The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy in Connecticut
55 Church Street, Third Floor
New Haven, CT 06510-3029

Tel: (203) 568-6270
Fax (203) 568-6271
nature.org/connecticut

Request for Qualifications and Proposals – Rippowam Place Bioswale
The Nature Conservancy in Connecticut
March 2019

Project Overview:

The Nature Conservancy in Connecticut ("TNC") seeks qualifications and quotes for services from experienced green stormwater infrastructure contractors ("Contractor") to **construct a bioswale** located in the public right-of-way (sidewalk) at Rippowam Place in Stamford. This bioswale will be the first of its kind in Stamford and will be paid for using private (non-public) funds.

Timeline:

The bioswale must be constructed by the end of June 2019.

Location:

The rain garden will be located in the public right-of-way (sidewalk) along Rippowam Place in downtown Stamford, as shown on the attached location map.

Scope of Work:

While ensuring a safe and legal work environment, the Contractor is responsible for all aspects of this project, including but not limited to:

- Securing necessary permits and any additional municipal requirements;
- Sidewalk and curb cutting, removal and disposal;
- Site excavation, materials hauling and disposal;
- Materials procurement, transportation, and installation, including stone base, bioswale soils, geotextile, gabion cage, stone edging, fence posts, plantings, and pea stone cover;
- Masonry and curbing installation, including stormwater inlet and fence post bases.

Design:

Building off the City of New Haven's successful bioswale program, TNC will use New Haven's standard designs for this project, which have been approved by the City of Stamford. The standard designs are for a 5' by 15' right-of-way bioswale.

See attached schematics for a 5' by 15' bioswale developed by the City of New Haven and Greater New Haven Water Pollution Control Authority.

Pre-submission Meeting:

A **mandatory** on-site pre-submission meeting will be held Tuesday, April 2 at 10:00 am.

Location:
Rippowam Place
(adjacent to 139 and 157 Main Street addresses)

Stamford, CT 06901

Submission Instructions:
To submit a proposal for this project, please send the following information to the contact information provided below by 5:00 pm Friday, April 19, 2019. Please provide the following items:

- A cover letter and resume demonstrating experience, skills and ability necessary to complete the project, including:
    - Description (including resumes and relevant experience) of team to lead project;
    - Example of similar past projects listing budget, timeliness, location, and brief project description;
    - Contact information for three (3) references for similar past projects;
- Budget: please complete the attached bid schedule to provide a detailed budget.

Please submit all proposals (must arrive prior to 5:00 pm Friday, April 19, 2019) via email, fax or post to:

Victoria Hoyland, P.E.
Environmental Engineer
The Nature Conservancy in Connecticut
55 Church Street, 3rd Floor
New Haven, CT 06510
victoria.hoyland@tnc.org
Fax: (203) 568-6271

PLANT LIST

SYM	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	COMMENTS
TREES						
GT	12	Gleditsia triacanthos var. inermis 'Skyline'	Skyline Honey Locust	B&B	3 1/2" - 4" CAL.	Full, Nicely Shaped, 7' Clear trunk
TC	9	Tilia cordata 'Greenspire'	Greenspire Littleleaf Linden	B&B	3 1/2" - 4" CAL.	Full, Nicely Shaped, 7' Clear trunk
ORNAMENTAL GRASS						
ES	251	Eragrostis spectabilis	Purple Love Grass	Cont.	1 Gal.	30" O.C. Spacing
SEED						
DC		Daucus carota	Queen Annes Lace	Seed		
CI		Cichorium intybus	Chickory	Seed		

