City of New London

Department of Finance-Purchasing Agent
13 Masonic Street • New London, CT 06320 • Phone (860) 447-5215 • Fax (860) 447-5297

Invitation for Bids

ADDENDUM

Bid No.: 2018-11

Addendum No.: 3 **Date Issued: 8/10/2018**

Green Harbor Beach and Pequot Avenue Storm Drainage

Opening Date and Time: August 16, 2018 @ 2:00 P.M.

Bidders Notes: This Addendum is issued to provide all bidders with notice of answers to questions submitted by interested parties. **PLEASE NOTE THAT ONLY CONTRACTORS THAT ATTENDED THE MANDATORY SITE VISIT ON AUGUST 7, 2018 ARE ELIGIBLE TO BID ON THIS PROJECT.**

All other terms and conditions remain the same.

This Addendum cover page must be signed and returned with your bid.

_____ _____

Authorized Signature of Bidder Company Name

Return Bid To:

Dedra Aker, Purchasing Agent
City of New London
13 Masonic Street
New London, CT 06320

Bids cannot be accepted after the Bid Opening Date and Time indicated above.

City of New London

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ADDENDUM 3

Questions from Contractors with answers for Bid No. 2018-11 Green Harbor Beach and Pequot Avenue Storm Drainage:

Question 1: I would like to have confirmed the thickness of asphalt that will be put back down over the area labeled "full depth reconstruction". The details are only showing what looks like to be temporary and permanent patches which will be on other sections of the project.
Answer: The pavement structure proposed for the area of full depth reconstruction is shown on the typical section for Pequot Avenue located on Sheet 2, Typical Cross Section and General Notes. The required cross section includes 7" of asphalt material (bituminous concrete) consisting of 2" HMA S0.375 on 5" HMA S0.5. This bituminous concrete is to be placed on 8" of Processed Aggregate Base and 12" of Subbase.

Question 2: Please clarify whether flagman for traffic management can be our own employees or whether they need to be city police.
Answer: Flaggers can be your own employees as long as they are Certified Flaggers.

Question 3: Please provide Geotechnical Report for this project.
Answer: The Geotechnical Report for this project is attached.

Question 4: Please outline where we can stage equipment and materials during the project.
Answer: Equipment and materials can possibly be staged at the Green Harbor Parking Lot or a section of the Municipal Lot across from Fred Shanty.

Question 5: Are there "Liquidated Damages" on this project? What is the dollar value?
Answer: Yes, there are Liquidated Damages and the dollar value is to be determined. December 31, 2018 is also a firm completion date.

Question 6: Do the concrete collars for the ductile iron pipe have to be cast in place or can we utilize precast collars?
Answer: Pre-cast concrete collars will be acceptable pending review of shop drawings indicating how and when they will be attached to the pipe.

Question 7: Can traffic be detoured during working hours?
Answer: Traffic can be detoured as necessary. Contractor should make all attempts to keep one lane open.

Question 8: There is a gas line that's noted to be relocated by others. Will this be complete before we start our work?
Answer: Eversource is going to relocate the gas line tentatively starting the last week of August.

END OF ADDENDUM 3

Geotechnical Report

Pequot Avenue Storm Drainage
95 – 150 Pequot Avenue
New London, Connecticut
October 30, 2017

MILONE & MACBROOM

Engineering | Planning | Landscape Architecture | Environmental Science

Geotechnical Report

Pequot Avenue Storm Drainage
95 – 150 Pequot Avenue
New London, Connecticut
October 30, 2017

Prepared for:
City of New London
13 Masonic Street
New London, Connecticut 06320

Prepared by:
MILONE & MACBROOM, INC.
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773
www.miloneandmacbroom.com

MMI #2389-43

Peter M. Heynen, P.E.
Director of Geotechnical Engineering Services

Marie G. Bartels, P.E.
Geotechnical Engineer

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FIGURES

TABLES

APPENDIX

1.0 INTRODUCTION

1.1 Purpose

Prepare a Geotechnical Report presenting the results of the recent subsurface explorations and geotechnical recommendations for the proposed Pequot Avenue Storm Drainage system in New London, Connecticut.

1.2 Scope of Services

Our work included the following tasks:

- Preliminary Geotechnical Engineering
  - Reviewed Project Requirements
  - Visited the Site
  - Prepared Subsurface Explorations
  - Procured and Coordinated Subcontractor for Borings
  - Cleared boring locations through "Call Before You Dig"

- Subsurface Exploration Program
  - Collected split spoon samples
  - Characterized subsurface and groundwater conditions
  - Observed five test borings

- Geotechnical Analysis and Report
  - Reviewed proposed storm drainage drawings
  - Analyzed collected data from subsurface explorations
  - Prepared digitized boring location plan
  - Prepared digital boring logs
  - Summarized field data
  - Provided pipe support recommendations
  - Provided construction considerations
  - Prepared geotechnical report signed and stamped by CTPE

1.3 Authorization

Our work was performed in general accordance with our proposal for Geotechnical Engineering services dated July 20, 2017.

