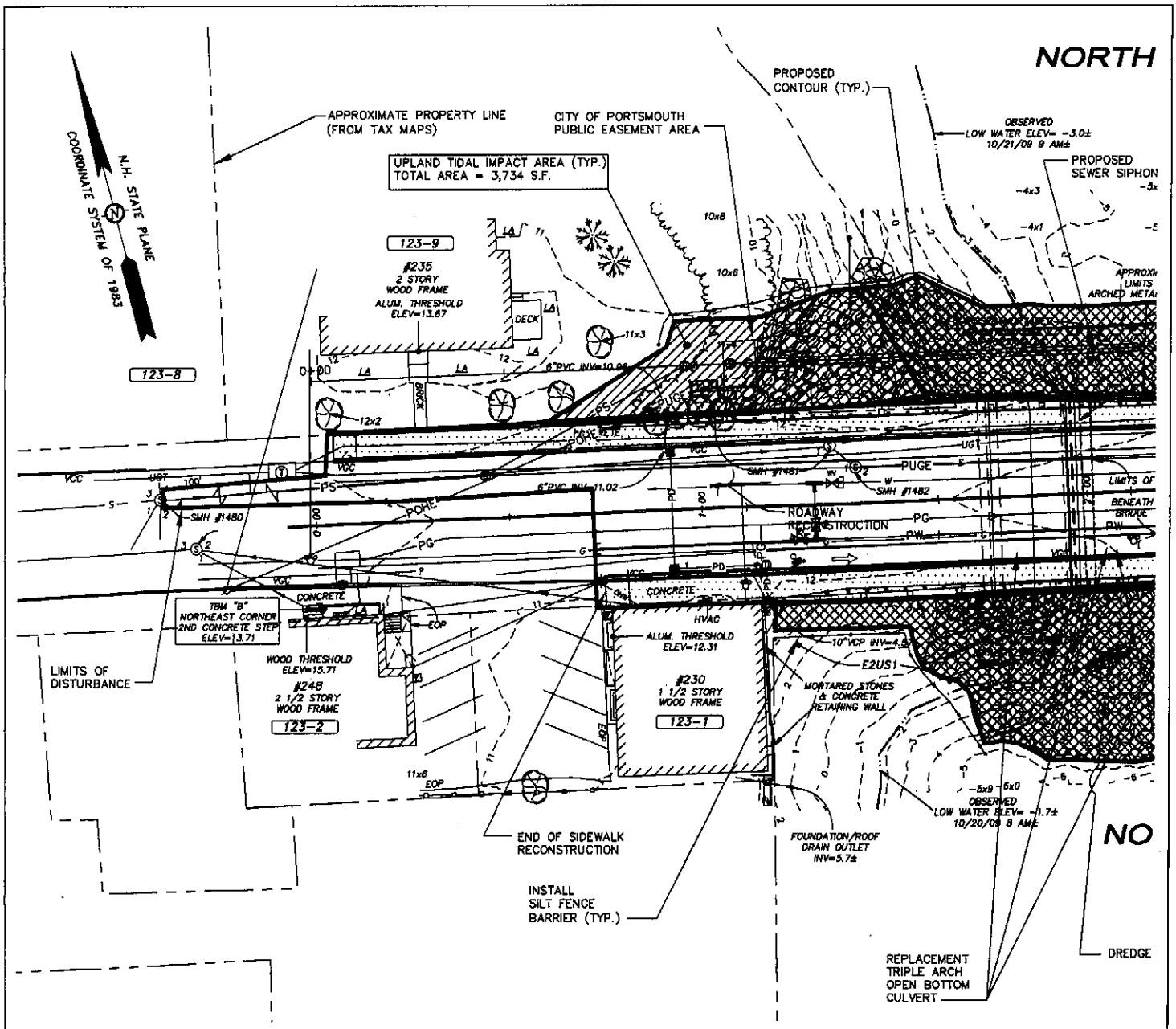
DRED/NHB
PO Box 1856
Concord NH 03302-1856

MAP OF PROJECT BOUNDARIES FOR: NHB ID# NHB09-2253



Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DRED/NHB
PO Box 1856
Concord NH 03302-1856



DATE: 12/28/09	
SCALE: 1"=20'	
DRAWN BY: RLH	
DESIGN BY: EDW	
APPROVED BY:EDW	
PROJECT NO: 4217	
FILE: 4217.DWG	

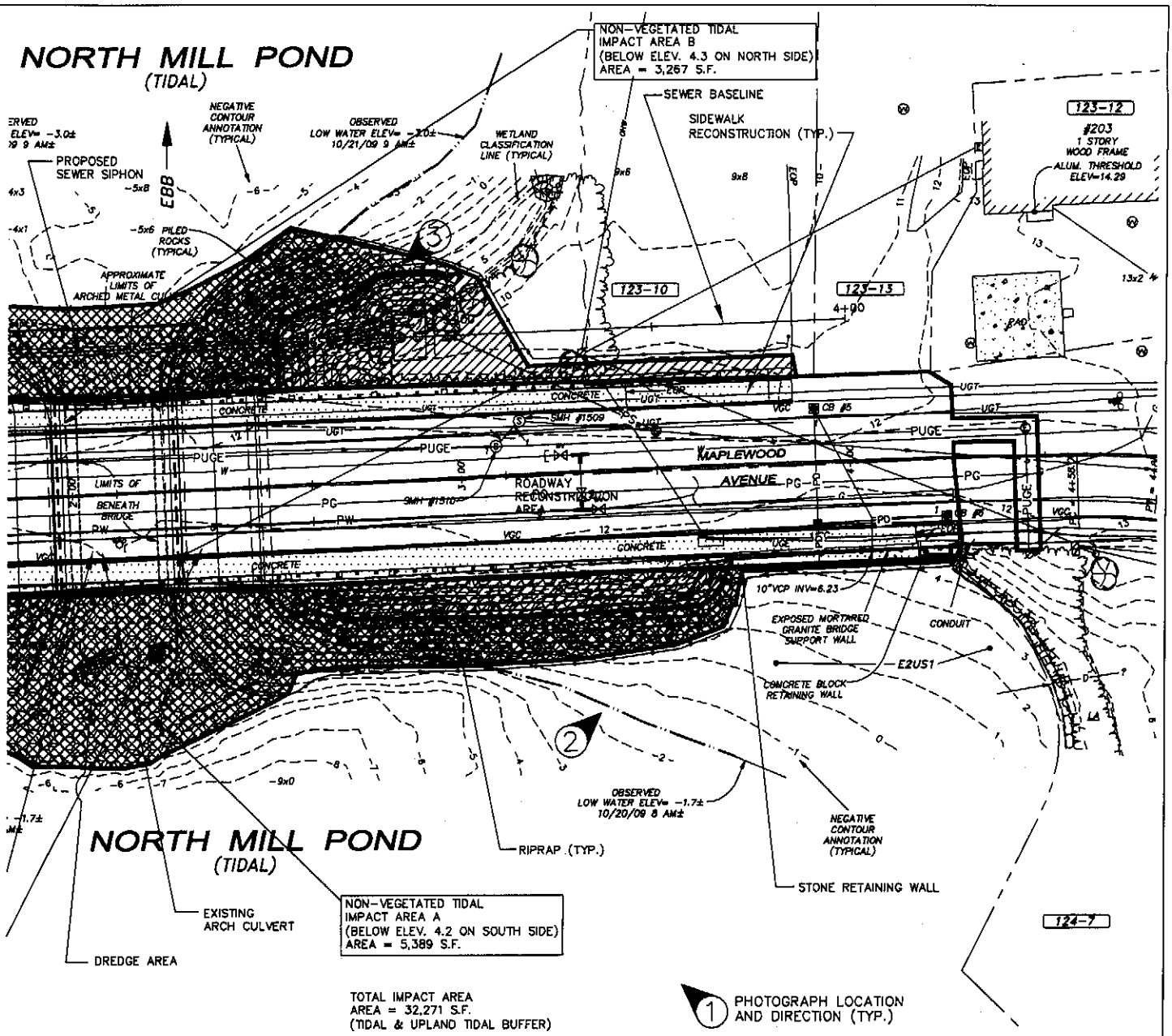
STATE OF NEW HAMPSHIRE
ERIC D. WEINRIEB
NO. 7634
LICENSED PROFESSIONAL ENGINEER
12/28/09