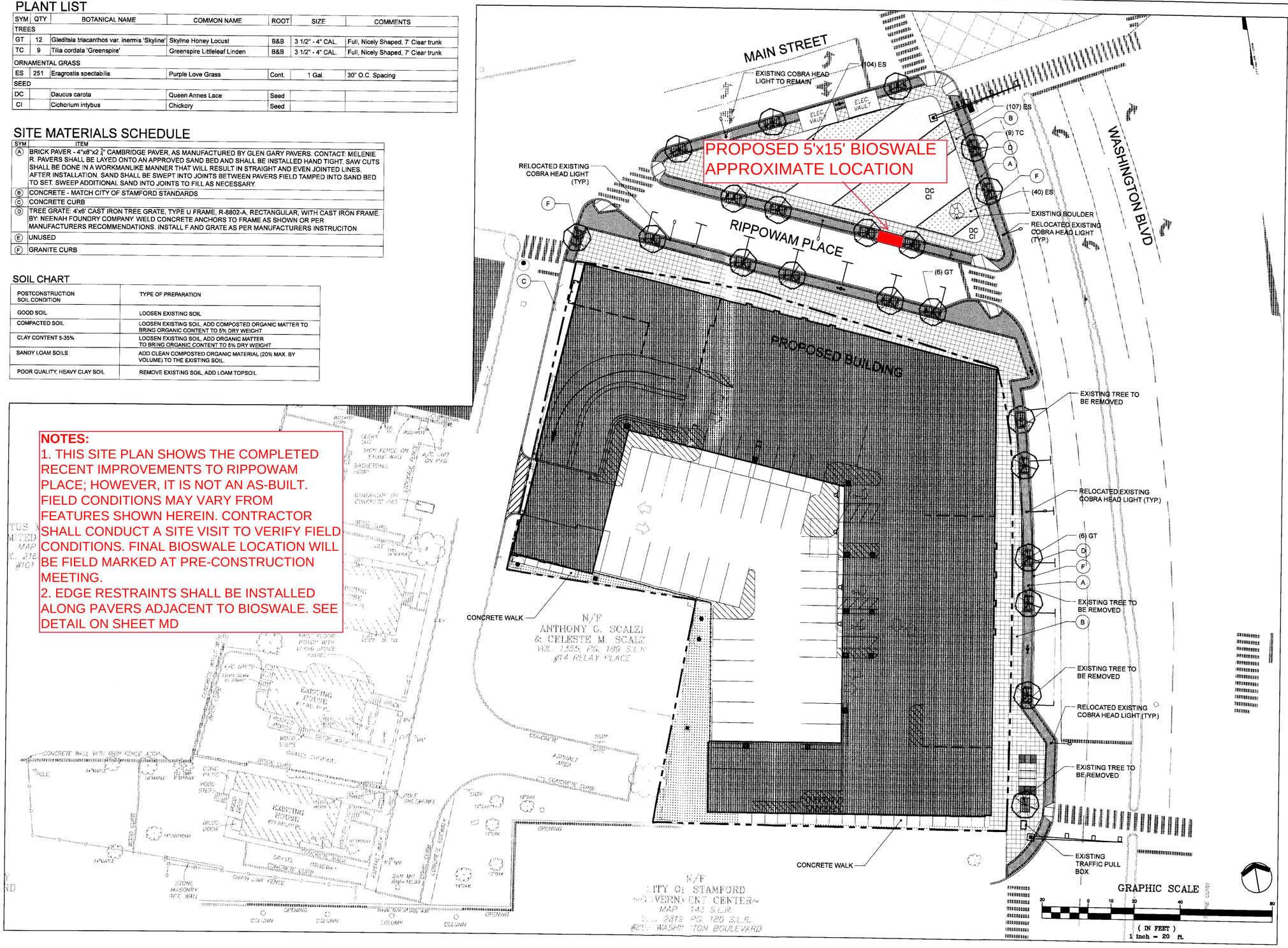
SITE MATERIALS SCHEDULE

SYM	ITEM
(A)	BRICK PAVER - 4"x8"x2 ¼" CAMBRIDGE PAVER, AS MANUFACTURED BY GLEN GARY PAVERS. CONTACT: MELENIE R. PAVERS SHALL BE LAYED ONTO AN APPROVED SAND BED AND SHALL BE INSTALLED HAND TIGHT. SAW CUTS SHALL BE DONE IN A WORKMANLIKE MANNER THAT WILL RESULT IN STRAIGHT AND EVEN JOINTED LINES. AFTER INSTALLATION, SAND SHALL BE SWEPT INTO JOINTS BETWEEN PAVERS FIELD TAMPED INTO SAND BED TO SET. SWEEP ADDITIONAL SAND INTO JOINTS TO FILL AS NECESSARY.
(B)	CONCRETE - MATCH CITY OF STAMFORD STANDARDS
(C)	CONCRETE CURB
(D)	TREE GRATE: 4'x6' CAST IRON TREE GRATE, TYPE U FRAME, R-8802-A, RECTANGULAR, WITH CAST IRON FRAME. BY: NEENAH FOUNDRY COMPANY. WELD CONCRETE ANCHORS TO FRAME AS SHOWN OR PER MANUFACTURERS RECOMMENDATIONS. INSTALL F AND GRATE AS PER MANUFACTURERS INSTRUCITON.
(E)	UNUSED
(F)	GRANITE CURB