2.0 PROJECT AND SITE INFORMATION

2.1 Site Information

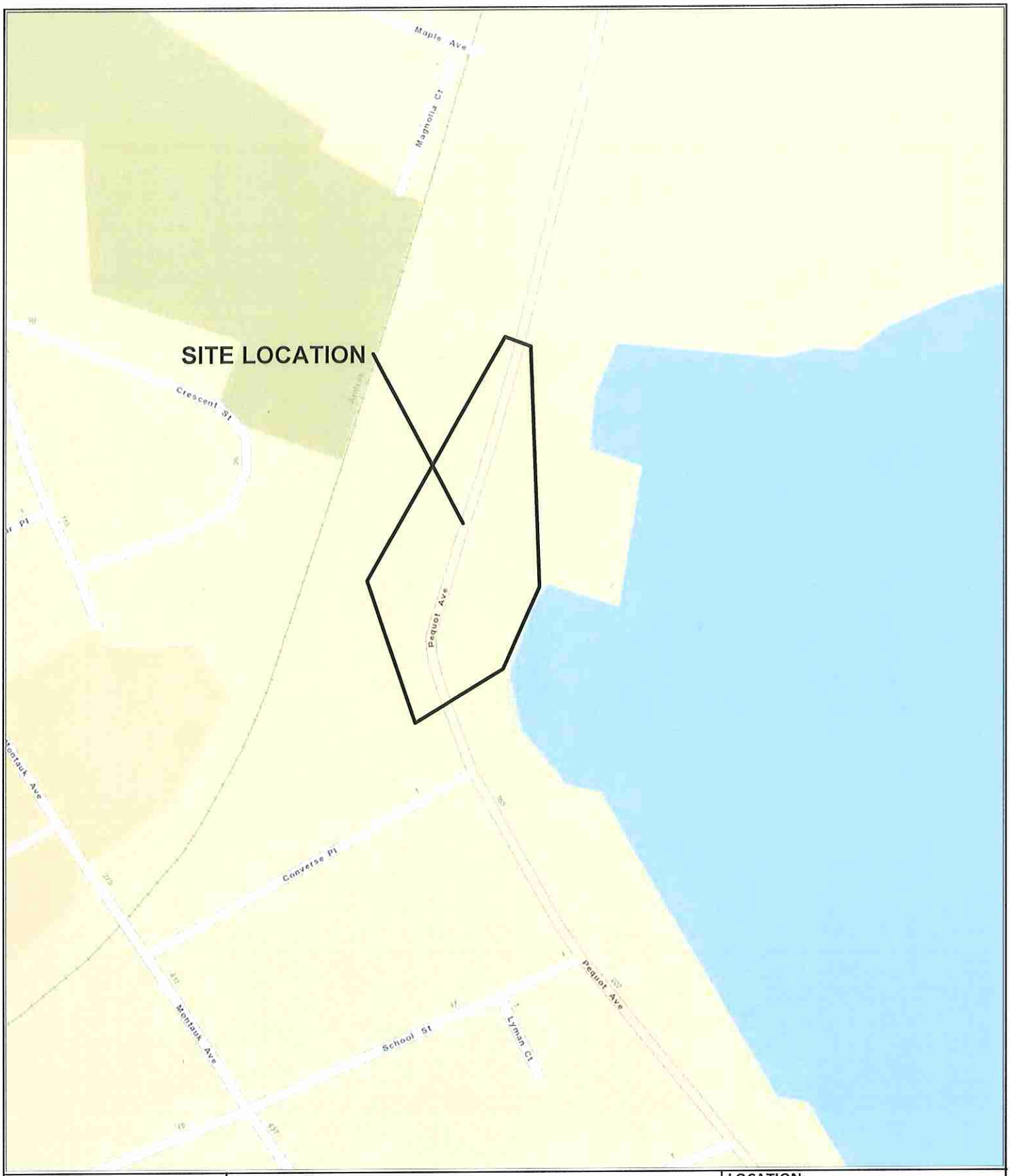
The project site is approximately located between 95 and 150 Pequot Avenue by Greens Harbor in New London, Connecticut, as shown on Figure 1. Elevations in this section of Pequot avenue vary slightly from about El. 7 on the south end, down to El. 4.5, up to El. 7, and to El. 4 on the north end.

Existing features include a beach located on the east side of the south end, where an existing 24-inch cast iron pipe protrudes from the beach surface at the water line. Green Harbor Park is located on the west side of the south end. Several residential homes line the street, as well as a Ferry Slip on the east side and Turning Tide on the west side, both on the north end.

2.2 Project Description

Based on available drawings, we understand the improvements proposed at this site include:

- A Junction Chamber located south of 130 Pequot Ave.
- A 160-foot long section of full depth roadway construction south of the junction chamber, including 130-feet of 12-inch Reinforced Concrete Pipe (RCP), six catch basins, three man-holes, and associated laterals.
- About 110-feet of 12-inch RCP extending south of the full depth roadway construction. Includes 2 catch basins, 1 manhole, and associated laterals
- A 260-foot long section of 4'x4' concrete box culvert extending from the Junction Chamber and through the beach area. Will empty about 100 feet beyond the end of the existing 24-inch cast iron pipe.
- About 370-foot length of 24-inch RCP extending north from junction chamber. Includes 4 man-holes, 1 specialty man-hole, two catch basins, and associated laterals.



SOURCE(S): 1992 Surficial Materials Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri	**SITE LOCATION PLAN** **FIGURE 1**	**LOCATION:** **NEW LONDON, CT**
N **PEQUOT AVENUE DRAINAGE IMPROVEMENTS** MXD: J:\2389-43\Geotechnical\figures\Site Location Plan.mxd	Map By: R.H. CHECKED: M.B. MMI#: 2389-43 DATE: 09/14/2017 Scale: 1 inch = 250 feet	MILONE & MACBROOM 99 Realty Drive Cheshire, CT 06410 (203) 271-1773 Fax: (203) 272-9733 www.miloneandmacbroom.com