MAPLEWOOD AVE CULVERT REPLACEMENT & NORTH MILL POND RESTORATION PORTSMOUTH, NH

ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

NHDES DREDGE AND FILL PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801



DATE: 12/28/09
SCALE: 1"=20'
DRAWN BY: RLH
DESIGN BY: EDW
APPROVED BY:EDW
PROJECT NO: 4217
FILE: 4217.DWG

STATE OF NEW HAMPSHIRE
ERIC D. WEINRIEB
NO. 7634
LICENSED
PROFESSIONAL ENGINEER
12/28/09

MAPLEWOOD AVE CULVERT REPLACEMENT & NORTH MILL POND RESTORATION PORTSMOUTH, NH

ALTUS ENGINEERING, INC.
133 COURT STREET
PORTSMOUTH, NH 03801
VOICE: (603) 433-2335
FAX: (603) 433-4194

NHDES DREDGE AND FILL PLAN

CITY OF PORTSMOUTH
1 JUNKINS AVE
PORTSMOUTH, 03801

MAPLEWOOD AVE. CULVERT REPLACEMENT & NORTH MILL POND RESTORATION

PHOTO 1 Overall view of culvert and wall looking north. Taken 10-21-09 by D. Mellor

PHOTO 2 Southeastern section of wall looking northeast. Taken 10-14-09 by D. Mellor

PHOTO 3 Wall and culvert looking southwest, note abandoned sewer line to be removed. Taken 10-14-09 by D. Mellor

MAPLEWOOD AVE. CULVERT REPLACEMENT & NORTH MILL POND RESTORATION

PHOTO 4 Culvert looking north, note sewer line to be moved. Taken 10-21-09 by D. Mellor

PHOTO 5 Culvert looking north, flood tide, date unknown, courtesy Bing Maps

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

January 07, 2010

NOTICE OF ADMINISTRATIVE COMPLETENESS
STANDARD DREDGE AND FILL APPLICATION

City of Portsmouth
1 Junkins Avenue
Portsmouth, NH 03802

RE: Wetlands File Number 2009-03043
City of Portsmouth, Maplewood Avenue, Portsmouth
Tax Map/Lot # 123 / ROW

Dear Sir or Madam:

This letter is to acknowledge that on 12/29/2009 the NH DES Wetlands Bureau received your Standard Dredge and Fill application and materials requesting a permit for jurisdictional impacts related to your proposed project on the lot(s) referenced above. Your name, mailing address, and site location are shown as they have been entered into our database. Please check that this information is correct and notify us of any errors.

The application has been accepted as administratively complete as of the date of this letter. This means that the application has been found to contain the basic items necessary and has been assigned to Dori Wiggin, (603) 559-1507 for a detailed technical review. **Please note, that while the basic items have been received, we may request additional filing fees or information as necessary to meet the requirements of RSA 482-A and the Wetlands Rules, Env-Wt 100 - 800.** Please check your materials to ensure that your submittal accurately and completely reflects your project, and refer to your wetlands file number, 2009-03043, if you need to contact the Bureau or submit additional information. You may use the Internet to check the status of the permit application review by using the "Wetland Permits Query" (Also known as "OneStop") on the DES website: http://www2.des.state.nh.us/OneStop/Wetland_Permits_Query.aspx.

Your assigned permitting inspector will conduct a detailed technical evaluation of your application, within **75** days of this letter if the project proposes less than 1 acre of jurisdictional impacts, or within 105 days if the project proposes 1 acre or more of jurisdictional impacts. In the event that more information is needed to fully evaluate your application you will receive a written request outlining the specific items that are required. During the technical review, the permitting inspector also will calculate the required fees and request any additional fees at that time. If these items are not received within **60** days of the request, DES is required by law to deny your application. Therefore it is important that you submit these items as soon as practicable.

Under RSA 482-A, the municipal conservation commission may request that the Bureau hold your application for 40 days from the date of the municipal clerk's signature to allow the conservation commission to review your application. (You may wish to contact your local conservation commission by calling your municipal office). As of this date the conservation commission has not contacted us in writing regarding your project.

If you have any questions, please contact the staff person identified above.