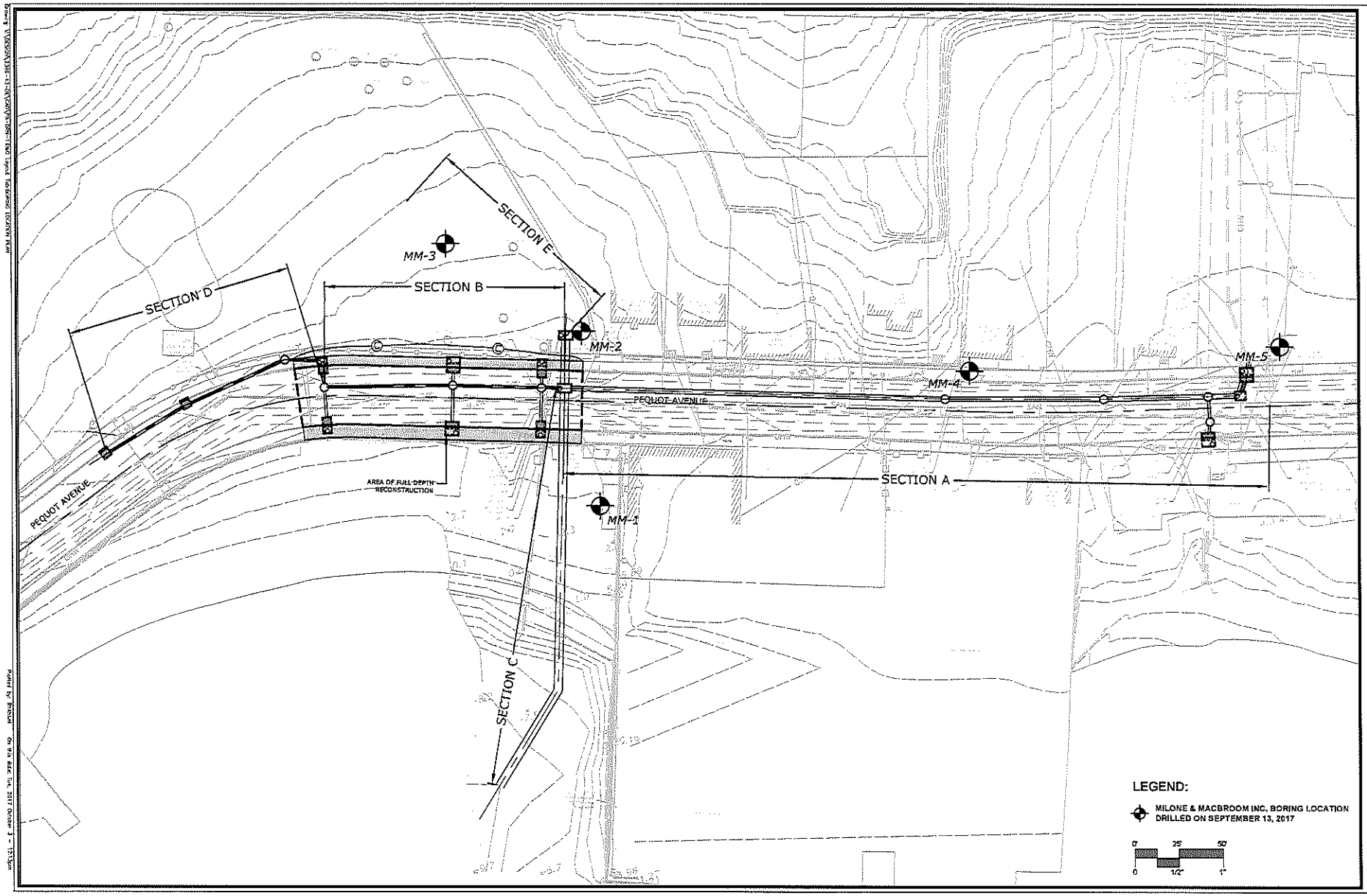
3.0 EXPLORATION PROCEDURES

3.1 Test Boring

General Borings, under subcontract to Milone & MacBroom, Inc. (MMI), drilled five (5) borings designated MM-1 through MM-5 at the site on Wednesday, September 13, 2017. The borings were advanced using a track drill rig and 2¼-inch inside diameter hollow-stem augers. The borings were advanced to refusal, with depths ranging from 4 to 15.5 feet below ground surface.

In general accordance with ASTM D1586, Standard Penetration Tests (SPTs) and split-spoon sampling were performed semi-continuously to 7 feet, and at 5-foot intervals thereafter using a 140-pound automatic hammer. After the borings were complete, the groundwater level was recorded and the holes were backfilled with soil cuttings.

Test boring logs are attached in Appendix B. Approximate boring locations are shown on Figure 2.



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REVISIONS

BORING LOCATION PLAN

PEQUOT AVENUE DRAINAGE IMPROVEMENTS

PEQUOT AVENUE
NEW LONDON, CONNECTICUT

R.H.	T.S	M.B.
DESIGNED	DRAWN	CHECKED

SCALE: 1"=50'

DATE: 10/3/2017

PROJECT NO: 2389-43

SHEET NO: 1 OF 1

4.0 SUBSURFACE CONDITIONS

4.1 Geologic Setting

According to the Surficial Geologic Map of the New London Quadrangle, Connecticut (1962) and the 1992 Surficial Materials of Connecticut, the site is mapped as Till. The Till is described as "compact, sandy and gravelly till. Surface smooth. Includes a few thin masses of loose till and small lenses of stratified material."

According to the Bedrock Geologic Map of the New London Quadrangle, Connecticut (1967) and the Connecticut State Bedrock Geology Map, the bedrock consists of New London Gneiss, a "light-gray, medium-to-fine grained massive gneissic granodiorite, locally quartz mononite, peppered with brilliant black biotite and scattered prominent magnetite grains...."

Refer to Figures 3A and 3B depicting surficial and bedrock geology according to the Connecticut State Geology Maps.

4.2 Subsurface Conditions

The soil layers encountered during the investigation are described below in order of increasing depth. Subsurface conditions are known only at the boring locations. The subsurface conditions between the borings may differ from those described below. Refer to the attached Boring Logs in Appendix B for further details.

Surface Material – Topsoil, Concrete, or Asphalt, were encountered at the surface of each boring, except MM-1 which was drilled on the beach. The Topsoil in borings MM-2 and MM-3 was about 4 to 6-inches thick. The concrete sidewalk at boring MM-4 was about 4-inches thick, and the asphalt at boring MM-5 was about 6-inches thick.

Fill – Located below the surface materials at each boring except MM-1, the fill was found to extend up to 3.5 feet below ground surface (bgs). The fill classifications varied greatly, generally consisting of fine to fine-to-coarse Sand with varying amounts of Gravel and Silt.

Sand – Below the Fill in borings MM-2 and MM-5, and at the surface of MM-1, 1 to 5 feet of loose to medium dense fine Sand, trace Silt was generally encountered.

Organic Silt – Below the Sand or Fill, a layer of Organic Silt was encountered in each boring, except MM-4. This 2.5 to 5-foot-thick layer extended up to 9.5 feet bgs (boring MM-5), and generally extended to Elevations ranging from El. -2 to -4.5. The Organic Silt generally consisted of dark gray, Organic Silt, with little fine Sand, little coarse Gravel. N-values in this layer ranged from the weight of the hammer to 2 blows per foot, indicating very loose or very soft conditions.

Sand – The soils returned to medium dense Sand, generally consisting of light brown to light gray fine Sand, trace to little Silt. This layer generally extended to 11 feet bgs.

Glacial Till – Below the Sand, Glacial Till was encountered 9.5 to 11.5 feet bgs, with the exception of MM-4, which refused shallow and encountered spoon refusal at 2 feet bgs. The Till generally consisted of medium dense to very dense light gray, fine to coarse Sand and fine to coarse Gravel, little to trace Silt.