Sincerely,

DES Wetlands Bureau

cc: Waterfront Engineering, LLC
Portsmouth Conservation Commission
Portsmouth Municipal Clerk

INDIVIDUAL INVENTORY FORM **NHDHR INVENTORY NUMBER: POR0110**

Name, Location, Ownership

1. Historic name: Maplewood Avenue Bridge/Seawall
2. District or area: Christian Shore Historic District
3. Street and number: Maplewood Ave. over North Mill Pond
4. City or town: Portsmouth
5. County: Rockingham
6. Current owner: City of Portsmouth

Function or Use

7. Current use(s): Bridge/causeway
8. Historic use(s): Bridge/causeway/dam

Architectural Information

9. Style: Range masonry
10. Architect/builder: Charles A. Putnam, engineer, Sugden Bros. contractors
11. Source: archive drawing
12. Construction date: 1896
13. Source: PPW archive drawing
14. Alterations, with dates: unknown
15. Moved? no ☒ yes ☐ date: NA

Exterior Features

16. Foundation: unknown
17. Cladding: granite
18. Roof material: NA
19. Chimney material: NA
20. Type of roof: NA
21. Chimney location: NA
22. Number of stories: NA
23. Entry location: NA
24. Windows: NA

Site Features

25. Setting: Waterfront
26. Outbuildings: none
27. Landscape features: tidal pond
28. Acreage: N/A
29. Tax map/parcel: map 123/no parcel

35. Photo 1 36. Date Jan 2008
37. Digital photo Direction: SE
38. Image file stored at: Waterfront Engineers LLC

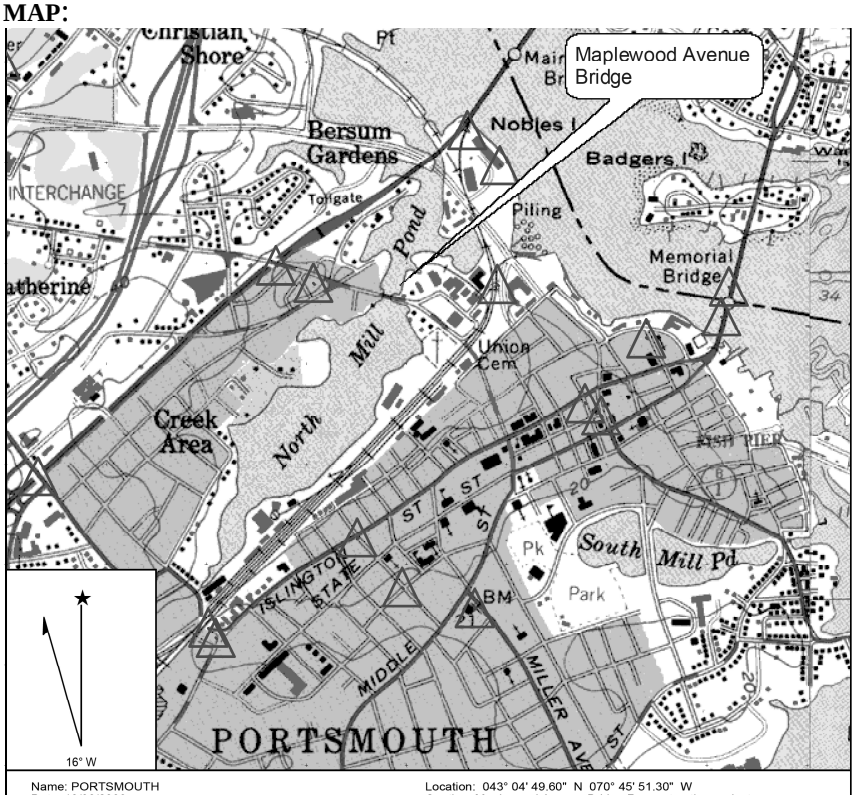
30 UTM reference: 19.

31. USGS quadrangle and scale: Portsmouth, 1:24000

Form prepared by

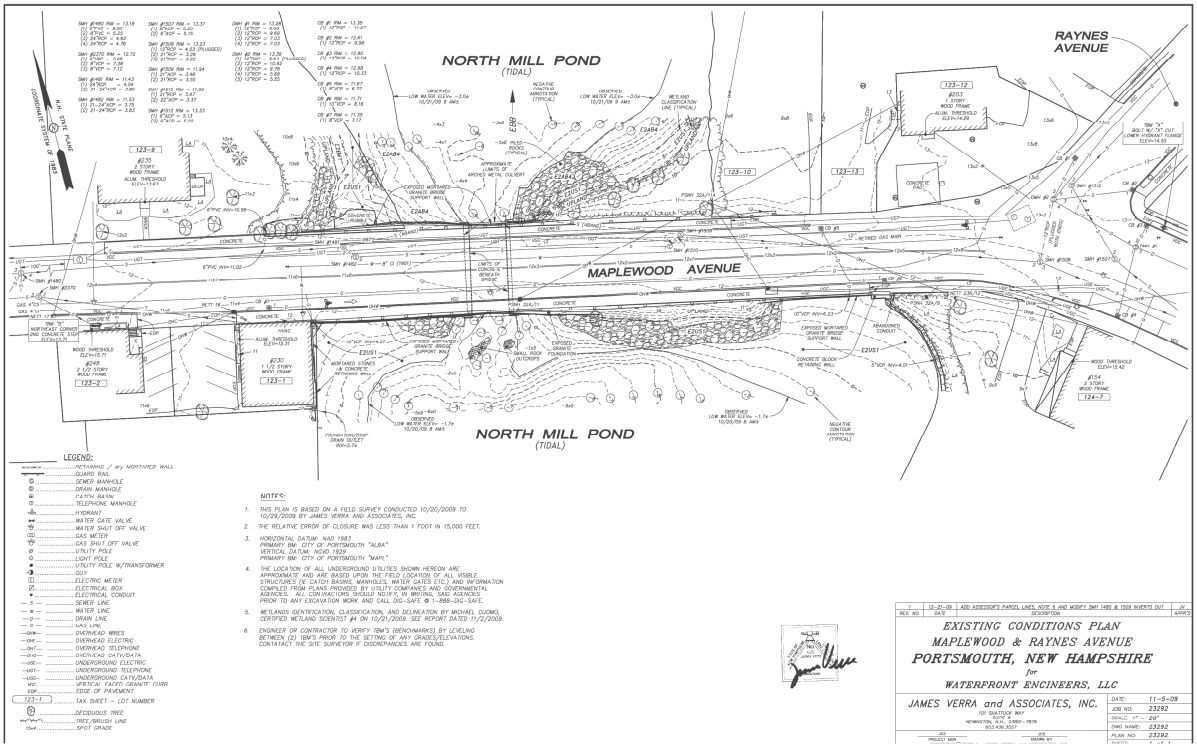
32. Name: Duncan Mellor, Carol Hooper, Kari Laprey
33. Organization: Waterfront Engineers LLC and Preservation Company
34. Date of survey: Dec. 2009

39. LOCATION MAP:



N

40. PROPERTY MAP:



Methods

The Maplewood Avenue Bridge is a contributing structure and a key element defining the edge of the Christian Shore Historic District, which was determined eligible for the National Register of Historic Places in 2006. This individual inventory form was prepared in 2009 in conjunction with a City of Portsmouth project involving the reconstruction of the Maplewood Avenue Bridge and the replacement of the associated arched opening (including restoration of tidal flow).