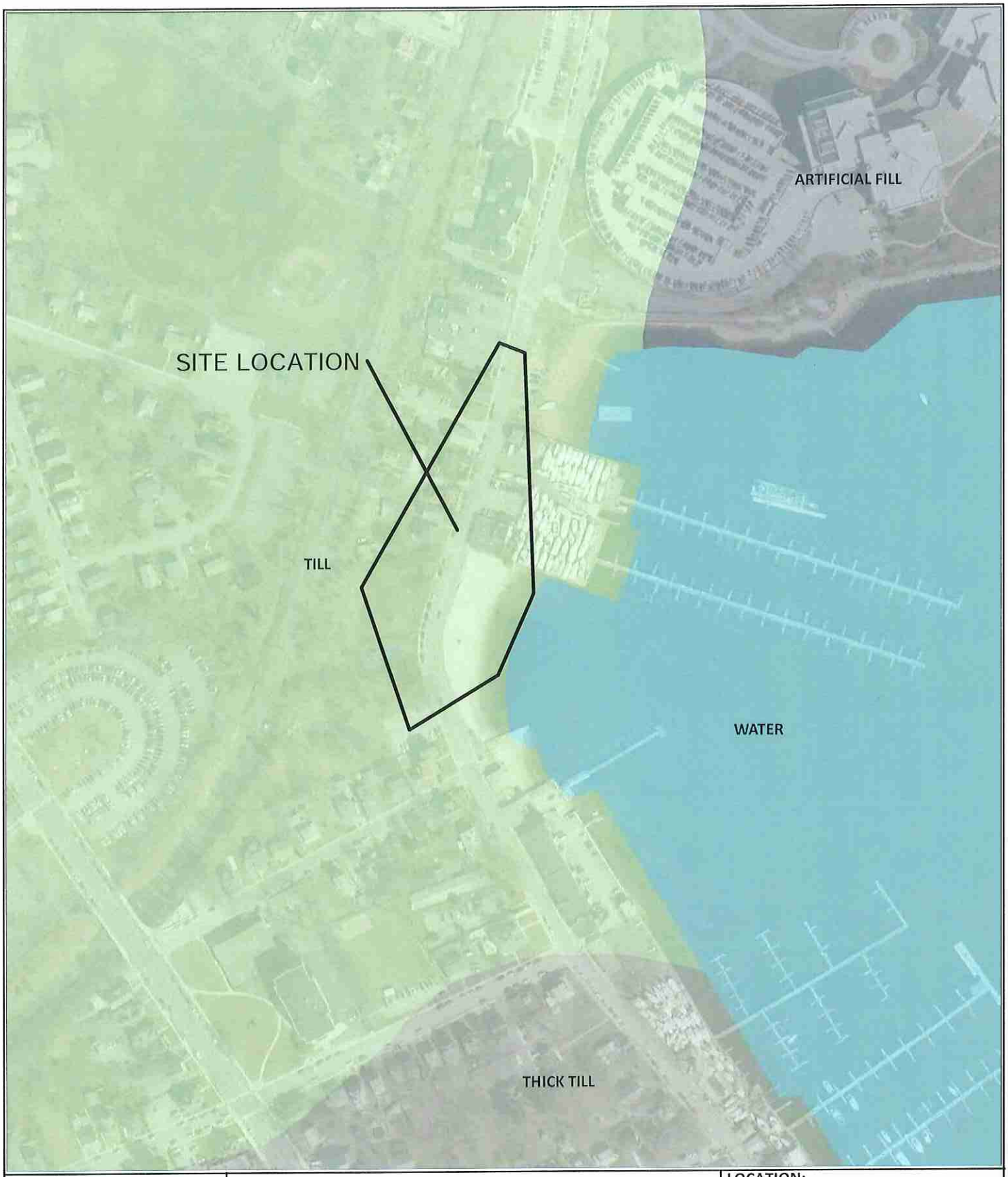
Decomposed Rock – Below the Glacial Till, Decomposed Bedrock was inferred based on increased drill chatter and slow auger advancement.

Inferred Bedrock – Bedrock was inferred by auger refusals at depths ranging from 4 to 15.5 feet, or at El. 2 (MM-4) to El. -11.5 (MM-1).

4.3 Groundwater Conditions

Based on wet soil samples, groundwater was estimated at 2 to 4 feet bgs, with elevations ranging from El. 1.5 (MM-1) to El. 4 (MM-4).

Seasonal groundwater fluctuations on the order of 5 feet may occur. Groundwater levels will fluctuate with tide, season, precipitation, temperature, construction activity in the area, and other factors. Groundwater level measurements represent conditions at the times and locations when the measurements were made. Different groundwater conditions will occur at other times and locations.



SOURCE(S):
1992 Surficial Materials
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

SURFICIAL GEOLOGY
FIGURE 3A

LOCATION:
NEW LONDON, CT

N

PEQUOT AVENUE DRAINAGE IMPROVEMENTS

MXD: J:\2389-43\Geotechnical\figures\Surficial Geology.mxd

Map By: R.H.
CHECKED: M.B.
MMI#: 2389-43
DATE: 09/14/2017
Scale: 1 inch = 250 feet

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SOURCE(S):
State Bedrock Geology
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

BEDROCK GEOLOGY
FIGURE 3B

LOCATION:
NEW LONDON, CT

N

PEQUOT AVENUE DRAINAGE IMPROVEMENTS

MXD: J:\2389-43\Geotechnical\figures\Bedrock Geology.mxd

Map By: R.H.
CHECKED: M.B.
MMI#: 2389-43
DATE: 09/14/2017
Scale: 1 inch = 250 feet

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5.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

5.1 General Geotechnical Discussion

There are five proposed areas within the project that we have separated for geotechnical review and analysis.

Area A: proposed 24-inch RCP extending from Junction Chamber to the north on Pequot Ave.
Area B: proposed 12-inch RCP extending from Junction Chamber to the south on Pequot Ave.
Area C: proposed 4ft x 4ft concrete box culvert extending from Junction Chamber to the east (beach).
Area D: proposed 12-inch RCP extending south of Area B (located 5 feet shallower than Area B).
Area F: future proposed 36-inch RCP extending from Junction Chamber to the west through park.

5.1.1 Data Interpretation

Due to the large amount of existing utilities within Pequot Avenue, we safely located our borings MM-2, MM-4, and MM-5 about 15 to 40 feet west of the proposed storm water alignment. Borings MM-2 (south end of Area A) and MM-5 (north end of Area A) encountered very soft organic silt to depths between El. -2 and El. -4.5, while MM-4 (middle of Area A) encountered shallow refusal on possible bedrock. Although soft organic Silt and shallow bedrock were encountered parallel to the alignment, it is uncertain what excavations took place during original roadway construction and utility installations.

We do not have borings within Areas B and D, but can assume organic silt is present beginning at depths around 2 to 5 feet, as observed in the nearest borings (MM-1, MM-2, and MM-3).

5.1.2 Existing Soils within Pequot Avenue

With consideration to how the boring data is interpreted as discussed in the previous section, it appears that most of the existing utility alignments (gas, sewer, water) are located within the depths of very soft organics and inferred shallow rock. Actual conditions will not become evident until construction, but in any case, we do not recommend that these new storm drain pipes be constructed over any organic soils, nor directly on rock.

5.1.3 Trench Support and Groundwater

During installation of the pipes and associated structures to depths ranging from 4 to 14 feet below existing street elevations, braced excavations such as steel sheeting to bedrock, and groundwater control, such as well points inside the sheeted trench, are recommended. Groundwater was observed between 2 and 4 feet below ground surface. Potential Organic Silt, clean Sands, and shallow Rock all provide challenges in protecting the existing utilities and dewatering.

5.1.4 Area F

Area F is part of a future plan, extending from the junction chamber in Pequot Ave, west through the park (approximately where boring MM-3 was performed). Drawings depicting proposed work are not yet available for this section. However, we can discuss what may be encountered. Based on MM-2 and

MM-3, we expect Fill over soft Organic Silt and buried topsoil roughly extending to El. -2. There do not appear to be any utilities existing through this section, which makes temporary lateral support less complicated, however, groundwater will still be a challenge with wet soils samples observed about 3 feet below grade in both borings MM-2 and MM-3, (El. 2.5 and El. 4, respectively). Recommendations herein may be considered for this section of the pipe, adjusted as needed to reflect that utilities are not immediately nearby, and reviewed by a geotechnical engineer.