This documentation was requested by New Hampshire Division of Historic Resources (NHDHR) to address the potential individual eligibility of the bridge for the National Register. The inventory form was prepared and researched primarily by Duncan Mellor, PE of Waterfront Engineers LLC. Because of a misunderstanding, Preservation Company (5 Hobbs Road, Kensington, New Hampshire) was contacted just prior to the deadline for submission of the document, and there were neither sufficient time nor dollars for them to do a thorough report. Therefore, they were only able to provide historical information relating to the Christian Shore neighborhood and assistance in production and editing of the form. Photographs were taken by in 2007 and 2009 during project planning by Duncan Mellor, but because of technical problems they are not included at this time, but they will be added for the next submission to NHDHR.

It should be noted that given the time constraints, historical research was conducted only at the City of Portsmouth Department of Public Works archives. It is likely that additional historical research at other Portsmouth and Concord repositories could yield additional important information and it is urged that this research be conducted to complete our understanding of this significant structure.[1]

41. Historical Background and Role in the Town or City's Development:

Introduction:

The Maplewood Avenue Bridge over the North Mill Pond is located in the northern part of Portsmouth, northwest of the downtown. tributary of the Piscataqua River. Downtown Portsmouth is located to its east. It serves as a crossing and also impounds this tidal inlet of the Piscataqua. Maplewood Avenue is one of the main routes between downtown Portsmouth and Newington. There was a bridge here from the 1760s. The existing bridge with central arch dates from 1896. Commonly known as a bridge, the structure is more like a causeway supported by granite seawalls. Historically, there were gates in the arched opening and the structure acted as a dam.

Christian Shore/Geographic Context:

Christian Shore is the name by which the neighborhood on the northwest shore of the North Mill Pond has long been known.[2] The historic district reflects the early settlement of this waterfront neighborhood, and residential development during the early 1800s. Christian Shore is bounded on the southeast by the North Mill Pond and is located on both sides of Maplewood Avenue above the bridge. The neighborhood consists primarily of houses from the Federal and Greek Revival periods. On the downtown side of the Maplewood Avenue Bridge, a cluster of historic houses line the southwest side of the street, backing up to the shore of the pond. This historic section of

[1] For instance, the files of the NH Dam Bureau (Concord) and the minutes of the Portsmouth City Council (Portsmouth). Contemporary newspapers would also be an obvious source. The Portsmouth Athenaeum, Portsmouth Public Library and Strawbery Banke were consulted for earlier Preservation Company work relating to the Christian Shore neighborhood, but could possibly yield additional information about the Maplewood Avenue bridge.

[2] This part of Portsmouth has been known as "Christian Shore" since the eighteenth century. According to local tradition, some of the families living in the neighborhood were of a religious sort, and others who were regulars at Foss's tavern across the creek in the old North End, sarcastically referred to going back home as leaving for "Christian Shore" (Candee 1992:29).

Maplewood, with the adjacent North and Union Cemeteries, are surrounded by areas of modern buildings and parking lots, cleared by Urban Renewal in the 1970s. From the eighteenth through the nineteenth centuries, a large shipyard was located on the water east of the bridge where Raynes Avenue is now.

The North Mill Pond has long served as a dividing line between the downtown and the northwestern edge of the urban center. The tidal pond was created in the 1760s when a dam and the original bridge at the Maplewood Avenue crossing were erected. The pond originated as a tidal inlet off the Piscataqua River at the mouth of a fresh-water creek. This was first known as Strawbery Banke Creek, then Fresh Creek (Foster 1876:69), and Islington Creek by the early 1800s (Hales 1813).

Historic Background:

In the 17th century, Fresh Creek was the northwest boundary of the large tract of land owned by Richard Cutt, which encompassed much of what is now downtown Portsmouth. From the 1660s, the creek at the head of the tidal inlet (near Bartlett St.) provided waterpower for a mill owned by John Cutt. The mouth of the creek remained an open waterway during this period, and shipbuilding was carried out along the shore (Candee 1992:1; Foster 1876:69). Settlement north of the creek was begun in the 1660s, first by the Jackson family, whose house still stands. They were shipbuilders, coopers and farmers. For the first hundred years, there was no "Maplewood Avenue Bridge." Instead, the short crossing of the creek was made by boat and the creek served as the northern edge of Portsmouth's developing urban core. On the southeast (downtown) bank of Fresh Creek, Nathaniel Meserve (1705-1758) established a shipyard (where Raynes Avenue is now) in the 1740s.

The first bridge and dam (which created the North Mill Pond), and what is now Maplewood Avenue which ran over it, originated in the 1760s. In 1764, the Meserve property on the downtown side of the creek was purchased by Peter Livius, a merchant recently arrived from Europe. He petitioned the Town for the right to dam the creek for power "capable of turning seven or eight different kinds of works besides four grist mills," in exchange for building a bridge at the dam (Candee 1992:29). The original bridge was 20' wide and 30' long, with a draw span. The dam and floodgates were located underneath (Brighton clippings binder 8:10). Portsmouth Public Works files show the bridge as early as 1810 ("Plan of the Bridge at the North Part of the Town of Portsmouth", Akerman, 1810, PPW files). Historic maps show that the grist mill stood on the north side of the bridge, just east of the center. Further investigation of historic photographs and plans is needed to discern the original form and appearance of the bridge.

Mill-owner Peter Livius lived in the later Boyd-Raynes House (not extant) on the downtown side of the bridge. In addition to the mill, he kept the shipyard and wharf. When he left the country as a Tory prior to the Revolution, the property was purchased by shipbuilder George Boyd who later enlarged the house into a massive gambrel roofed building which stood near the southeast corner of the bridge until the early 20th century (Candee 1992:29; Gurney 1902:41).