5.2 Pipe Installation Recommendations

In general, we recommend sheeting to maintain the excavations, and well points to lower the groundwater during construction. We further recommend any organic silt encountered to be excavated and replaced. The following recommendations are given in the order in which we recommend they occur:

1) Sheet piles to bedrock to support excavations and aid in groundwater control
2) Dewatering with Well Points located inside sheeted trench
3) Excavations to extend to 12-inches below pipe invert, or to bottom of Organic Silt Layer, whichever is deepest.
4) Placement of bedding material and/or Structural Fill
5) Installation of proposed pipes
6) Soil backfill & compaction
7) Removal of sheeting
8) Installation of roadway section.

5.3 Alternate Pipe Selection

Organic Silt is expected below the north end of Area A and below Area D. Alternative to removing the Organic Silt layer, welded or mechanically jointed pipe may be considered. These types of flexible pipes protect against differential settlements, caused by settlement of the Organic Silt layer. Ductile Iron or HDPE pipe types may be considered; however, the material type may be controlled by the structural capacity requirements for minimum cover, since the proposed top of pipe resides about 18 to 24-inches from the finished grade in the two noted areas of concern.

5.4 Temporary Lateral Support

A method to support excavation side walls will be required for installation of the proposed pipes to depths up to 14 feet below grades, and up to 11 feet below groundwater. This support should not only support the excavation but also aid in dewatering. Sheeting installed to the top of bedrock will further aid in dewatering while limiting the effects of groundwater drawdown on the existing utilities, located outside the installed sheeting.

Furthermore, consideration must be given to the sheeting removal process at the completion of construction, such that new and existing utilities are not disturbed. See Sections 6.2 and 6.3 for further discussion on the protection of existing utilities. Consideration may be given to make the support permanent.

In Area C, where the 4ft x 4ft concrete box culvert crosses the beach and extends into the water line, a braced excavation and dewatering system will need to be designed for placement of the box culvert. A scour analysis should be performed to determine if the proposed box culvert should be on piles or all box culvert joints be articulating. See the following Section 5.5 for further discussion on dewatering.

The following soil parameters may be assumed in design of a lateral support system.

TABLE 1
General Soil Properties

Strata	Total Unit Weight (pcf)	Friction Angle (degrees)
Sand	120	30
Organic Silt	100	20
Till	135	36

5.5 Groundwater Control

With groundwater observed 2 to 4 feet below existing grades, and excavations depths of up to 14 feet, deliberate dewatering within the sheeted trench will be required to lay pipe. Well points inside the sheeting are effective for lowering the ground water table. This process needs to be controlled such that the water is not drawn down too quickly or for too long, both of which could cause settlement of the existing utilities outside the sheeting. However, where sheeting is installed to the top of bedrock, the effects of water drawdown on the outside of the sheets is negligible.

5.6 Excavations & Backfill

We recommend excavations remove the Organic Silt layer. The excavations will extend below groundwater and should be dewatered as discussed in Section 5.5. The final 12-inches of the excavation should be completed such that the underlying Sand material to remain in place, is not disturbed. This can be accomplished by hand, or with an excavator bucket with teeth horizontal to the excavated surface.

About 12-inches of bedding material should be placed below the pipe. See Appendix A for material specification.

If over-excavations greater than 12-inches are needed to remove unsuitable soils, we recommend the following, assuming the subgrade is wet:

1. Place ¾-inch crushed stone, wrapped in Mirafi 500x or equal filter fabric to the bottom of pipe bedding elevation. Fabric should overlap 12-inches at the seams.
2. If the excavation extends greater than 12-inches below proposed pipe bottom, the contractor may choose to place 6-inches of ¾-inch crushed stone, wrapped in filter fabric, followed by Compacted Structural Fill to the bottom of pipe bedding elevation.

The contractor should adjust the crushed stone thickness in order to provide a dry, firm, and stable subgrade.

5.7 Pipe Backfill Requirements

We recommend the pipe be placed upon 12-inches of bedding, followed by compaction on either side of the placed pipe. Placement and compaction of structural fill should then continue in accordance with the compaction requirements stated in Appendix A.

5.8 Pavement Sections

Following pipe backfill and removal of sheeting, the roadway can then be restored.

5.8.1 Full Depth Roadway Reconstruction

In Area B, where full depth roadway reconstruction is proposed, all existing organic-containing fill materials should be completely removed. The resultant subgrade surface should then be proof rolled under the observation of the engineer prior to placement of any new material. We recommend the following pavement and sidewalk sections:

TABLE 2
Full Depth Pavement Section Recommendations

Generalized Layer Description	Minimum Course Thickness (in.)	Specification (per ConnDOT Form 817)
Bituminous Concrete Wearing Course	2	M. S0.375 [1]
Binder Course	5	M. S0.5 [2]
Processed Aggregate Base	8	M.05.01
Subbase	12	M.02.02 – Grading B
Total Thickness	**27**	

[1] Gradation similar to M.04.01 Class 2, Form 816
[2] Gradation similar to M.04.01 Class 1, Form 816

TABLE 3
Sidewalk Section Recommendations

Generalized Layer Description	Minimum Course Thickness (inches)	Specification (per CTDOT Form 817)
Concrete	4	M.03.02-1 Class "F"
Granular Fill	6	M.02.01 – Grading A

The processed aggregate base, subbase, and/or granular fill should be compacted to at least 95 percent of the optimum dry density per ASTM D 1557. Underlying structural fill, where and as needed, should be compacted to at least 95 percent of the optimum dry density per ASTM D 1557.

5.8.2 Pavement Repair

We recommend restoration of pavement match the existing as best as practical. Upon trench backfilling, we recommend the base and subbase be stripped 18-inches laterally beyond the edges of the trench, and the binder and wearing coarse be stripped 24-inches beyond edges of trench. The sections should then be replaced to match the existing roadway material thicknesses, using the following materials:

TABLE 4
Pavement Section Recommendations

Generalized Layer Description	Specification (per ConnDOT Form 817)
Bituminous Concrete Wearing Course	M. S0.375 [1]
Binder Course	M. S0.5 [2]
Processed Aggregate Base	M.05.01
Subbase	M.02.02 – Grading B

[1] Gradation similar to M.04.01 Class 2, Form 816
[2] Gradation similar to M.04.01 Class 1, Form 816

6.0 GEOTECHNICAL CONSTRUCTION CONSIDERATIONS

6.1 Trench and Pipe Subgrade Preparation

6.1.1 Excavations in Organic Silt

The pipe subgrades for Area B, Area C, and the south end of Area A, are expected to be below the organic silt, and will reside on fine Sand.

Pipe subgrades for Area D and the north end of Area A, are expected to reside above or within the observed extends of the Organic Silt. We recommend the Organic Silt be removed from below the pipe in Area A.