Maplewood Avenue was originally called Mill Street and later Elm Street. The "North Bridge" (or "North Mill Bridge") connected Christian Shore and the outlying rural area beyond more directly with the developing commercial center. Settlement on the north side of the bridge increased (Grant 1774; Candee 1992:2). At this time, the road to points north turned from present-day Maplewood Avenue onto Dennett Street to reach Woodbury Avenue (Grant 1774). The upper part of Maplewood Avenue, originally North Road, was built in the 1790s as a connection to the new Piscataqua Bridge (Newington-Durham) and the First New Hampshire Turnpike to Concord. This became the main route in and out of Portsmouth. Land in the vicinity was subdivided and advertised for its proximity to the highway: "The largest part of the country produce passes by these lots into

town and there are several good stands for stores" (Candee 1992:30). Maplewood Avenue acquired its current name in the 1880s along with many Portsmouth streets, replacing Elm and North streets (Brighton clippings binder 8:4).

The shores of the North Mill Pond were an active industrial area. The gristmill on the bridge was owned in the early 1800s by Captain John Bowles who lived nearby on Maplewood and had a wharf adjacent (Candee 1992:30). Several tanneries operated in the neighborhood. The third Nathaniel Jackson (1741-1810) was a tanner, with a slaughterhouse, bark house and tan yard on the waterfront northeast of the bridge. Water was needed for the tanning process and tidal power was used to grind the bark. Cordwainers or shoemakers worked in the area using leather from the tanneries. The Dodge family had a pottery near the shore southwest of the bridge throughout the middle of the 19th century (Candee 1992:31). Moses H. Goodrich was the owner of the tannery on the northwest corner of the bridge from the 1830s to the 1890s. Many area residents were employed in the large shipyard southeast of the bridge, then owned by George Raynes. The mid-19th century miller in the gristmill on the bridge was William Rand who lived nearby (Walling 1850; Bureau of the Census 1850b). It remained in operation into the 1880s, at which time it was owned by Eastern Railroad and leased to the City (Garvin and Griggs 1995:46). It was then the only gristmill in Portsmouth and employed three men (Bureau of the Census 1880b). By 1887 the building was standing vacant and in 1894 it was dismantled (Sanborn 1887; Brighton clippings binder 8:10). In 1895, Moses H. Goodrich retired as the last tanner and currier in Portsmouth (Candee 1992:31).

Originally, much of the transport of freight to and from tanneries and other industries in the area was by boat and there were wharves on the shore on either side of the bridge. After the railroad and steam power were introduced in the 1840s, the southeast shore of the North Mill Pond was the site of the rail yards and the focus of industrial activity.

Throughout the late 19th century, pollution in the North Mill Pond was a public issue. The pond was an outlet for waste, including that from the breweries at the west end, but the pond's many inlets retained some water at low tide. The City worked to keep the pond cleaner by flushing it on a regular basis. Sewers to carry off the brewery wastes (directly to the Piscataqua) were built in the 1880s (Brighton clippings binder 8:10).

Construction of Existing Bridge:

Meanwhile, the existing North Bridge on Maplewood Avenue was in poor condition. The pre-1896 bridge, likely only one of many that had been built on the site, was of stone construction. It had a gated opening (at the location of the arched opening of the present bridge) and to the east a "bridge" section with three supporting piers and four openings. In 1893 the City began making plans to replace the old bridge and the next year the mill at the bridge was torn down. The new stone bridge with a single granite arch opening was designed in 1896 by civil engineer Charles A. Putnam of Salem, Massachusetts. [3] Construction took place in 1896-97 (Brighton clippings binder 8:10). The contractor for the project was Sugden Brothers, general contractors and builders in Portsmouth. They employed stone cutters from Durham for the project and the granitic igneous rock, likely came from there.[4] In addition to smaller operations and the splitting of the many glacial erratic boulders, a

[3] Putnam was a surveyor as well as an engineer and his advertisement in an 1884 city directory suggests that he specialized in work for railroads, sewage systems for cities and towns, water supply systems and river and harbor improvements. (1884 Briggs & Co. Essex County Directory Boston).

[4] An obituary from 1899 notes, "Mr. Stevens was an excellent stone cutter and was employed in the building of the new stone arch bridge over the North Mill pond two years ago with several other men from the Durham quarries."

good-sized late -19th century granite quarry operated in Durham, which was underlain by sienitic granite ledge, in the late 19th century. According to the 1896 City annual report, Sugden Brothers were paid a total of $7,600, which apparently included the materials. A small amount of lumber was purchased from J.H. Broughton. M.H. Goodrich was paid for land and damages. F.C. Hoyt was paid for engineering services, Charles A. Putnam for the plans and specifications.

Additional research may reveal more specific information about the construction of the current Maplewood Avenue Bridge, but based on the 1896 Putnam plan, it appears that much of the current bridge dates to this 1896 building effort; the central arched opening and north elevation, for instance, closely follow the plan. Whether the south wall was originally constructed following the Putnam plan is unclear. The 1896 drawing shows the wall extending the full width of the North Mill Pond, however, as it currently exists, the south wall ends where the openings in the earlier bridge are shown on the Putnam Plan. This middle portion of the south wall was apparently filled and rip rapped, perhaps as a cost saving measure, an instability repair, or to help reduce water seepage. Additional research would need to be done to understand the historic construction and operation of the Maplewood Avenue Bridge. The central arched opening was designed to have flood gates; although no longer needed for water-power, the tidal North Mill Pond still served to flush drainage systems not covered by the city sewers.

Subsequent Repairs/Maintenance:

The intended flood gates were not installed until a few years later (Brighton clippings binder 8:10). In addition to allowing filling of the pond for flushing, the gates were needed to retaining the full pond in winter to form ice for skating and horse racing which were popular with local residents.

Repairs were needed as early as 1900, when the newspaper reported the new Maplewood Ave. Bridge was being undermined with water creating holes in the base of the structure (*Portsmouth Herald* 5 /19/1900).

Shortly after the new bridge was built, Maplewood Avenue became the route of one of Portsmouth's streetcar lines. Early in 1899, the electric light and telephone poles on the bridge were relocated from the south to the north side, to be in-line with the trolley poles (*Portsmouth Herald* 3/1/1899). Automobiles were introduced to the bridge not long after and Maplewood Avenue from that point forward was to be a main route between the downtown and Routes 4 and 16 to points north and west.

42. Applicable NHDHR Historic Contexts:

78. Outdoor recreation in New Hampshire.
87. Street railroads in New Hampshire, 1880-1950.
88. Automobile highways and culture, 1900-present.
97. Engineering in New Hampshire, 1623-present
-- Tidal structures in New Hampshire

43. Architectural Description and Comparative Evaluation:

The Maplewood Avenue Bridge carries Maplewood Avenue over the North Mill Pond and over fill likely placed for this and earlier versions of the structure. Although commonly referred to as a bridge, it combines elements of a number of types of structures. Essentially, the structure consists of two parallel, battered stone walls which retain fill and a central arched bridge (over the waterway). It was designed and today functions largely as a retaining wall supporting the causeway fill. Historically, however, with gates on the central arched opening that are no longer extant, it

occasionally acted as a dam containing the North Mill Pond water. The structure also acts to a small extent as a seawall; although the walls provide protection from small wave and tidal current flow erosion, the walls do not have to resist the kinetic energy of ocean waves, as do true seawalls.

The Maplewood Avenue Bridge is a mortared, vertical granite wall with a central arch. It is constructed as a typical stone gravity retaining wall with its water side exposed and its land side built into the earth.

The bridge is approximately 300' long with sections of wall typically about 10' high, with a maximum height of 19' on the north side at the arched opening. The structure is approximately 45' wide. Based on the 1896 drawing, the north wall has a 9' base width, 2.5' cap width and 1H:12V front face batter.

The semi-circular arched opening in the center of the structure (the "bridge" section) is 28' in length and has a radius of 15.5 feet. It is about 17' high and 8'9" from the top to the spring line. The exposed arch face stones are stone-faced granite blocks approximately 1' wide by 1.5' high, with mortared joints (partially missing below high tide level). It has a non-original grouted corrugated steel plate arch culvert insert which is founded on cast-in-place concrete footings (1976).

The walls of the structure itself are rough squared stone range masonry. These quarry-faced granite stones are in courses about 2' high with stone blocks varying from about 2' to 6' in length. The horizontal joints between courses vary from tight to open as much as 6" and in-filled with chinking stones, due to the variation in stone block height. The vertical joints between stone blocks also vary from tight to open 6" with infill of chinking stones and/or Portland cement mortar. Below high tide level, most of the surficial mortar is missing; however Portland cement or lime mortar remains farther back in the open joints. Above high tide level most of the stone joints are mortared. This mortar is poorly finished and appears to be a hand-packed joint repair (no tooling apparent) and was probably not installed by a mason.

Most of the face stones show quarry marks, the most common of which are commercial feather and wedge splitting holes (½" dia. by 3" deep typ.) spaced 3" to 6" on center along edges. Some of the drill holes have round bottoms, while a few adjacent holes have conical bottoms, suggesting different drill steel bitts were used (some likely worn). One stone has feather and wedge splitting holes on the mid face where a protrusion was removed and another shows a blast drill hole (1.375" dia.) along the face of the stone. The plug-and-feather technique confirms that the stone cutting dates to the post-1830 period (Garvin ND). The exposed faces of the stones have likely been rough worked with a face hammer; however the faces are now weathered.

Just above high tide level on both sides of the arched opening are the remains of iron/steel fasteners that were likely connections from prior tide gates.

As discussed below, on the north wall there is an attached sewer pipe and areas in-filled with brick.

Alterations

Likely the first alteration to the Maplewood Bridge was the addition of the flood gates which were constructed by Solomon Littlefield for $1050 in 1899 (Portsmouth Herald 1/23 and 10/18/1899).

Some time after 1896 and before 1936, the North Elevation wall may have been rebuilt on each side of the central arch to allow sewer main penetrations. The old sewer line appears to be welded steel pipe. The actual date of installation is not known, but a sewer main support was detailed on a Public Works sketch dated 1936. Due to the shallow penetration angle, the north walls are not straight and follow the sewer pipe alignment, with substantial infill of brickwork around the pipe penetrations.

The present city gravity flow sewer main penetrates through the arch culvert, though the date of this penetration is not known either.

Other alterations to the wall include a concrete cap and sidewalks on top of the granite wall stones.

The historic 1896 pipe railing was replaced with the current steel railing at an unknown date.

As discussed above, in 1976 a grouted corrugated steel plate arch culvert was inserted into the semi-circular arch culvert.

Present Conditions

The North wall shows signs of leaning offshore and of settlement. As observed from a 1948 archive drawing, at that point the wall was already being monitored for movement. The wall stone over the arched opening (on timber pile-supported footings per archive drawings) is higher than the rest of the North wall and the North wall to the west of the opening also has the most severe lean offshore (up to -1H:12V), with opened joints, and some block-to-block sliding. The earth fill slope to the east of the arched opening may also be repair material, placed to stabilize a moving wall. The sidewalk and roadway above the North wall shows signs of differential settlement in the vicinity of the arched opening, with perhaps 3" of differential settlement on each side of the culvert, road pavement cracking, sidewalk cracking and drainage problems.

The 1896 drawing indicates that the outer face of the wall was to lean inshore at a 1H:12V batter, however the 9' base width of the wall footing was probably insufficient for a 19' high gravity wall founded in the tide zone especially given modern highway vehicle loads. The North wall was probably also compromised by the sewer line penetrations (pipe now corroded through), which are almost parallel with the wall and which have been patched in with brickwork, which is not a durable material in a salt water freeze/thaw environment.

The South wall also has signs of leaning offshore (up to -0.4H:12V), and of settlement similar to the North wall and there is a noticeable offshore bulge at mid height of the wall. Many of the mortar-pointed stone joints have opened, cracking the mortar, in the vicinity of this bulge. A clay drain pipe outfall at the western end of this wall is cracked and appears to be collapsed within the wall and this may be contributing to the loss of backfill soil.

To the east of the arched opening on the South wall, there is approximately 90 linear feet of earth fill slope, which in comparison to the 1896 drawing, suggests this was placed in front of the wall, perhaps as an instability repair, or to help reduce water seepage (this area contains the four filled original water passages shown on the 1896 drawing). The slope area does have some active erosion.

To the east of this slope is another 60 linear feet of stone seawall that appears to be in generally satisfactory condition with only some upper stone blocks pushed offshore about 1" relative to the blocks below.

Comparable Structures

The Maplewood Avenue Bridge/Seawall is unique in that it combines elements of dams, retaining walls, seawalls, causeways and bridges. For this reason there is no single appropriate comparable. However, there are many seawalls in the area that have similar stonework and that have some of the same functions.[5] Although there is no comprehensive historical evaluation of seawalls in the Portsmouth area, there are many examples of similar granite range masonry seawalls and at least one other stone arch culvert in the local area. Comparable structures discussed here are range masonry structures rather than rubble masonry or random ashlar/ broken range structures. Many appear to be of a similar vintage, in some cases, with superior stonework and construction.