In Area D, although boring information is unavailable, we roughly estimate about 2 to 4 feet of Organic Silt can be expected. We expect the proposed depth of the 12-inch pipe will be above that of the Organic Silt. In this Area, we provide the following two options:

1. The Organic Silt be removed below the pipe. If possible, it would be helpful if construction is sequenced to work from Area B south into Area D. This will allow for the Organic Silt layer to be identified in Area B, and chased into Area D, especially since boring information is not available in Area D.
2. Revise the pipe type to consist of welded or mechanical jointed pipe (as presented in Section 5.3), to be placed over the Organic Silt layer.

Excess soils should be disposed of in accordance with federal, state, and local regulations.

6.2 Monitoring of Existing Utilities

Due to the close proximity of the existing utilities and the complication of lateral support installations, removals, and dewatering, we recommend the existing utilities be monitored. Allowable movement of each utility type should be determined and maintained within established allowable limits. Utility monitoring can be accomplished by safely vacuuming a hole to the top of the nearest existing utility to the construction operations, and installing a sleeved pipe and rod to observe the top of utility pipe elevation. The utility elevation is monitored by survey periodically between construction activities, or continuously during critical construction activities. Construction activities include temporary lateral support installations, dewatering operations, temporary lateral support removal, or any other construction that may pose a risk to the existing utilities.

Should movement of existing utilities occur during construction operations, construction must stop immediately until the engineer determines which contingency plan should be put into action.

6.3 Support of Existing Utilities within Trench

Where existing utilities are of close proximity to the proposed pipe and trench excavations, it may benefit the existing utilities to be suspended/supported from inside the trench. This will eliminate the need to protect and/or monitor them within the soil, as discussed in Section 6.2. Alternatively, utilities of concern may be relocated.

6.4 Freezing Conditions

All pipe subgrades should be free of frost before placement of pipe and backfill. Frost-susceptible soils that have frozen should be removed and replaced with compacted structural fill or crushed stone.

APPENDIX A

MATERIAL SPECIFICATIONS

Recommended Material Specifications
Pequot Avenue Storm Drainage
New London, Connecticut

Pipe Bedding

In accordance with ConnDOT Standard Specifications Form 817, Pipe Bedding materials should consist of Sand or Sandy soil with 100% passing the 3/8-inch sieve, and no more than 10% passing the #200 sieve.

Structural Fill

Structural Fill should consist of hard, durable sand and gravel. It should be free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be neoplastic. Structural fill shall meet the following gradation requirements from ConnDOT Form 817 M.02.06 Grading A:

Sieve Size	Percent Passing by Weight
3½ inches	100
1½ inch	55 – 100
¼ inch	25 – 60
No. 10	15 – 45
No. 40	5 – 25
No. 100	1 – 10
No. 200 (fines)	0 – 5

Structural Fill should be compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction).

Maximum loose lift thickness for Structural Fill shall be as suited to the compaction equipment being used, but in no case greater than:

- 6-inches for vibratory plate and jumping jack compactors
- 9-inches for self-propelled walk behind or robotic vibratory drum compactors
- 12-inches for ride-on self-propelled vibratory drum rollers.

Each lift of backfill shall receive at least four coverages of the compaction equipment

Subbase

Subbase should consist of sound, tough, durable particles of crushed or uncrushed gravel, free from clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the "fines") should be neoplastic. Subbase shall meet the following gradation requirements from ConnDOT Form 817 M.02.06 Grading B:

Sieve Size	Percent Passing by Weight
5-inch	100
3½ inches	90 – 100
1½ inch	55 – 95
¼ inch	25 – 60
No. 10	15 – 45
No. 40	5 – 25
No. 100	0 – 10
No. 200 (fines)	0 – 5

Subbase should be compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction).

Maximum loose lift thickness for Subbase shall be as suited to the compaction equipment being used, but in no case greater than:

- 6-inches for vibratory plate and jumping jack compactors
- 9-inches for self-propelled walk behind or robotic vibratory drum compactors
- 12-inches for ride-on self-propelled vibratory drum rollers.

Each lift of backfill shall receive at least four coverages of the compaction equipment

Processed Aggregate Base

Processed Aggregate Base should consist of coarse and fine aggregates so that the resulting material meets the following gradation requirements from ConnDOT Form 817 M.05-01:

Sieve Size	Percent Passing by Weight
2½ inches	100
2 inch	95 – 100
¾ inch	50 – 75
¼ -inch	25 – 45
No. 40	5 – 20
No. 100	2 – 12

Crushed Stone

Crushed stone should consist of a ¾-inch size durable crushed rock or durable crushed gravel stone and shall conform to the requirements of Connecticut Department of Transportation Form 817, Section M.01.01, and No. 6. Crushed stone should be compacted with at least four passes of a vibratory compactor.

Woven Geotextile Fabric

Mirafi 500x or approved equal shall be used for use in wrapping crushed stone.

APPENDIX B

BORING LOGS

TEST BORING LOG

MILONE & MACBROOM
99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT:	Pequot Ave Drainage Improvements	BORING NO.: MM-1	SHEET: 1 of 1
LOCATION:	Pequot Ave, New London, CT	CONTRACTOR:	General Borings, Inc.
PROJ. NO:	2389-43	FOREMAN:	Jim
CLIENT:	City of New London	INSPECTOR:	MGB
DATE:	September 13, 2017	GROUND SURFACE ELEVATION:	2.5

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL.	GROUNDWATER DEPTH (FT.)			TYPE OF RIG: Track
TYPE	HAS	--	SS	--	DATE	TIME	WATER DEPTH	
SIZE ID (IN.)	3-3/4	--	2"	--	9/13/2017	0820 hrs	1 .0' (wet spoon)	RIG MODEL: D50
HMR. WT (LB.)	--	--	140	--				
HMR. FALL (IN.)	--	--	30	--				LABORATORY TESTING ☐

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	18	3 2 5 7	SS-1: Loose, light brown, fine to medium SAND (Wet @ 12")				
2 3	S-2	20	2 4 6 8	SS-2: Medium Dense, Top 15" - Light brown, fine SAND, trace Shells Bottom 5" - Dark Brown, fine to coarse SAND, trace fine Gravel, trace Shells		SAND		
4 5					5.5'		-3.0'	
6	S-3	18	3 1 WOH WOH	SS-3: Very Loose, Top 7" - Black, fine SAND, little Silt Bottom 11" - Brown, ORGANIC SILT, trace fine Sand		ORGANIC SILT		
7 8	S-4	17	2 4 11 12	SS-4: Medium Dense, Top 5" - Brown, very fine to fine SAND, some Silt Bottom 12" - Light Brown, fine SAND, trace (-) Silt	8.0'		-5.5'	
9 10						SAND		
11	S-5	18	4 6 7 12	SS-5: Medium Dense, Top 13" - Light gray, fine SAND, trace Silt Bottom 5" - Orange brown, fine to medium SAND, little fine Gravel	11.5'		-9.0'	
12 13						TILL		
14				BOTTOM OF EXPLORATION ±14.0'	14.0'	AUGER REFUSAL @ 14.0'	-11.5'	
15 16 17 18 19 20 21 22								