There are many stone seawalls of unknown dates protecting both private and public property along the waterways. Most differ significantly from the Maplewood Avenue Seawall in length, design and/or materials. Particularly common are simple rubble walls using local stone that retain filled land and prevent erosion. Other common types of walls are more substantial coursed granite walls, often associated with public facilities or historic structures. Examples of the coursed range granite walls can locally be seen in Portsmouth, Kittery and New Castle. Comparable examples of granite arch culverts in the seacoast area are more difficult to find, however one example in Seabrook is presented.

Prescott Park Seawalls, Portsmouth:

Prescott Park contains two historical granite seawalls of similar size to the Maplewood Avenue walls (ages unknown). Note that the length of granite seawall in the vicinity of the whale sculpture is clearly a modern wall using modern saw-cut granite blocks. The historical walls are constructed of stone faced cut granite blocks, dressed to maintain consistent course height and narrow joints. Some of the blocks retain commercial feather and wedge tool marks along the edges. There are indications that these walls use header and stretcher construction and are well built with no apparent signs of displacement or differential settlement. The granite cap stones are uniform and have a flat medium pointed finish on the top surface and coarse pointed exposed face finish, which is in strong contrast to the modern length of wall with thermal finished saw cut top surfaces. These historical walls are similar to Maplewood Avenue, but are of a higher quality construction with more labor intensive stone work.

Wentworth Gardner House Seawall, Portsmouth:

This is a granite seawall of similar size to the Maplewood Avenue walls. This wall is constructed of quarry-faced and stone-faced cut granite blocks, dressed to maintain consistent course height and straight joints. Most of the blocks retain commercial feather and wedge tool marks along the edges. The granite cap stones are uniform and have a flat top surface and stone faced exposed vertical face. The age of this wall is not known and the wide unpointed mortar joints which lack apparent chinking stones, along with the fine finish to the top surface (which may be a sawn surface with thermal finish) suggests this may not be an historical wall. This wall is similar to Maplewood Avenue, but with a higher quality construction with more labor intensive stone work, though it may not be historical.

Mechanic & Gates Street Seawall, Portsmouth:

(Located behind the City sewage pump station on Mechanic Street opposite Gates Street.) A portion of this seawall is of granite block construction (similar to the Maplewood Avenue walls) and a portion is a mixture of granite and local rubble stone construction with a granite block cap. This wall is constructed of quarry faced granite blocks. Most of the granite blocks retain commercial

[5] Another possible route would be to look at comparables in the NHDOTstone culvert survey.

feather and wedge tool marks along the edges. This wall has documented stability problems dating back to the 1950's and may be the former Pierce Island bridge abutment (construction date unknown). This historical wall is similar to Maplewood Avenue, however it is of a lower quality construction and partially uses local rubble stone.

Marconi Wharf, Mechanic St, Portsmouth:
This seawall is of granite block construction similar to the Maplewood Avenue walls. It is a granite rough coursed rubble stone construction, apparently dry set with chinking stones. This wall is constructed of quarry faced granite stones, with minimal working. Construction date is unknown. This wall is similar to Maplewood Avenue, but of a slightly lower quality construction (less squared) and slightly more variation in horizontal joint alignments.

Fort Constitution, New Castle:
Fort Constitution contains granite walls built in 1866 and while the function of these walls was to enclose cannons, they also function as a retaining wall and seawall. These walls are constructed of drafted-edge stone-faced cut granite blocks, dressed to maintain consistent course height and tight joints. There are indications that these walls use header and stretcher construction, they are very well built and represent the highest quality of exterior granite masonry construction. The exposed interior faces of the granite blocks have a high quality peen-hammered finish. The stone joints are tight (¼" to ½" typ.) and are mortared at least 2' deep (deteriorated in places). The stones around the cannon ports do contain shear keyways in the vertical joints. These historical walls are similar in age and masonry to Maplewood Avenue, but are of the highest quality construction with much more labor intensive stone work.

Fort McClary, Kittery:
Fort McClary contains granite walls built in 1868 which are very similar in construction to Fort Constitution (likely the same specifications). The function of these granite block walls was as a fortification, but here most of the granite block walls function as retaining walls, with fewer areas built to enclose cannons. These walls are constructed of drafted-edge stone-faced cut granite blocks, dressed to maintain consistent course height and tight joints. There are indications that these walls use header and stretcher construction, they are very well built and represent the highest quality of exterior granite masonry construction. The exposed interior faces of the granite blocks have a high quality peen-hammered finish. These historical walls are similar in age and masonry to Maplewood Avenue, but are of the highest quality construction with much more labor intensive stone work.

Cains Brook Culvert, Seabrook:
A granite arch culvert existing over Cains Brook in Seabrook at the former railroad line behind the Seabrook Home Depot store. Based on the history of the Eastern Railroad extension from Newburyport to Portsmouth, it is likely that this culvert was built around 1840. The culvert arch is faced with drafted edge peen-hammered dressed granite blocks. The interior of the arch culvert is much rougher granite rubble construction. This historical granite arch culvert is somewhat older than the Maplewood Avenue structure, and its masonry is superior to that at Maplewood Avenue; it has a pointed gothic style arch and is faced with higher quality granite stonework.

44. National or State Register Criteria Statement of Significance:

As discussed above, the Maplewood Avenue Bridge is a contributing element to the Christian Shore Historic District. Although the limited nature of this document has not permitted a detailed investigation of the structure, it is evident that the Maplewood Avenue Bridge is a valuable and highly significant resource to the City of Portsmouth and is clearly eligible on an individual basis for the National Register under Criterion A and Criterion C.

Under Criterion C, in the area of Engineering, the Maplewood Avenue Bridge is significant as an unusual late 19th century design which combines elements of bridge, dam, causeway, and seawall. Additional research must be done to fully understand the design and its engineering significance. The bridge also illustrates late nineteenth century retaining wall masonry construction techniques, including stone arch construction.

Under Criterion A, the structure has significance relating to a number of different areas. Amongst these is its role in controlling the flow of water into the North Mill pond (and related infrastructure improvements) and as part of a primary transportation artery into Portsmouth.

45. Period of Significance:

1896

46. Statement of Integrity:

Although there are a number of issues relating to the structural integrity of the wall as discussed above, all appear to be remediable and overall the Maplewood Avenue Bridge retains strong integrity. Alterations to the original fabric include the replacement of the railing, the sewage pipe infiltration on the north elevation, and the potential fill on the east side of the south elevation.

47. Boundary Discussion:

The boundary of the individually eligible resource is the footprint of the structure and roadway. The structure is also included in the boundary of the Christian Shore Historic District.

48. Bibliography and/or References:

Brewster, Charles W.
1971 *Rambles About Portsmouth, First Series*. Reprint of 1859 edition. Somersworth, NH: New Hampshire Publishing Company.

Brewster, Charles W.
1972 *Rambles About Portsmouth, Second Series*. Reprint of 1869 edition. Somersworth, NH: New Hampshire Publishing Company.

Brighton, Raymond
n.d. Clippings binders, in collection of Portsmouth Athenaeum.

Brighton, Raymond A.
1979 *They Came to Fish, Volumes One and Two*. Reprinted 1994. Portsmouth, Peter E. Randall Publisher.

Bureau of the Census
1850-1880a Industrial Census schedules. Collection New Hampshire State Archives, Concord.

Candee, Richard M.
1992 *Building Portsmouth: The Neighborhoods and Architecture of New Hampshire's Oldest City*. Portsmouth, NH: Portsmouth Advocates, Inc.

Candee, Richard M.
2006 *Building Portsmouth: The Neighborhoods and Architecture of New Hampshire's Oldest City, Second Edition*. Portsmouth, NH: Back Channel Press for Portsmouth Advocates, Inc.

City of Portsmouth Annual Report for 1896. Archive.com.

City of Portsmouth Seawall Inspection Report", RFP 49-07, Waterfront Engineers, 2009

Dolph, James and Ronan Donahoe
1997 *Images of America Around Portsmouth In The Victorian Era The Photography of The Davis Brothers*. Arcadia Publishing Dover, New Hampshire 1997.

Foss, Gerald D.
1994 *The Old Photographs Series: Portsmouth*. Augusta, ME: Alan Sutton.

Foster, Joseph H.
1876 *The Portsmouth Guide Book*. Portsmouth, NH: Journal Steam Press.

Garvin, James L. and Susan Griggs
1995 *Historic Portsmouth: Early Photographs from the Collection of Strawbery Bank*e. Original text 1974, revised 1995. Portsmouth, NH: Peter Randall Publisher.

Garvin, James L.
1999 "Bridges of the Piscataqua," typescript on file at the New Hampshire Division of Historical Resources, Concord.

Grossman, Nancy
2005 *Place Names of Portsmouth*. Portsmouth, NH: Placenames Press.

Gurney, C.S.
1902 *Portsmouth Historic and Picturesque*. Portsmouth, NH, reprinted 1981.

Portsmouth Athenaeum, vertical files – street files.

Portsmouth Herald, Ancestry.com.

Portsmouth Public Works - historic plans.

Preservation Company
2006 Christian Shore Historic District NHDHR Area Form. On file at New Hampshire Division of Historical Resources, Concord.

Plans

"Plan of the Bridge at the North Part of the Town of Portsmouth", Akerman, 1810, City of Portsmouth DPW archives tube 621.

"Maplewood Avenue Bridge at Portsmouth, NH", Charles A. Putnam, July 1896, City of Portsmouth DPW archives tube 1839.

"Maplewood Avenue Bridge" Highway Dept. plan and profiles, 1948, Portsmouth DPW archives.

External sewer line support detail, L.E. Scruton, 1936, Portsmouth DPW archives.

City utility plan, March 1976, Portsmouth DPW archives

Maps

Beers, F. W.
1876 *Map of the City of Portsmouth, New Hampshire.* New York: F.W. Beers & Co. Collection of the Portsmouth Athenaeum.

Chace, J. Jr.
1857 *Map of Rockingham County, New Hampshire.* Philadelphia: Smith & Coffin

Grant, James
1774 *A Plan of Piscataqua Harbor, the Town of Portsmouth*. Collection of the New Hampshire Historical Society, Concord, N.H.

Hales, J.G.
1813 *Map of the Compact Port of the Town of Portsmouth in the State of New Hampshire.* Boston: T. Wightman

Hurd, D.H.
1892 *Town and City Atlas of the State of New Hampshire.* Boston: D.H. Hurd

Merrill, Phineas
1805 Plan of Portsmouth, New Hampshire. Microfilm collection of New Hampshire Historical Society, Concord.

Portsmouth City Directory
1878 Map of Portsmouth, on file at the Portsmouth Public Library.

Ruger, A.
1877 Bird's eye view of Portsmouth, Rockingham Co., New Hampshire 1877. A. Ruger del. D. Bremner & Co. Lith.

Sanborn Map and Publishing Company
1878, 1887, 1892, 1898, 1904, 1910, 1920, 1939, 1956 (revised), 1970 (revised). *Portsmouth, New Hampshire.* New York: Sanborn Map and Publishing Co. Microfilm Collection New Hampshire Historical Society.

Walling, H.F.
1850 *Map of the City of Portsmouth, New Hampshire.* Portsmouth, NH: W. Brewster

Historic Photographs
Portsmouth Athenaeum files
Thayer Cumings Library, Strawbery Banke Museum

Surveyor's Evaluation

NR listed:	individual	☐	NR eligible:		NR Criteria:	A	☒
	within district	☐	individual	☒		B	☐
			within district	☒		C	☒
Integrity:	yes	☒	not eligible	☐		D	☐
	no	☐	more info needed	☒		E	☐

CITY OF PORTSMOUTH

MAPLEWOOD CAUSEWAY DESIGN NEARS COMPLETION

Jan. 14, 2010

FOR MORE INFORMATION:
Peter Britz, Environmental Planner, 610-7215

PORTSMOUTH – "The City is nearing completion of the design work to replace the deteriorating culvert beneath the Maplewood Avenue causeway across the North Mill Pond in a historically appropriate manner that will help the environment while enhancing public recreation opportunities", Deputy Public Works David Allen said.

The design, which was entirely paid for with federal funds, calls for replacement of the corrugated steel culvert with three concrete arched culverts. This change will result in a wider opening that improves tidal flow in and out of the North Mill Pond, which will help the coastal habitat while providing easier access for personal watercraft like kayaks. The causeway reconstruction also will provide improved bicycle and pedestrian access.

A key aspect of the design is to also restore the deteriorated seawalls adjacent to the culvert, rebuilding them with granite and facing them with natural stone to provide a historic appearance to the project. A sketch from 1896 indicates the causeway originally functioned as a dam that supported multiple tidal water-powered mills.

Funding for the project was provided by the National Oceanic and Atmospheric Administration (NOAA) Restoration Center in conjunction with the New Hampshire Department of Environmental Services Coastal Program. Although federal grant money has not yet been made available to begin construction, City officials said having the design in place will speed the project once funding becomes available, currently identified in the City's 2012 Capital Improvement Plan.

##

NEW HAMPSHIRE COASTAL PROGRAM

NOAA

NHDES