Remarks:

COHESIONLESS SOILS	COHESIVE SOILS	SAMPLE TYPE	PROPORTIONS
N = 0 - 4 = VERY LOOSE	N = 0 -2 = VERY SOFT	C = ROCK CORE	trace = 0% - 10%
4-10 = LOOSE	2 - 4 = SOFT	S = SPLIT SPOON	little = 10% - 20%
10-30 = MEDIUM	4 - 8 = MEDIUM	UP = UNDISTURBED PISTON	some = 20% - 35%
30-50 = DENSE	8 -15 = STIFF	UT = UNDISTURBED THINWALL	and = 35% - 50%
50 + = VERY DENSE	30 + = HARD		

TEST BORING LOG

MILONE & MACBROOM
99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT:	Pequot Ave Drainage Improvements	BORING NO.: MM-2	SHEET: 1 of 1
LOCATION:	Pequot Ave, New London, CT	CONTRACTOR:	General Borings, Inc.
PROJ. NO:	2389-43	FOREMAN:	Jim
CLIENT:	City of New London	INSPECTOR:	MGB
DATE:	September 13, 2017	GROUND SURFACE ELEVATION:	5.5

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL.	GROUNDWATER DEPTH (FT.)			TYPE OF RIG: Track
TYPE	HAS	--	SS	--	DATE	TIME	WATER DEPTH	
SIZE ID (IN.)	3-3/4	--	2"	--	9/13/2017	1100 hrs	3.0' (wet sample)	RIG MODEL: D50
HMR. WT (LB.)	--	--	140	--				
HMR. FALL (IN.)	--	--	30	--				LABORATORY TESTING ☐

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	SS-1	14	2 2 3 2	SS-1: Loose, Top 6" - Topsoil Bottom 8" - Brown/black, fine to coarse SAND, little Silt, trace fine Gravel (Moist)	.5'	TOPSOIL	5.0'	
2					2.0'	FILL	3.5'	
3	SS-2	13	2 3 3 3	SS-2: Loose, gray/brown, fine SAND, trace Silt (Wet)				
4					4.5'	SAND	1.0'	
5								
6	SS-3	2	1 WOH 1 WOH	SS-3: In tip - brown/gray, very fine to fine SAND, some Silt, trace Oranics (Wet)				
7					7.5'	ORGANIC SILT	-2.0'	
8	SS-4	23	3 5 8 8	SS-4: Medium dense, Top 6" - Black/dark gray, ORGANIC SILT Middle 12" - Light brown, fine SAND, trace Silt Bottom 5" - Light gray, fine to medium SAND, trace Silt				
9								
10						SANDS		
11	SS-5	24	5 10 19 22	SS-5: Medium dense, Top 6" - Light brown, fine to medium SAND, trace Silt Middle 8" - Light gray, fine to coarse SAND, trace Silt Bottom 7" - Light gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt	11.5'		-6.0'	
12								
13						TILL		
14					14.0'		-8.5'	
15						INFERRED DECOMPOSED BEDROCK		
	SS-6	6	83/6"	SS-6: Very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt (Decomposed Rock)	15.5'		-10.0'	
16				BOTTOM OF EXPLORATION ±15.5'		AUGER REFUSAL @ 15.5'		
17								
18								
19								
20								
21								
22								

Remarks:

COHESIONLESS SOILS	COHESIVE SOILS	SAMPLE TYPE	PROPORTIONS
N = 0 - 4 = VERY LOOSE	N = 0 -2 = VERY SOFT	C = ROCK CORE	trace = 0% - 10%
4-10 = LOOSE	2 - 4 = SOFT	S = SPLIT SPOON	little = 10% - 20%
10-30 = MEDIUM	4 - 8 = MEDIUM	UP = UNDISTURBED PISTON	some = 20% - 35%
30-50 = DENSE	8 -15 = STIFF	UT = UNDISTURBED THINWALL	and = 35% - 50%
50 + = VERY DENSE	30 + = HARD		

TEST BORING LOG

MILONE & MACBROOM
99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT:	Pequot Ave Drainage Improvements	BORING NO.: MM-3	SHEET: 1 of 1
LOCATION:	Pequot Ave, New London, CT	CONTRACTOR:	General Borings, Inc.
PROJ. NO:	2389-43	FOREMAN:	Jim
CLIENT:	City of New London	INSPECTOR:	MGB
DATE:	September 13, 2017	GROUND SURFACE ELEVATION:	7

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL.	GROUNDWATER DEPTH (FT.)			TYPE OF RIG: Track
TYPE	HAS	--	SS	--	DATE	TIME	WATER DEPTH	
SIZE ID (IN.)	3-3/4	--	2"	--	9/13/2017	1000 hrs	3.0' (wet sample)	RIG MODEL: D50
HMR. WT (LB.)	--	--	140	--				
HMR. FALL (IN.)	--	--	30	--				LABORATORY TESTING ☐

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	SS-1	13	3 5 8 13	SS-1: Medium dense, Top 3" - Topsoil Bottom 10" - Dark brown, fine SAND and SILT (Moist)	.3'	TOPSOIL	6.8'	
2					2.0'	FILL	5.0'	
3	SS-2	18	2 1 1 3	SS-2: Very loose, Top 15" - Dark gray, ORGANIC SILT, trace Roots, little fine Sand Bottom 3" - Gray, fine to coarse SAND, some Silt, trace Roots (Wet)	3.5'	ORGANIC SILT	3.5'	
4					4.0'	SAND	3.0'	
5						FILL/TOPSOIL		
6	SS-3	6	2 1 1 3	SS-3: Very loose, Top 6" - Dark brown, SILT, trace fine Sand, trace Roots (Moist) In tip -Gray, SILT, little fine to medium Sand (Wet)	6.0'		1.0'	
7						ORGANIC SILT		
8	SS-4	4	1 3 13 22	SS-4: Medium dense, dark brown, SILT, little fine to coarse Sand, trace Roots (Wet)	8.0'		-1.0'	
9								
10								
11	SS-5	24	44 30 29 29	SS-5, Very Dense Top 6" - Orange/brown, fine to coarse SAND Middle 11" - Gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt Bottom 7" - Gray, fine SAND, trace Silt (Wet)		TILL		
12								
13					13.0'		-6.0'	
				BOTTOM OF EXPLORATION ±13.0'		AUGER REFUSAL @ 13.0'		
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:

COHESIONLESS SOILS	COHESIVE SOILS	SAMPLE TYPE	PROPORTIONS
N = 0 - 4 = VERY LOOSE	N = 0 -2 = VERY SOFT	C = ROCK CORE	trace = 0% - 10%
4-10 = LOOSE	2 - 4 = SOFT	S = SPLIT SPOON	little = 10% - 20%
10-30 = MEDIUM	4 - 8 = MEDIUM	UP = UNDISTURBED PISTON	some = 20% - 35%
30-50 = DENSE	8 -15 = STIFF	UT = UNDISTURBED THINWALL	and = 35% - 50%
50 + = VERY DENSE	30 + = HARD		

TEST BORING LOG

MILONE & MACBROOM
99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT:	Pequot Ave Drainage Improvements	BORING NO.: MM-4	SHEET: 1 of 1
LOCATION:	Pequot Ave, New London, CT	CONTRACTOR:	General Borings, Inc.
PROJ. NO:	2389-43	FOREMAN:	Jim
CLIENT:	City of New London	INSPECTOR:	MGB
DATE:	September 13, 2017	GROUND SURFACE ELEVATION:	6

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL.	GROUNDWATER DEPTH (FT.)			TYPE OF RIG: Track
TYPE	HAS	–	SS	–	DATE	TIME	WATER DEPTH	
SIZE ID (IN.)	3-3/4	–	2"	–	9/13/017	1330 hrs	n/a	RIG MODEL: D50
HMR. WT (LB.)	–	–	140	–				
HMR. FALL (IN.)	–	–	30	–				LABORATORY TESTING ☐

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
			Auger	Top 4" - Concrete	.3'	CONCRETE 4"	5.7'	
1	SS-1	7	6,25/5"	SS-1: Gray fine SAND, trace Silt, trace fine Gravel (Moist)	2.0'	FILL	4.0'	
2								
3	SS-2	0	Bouncing Spoon	SS-2: No Recovery	4.0'	INFERRED TILL AND/OR INFERRED DECOMPOSED BEDROCK	2.0'	
4				BOTTOM OF EXPLORATION ±4.0'		AUGER REFUSAL @ 4.0'		
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:
Grinded on refusal for a few minutes
Referred to Geology map and found bedrock outcrops mapped to North

COHESIONLESS SOILS	COHESIVE SOILS	SAMPLE TYPE	PROPORTIONS
N = 0 - 4 = VERY LOOSE	N = 0 -2 = VERY SOFT	C = ROCK CORE	trace = 0% - 10%
4-10 = LOOSE	2 - 4 = SOFT	S = SPLIT SPOON	little = 10% - 20%
10-30 = MEDIUM	4 - 8 = MEDIUM	UP = UNDISTURBED PISTON	some = 20% - 35%
30-50 = DENSE	8 -15 = STIFF	UT = UNDISTURBED THINWALL	and = 35% - 50%
50 + = VERY DENSE	30 + = HARD		

TEST BORING LOG

MILONE & MACBROOM

99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT:	Pequot Ave Drainage Improvements	BORING NO.: MM-5	SHEET: 1 of 1
LOCATION:	Pequot Ave, New London, CT	CONTRACTOR:	General Borings, Inc.
PROJ. NO:	2389-43	FOREMAN:	Jim
CLIENT:	City of New London	INSPECTOR:	MGB
DATE:	September 13, 2017	GROUND SURFACE ELEVATION:	5

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL.	GROUNDWATER DEPTH (FT.)			TYPE OF RIG: Track
TYPE	HAS	--	SS	--	DATE	TIME	WATER DEPTH	
SIZE ID (IN.)	3-3/4	--	2"	--	9/13/017	1400 hrs	2.0' (wet sample)	RIG MODEL: D50
HMR. WT (LB.)	--	--	140	--				
HMR. FALL (IN.)	--	--	30	--				LABORATORY TESTING ☐

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
					.5'	ASPHALT	4.5'	
1								
2	SS-1	8	4 3 11 7	Asphalt (Auger) SS-1: Medium-dense Top 4" - Gray brown, fine to coarse SAND and fine to coarse Gravel, little Silt Bottom 4" - Brown, fine to coarse SAND, little Silt, little fine to coarse Gravel (Wet)		FILL		
3					3.5'		1.5'	
4	SS-2	10	12 3 3 1	SS-2: Loose Top = Light gray, fine SAND, trace Silt Bottom 4" = Dark gray, organic SILT, little fine SAND, little coarse Gravel, trace Roots	4.5'	SAND	.5'	
5								
6	SS-3	8	1 WOH 1	SS-3: Very loose WOOD and ORGANIC SILT, little fine to coarse Gravel		ORGANIC SILT		
7			WOH		7.5'		-2.5'	
8	SS-4	18	1 2 2 6	SS-4, Loose Top 6" - Brown, fine SAND, some Silt, trace fine Gravel, trace Organics Bottom 12" - Brown, fine SAND, little Silt, trace Organics		ORGANIC SILT/SAND		
9					9.5'		-4.5'	
10						FINE SAND		
11	SS-5	19	12 17 21 28	SS-5, Dense Top 9" - Light gray, fine to medium SAND, trace fine Gravel, little Silt Bottom 10" - Light gray, fine to coarse SAND and fine to coarse Gravel, little Silt	11.0'		-6.0'	
12						TILL		
13								
14					14.0'		-9.0'	
				BOTTOM OF EXPLORATION ±14.0'		AUGER REFUSAL @ 14.0'		
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:

COHESIONLESS SOILS	COHESIVE SOILS	SAMPLE TYPE	PROPORTIONS
N = 0 - 4 = VERY LOOSE	N = 0 -2 = VERY SOFT	C = ROCK CORE	trace = 0%- 10%
4-10 = LOOSE	2 - 4 = SOFT	S = SPLIT SPOON	little = 10%- 20%
10-30 = MEDIUM	4 - 8 = MEDIUM	UP = UNDISTURBED PISTON	some = 20%- 35%
30-50 = DENSE	8 -15 = STIFF	UT = UNDISTURBED THINWALL	and = 35%- 50%
50 + = VERY DENSE	30 + = HARD		

APPENDIX C

LIMITATIONS

LIMITATIONS ON WORK PRODUCT

Site Observations

1. The analyses and recommendations submitted in this report are based in part upon the data obtained from limited subsurface observations. The nature and extent of subsurface variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of limited observations; actual soil transitions are probably more erratic.

3. Water level readings have been made under conditions stated. This data has been reviewed, and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time observations were made.

4. In the event that any changes in the proposed general project development are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report are modified or verified in writing by MMI. It is recommended that MMI be provided the opportunity to review the final design plans and specifications in order to verify that earthwork and roadway construction recommendations have been properly interpreted and implemented.

Construction

5. It is also recommended that MMI be provided the opportunity to perform the recommended construction-phase monitoring services to verify that the intent of our recommendations is being properly implemented in the field during construction. The recommendations given in this report shall not be considered valid unless we are given the opportunity to perform in this capacity.

Topographic Data

6. This report is based on preliminary site plans prepared by MMI.

Use of Report

7. This Geotechnical Report has been prepared for the exclusive use of the City of New London, relative to the proposed work along Pequot Avenue in New London, Connecticut, and is intended to be in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

8. This Geotechnical Report has been prepared for this project by MMI. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it only with the authorization of the owner and then with the understanding that its scope is limited to design considerations only.