SOIL CHART

POSTCONSTRUCTION SOIL CONDITION	TYPE OF PREPARATION
GOOD SOIL	LOOSEN EXISTING SOIL
COMPACTED SOIL	LOOSEN EXISTING SOIL, ADD COMPOSTED ORGANIC MATTER TO BRING ORGANIC CONTENT TO 5% DRY WEIGHT
CLAY CONTENT 5-35%	LOOSEN EXISTING SOIL, ADD ORGANIC MATTER TO BRING ORGANIC CONTENT TO 5% DRY WEIGHT
SANDY LOAM SOILS	ADD CLEAN COMPOSTED ORGANIC MATERIAL (20% MAX. BY VOLUME) TO THE EXISTING SOIL.
POOR QUALITY, HEAVY CLAY SOIL	REMOVE EXISTING SOIL, ADD LOAM TOPSOIL

NOTES:
1. THIS SITE PLAN SHOWS THE COMPLETED RECENT IMPROVEMENTS TO RIPPOWAM PLACE; HOWEVER, IT IS NOT AN AS-BUILT. FIELD CONDITIONS MAY VARY FROM FEATURES SHOWN HEREIN. CONTRACTOR SHALL CONDUCT A SITE VISIT TO VERIFY FIELD CONDITIONS. FINAL BIOSWALE LOCATION WILL BE FIELD MARKED AT PRE-CONSTRUCTION MEETING.
2. EDGE RESTRAINTS SHALL BE INSTALLED ALONG PAVERS ADJACENT TO BIOSWALE. SEE DETAIL ON SHEET MD



erla landscape architecture, llc
518 N Water Street Sebo, CT 203.853.7600 www.erlarains.com

NO.	ISSUE	DATE
1	CLIENT REVIEW	2.04.14
2	SITE PLAN APPROVAL FILING	2.17.14
3	TEAM REVIEW	5.28.14
4	SITE PLAN APPLICATION	6.26.14
5	REVISED PER PLAN REVIEW MEETING	9.16.14
6		
7		

WASHINGTON BLVD AND MAIN STREET
STAMFORD, CT 06905

PROJECT

DWG TITLE
LANDSCAPE SITE PLAN

JOB NO.

DATE 2.17.14

SCALE 1"=20'-0"

DRAWN BY

SPL-1.0

Rippowam Place Biowale Bid Schedule

Item Number	Description	Unit	Est. Quantity	Unit Cost	Total Cost
1	Insurance, Bonds, Permitting, Mobilization	LS	1		
2	Installation/Cutting of Inlet	EA	1		
3	Excavation and Disposal of Material[1,2]	SY	8.5		
4	Backfill of Bioswale (including geotextile fabric, stone, and engineered soil)[2]	SY	8.5		
5	Gabion Installation	EA	1		
6	Concrete Apron and Splash Pad Installation	EA	1		
7	Fence installation	LF	25.3		
8	Brick Paver Reinstallation with Edge Restraint	LS	1		
9	Stone Strip Bed Installation	LF	40.7		
10	Bioswale Plants (materials)	LS	1		
11	Plantings (installation)	LS	1		
12	Peastone Installation	SY	8.5		
13	Traffic Control[3]	DAY			
14	Erosion and sediment control	LS	1		

[1]Brick pavers to be salvaged and returned to City Staff.

[2]Unit based on surface area of bioswale. See plans for profile and depth.

[3]Contractor to fill in number of days

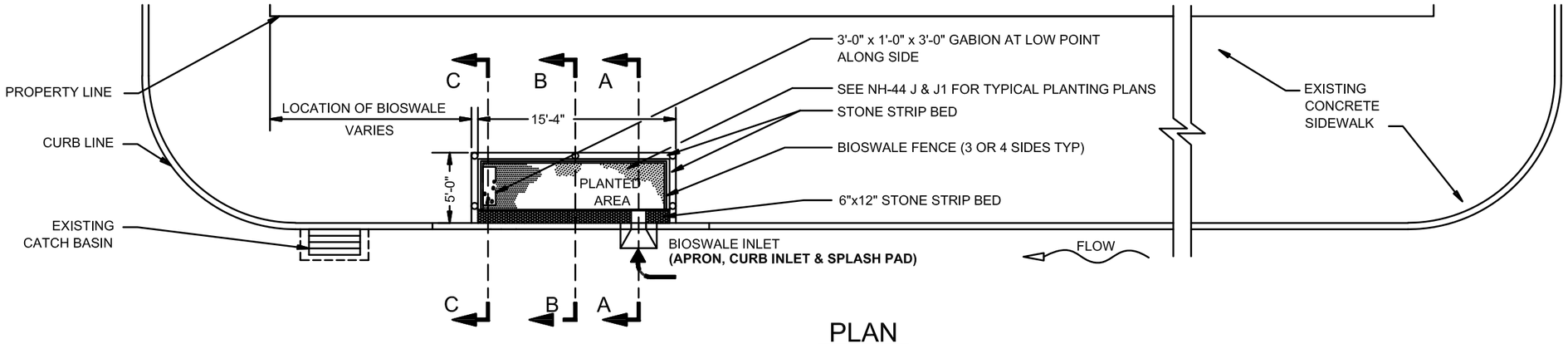
NOTES:

1. BOTTOM OF BIOSWALE IS TO BE LEVEL, UNCOMPACTED (SCARIFY) PRIOR TO FILLING WITH STONE.
2. NO COMPACTION OF STONE OR SOIL LAYERS.

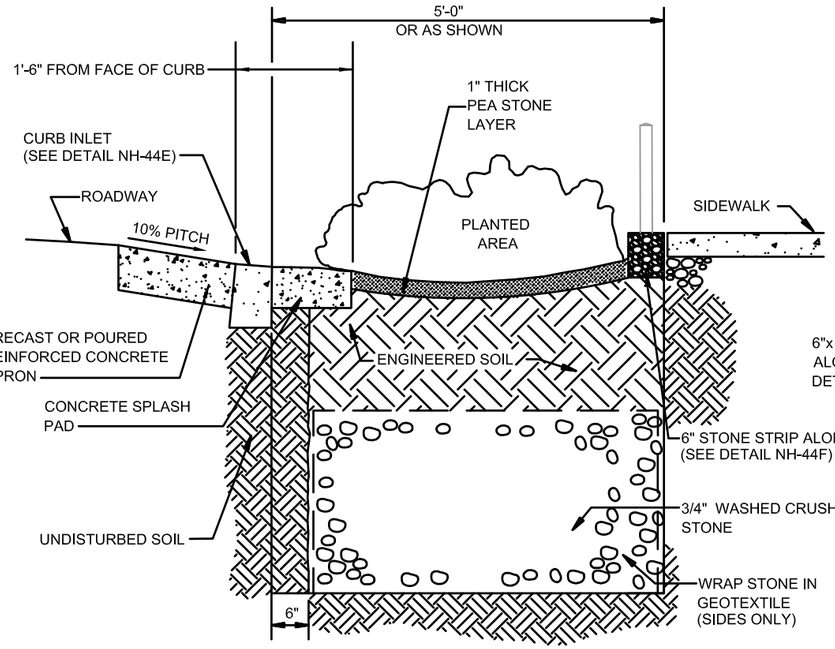
CITY OF NEW HAVEN
DEPARTMENT OF ENGINEERING

GIOVANNI ZINN, P.E.
CITY ENGINEER

DRIVE: K:\ENGINEER\DWG
FILE: CITYSTD\DETAILS\2018 DETAILS
DATE: JAN. 2018
DRAWING NO.: **STD-NH-44A**

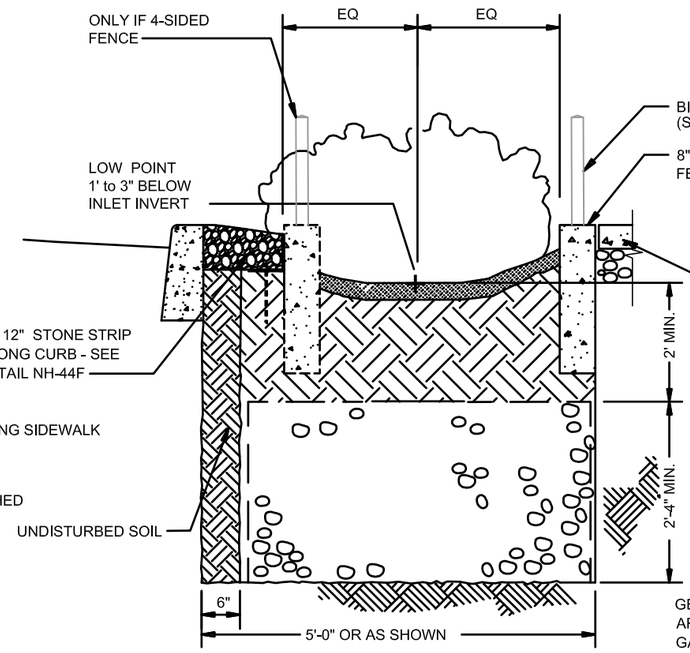


PLAN



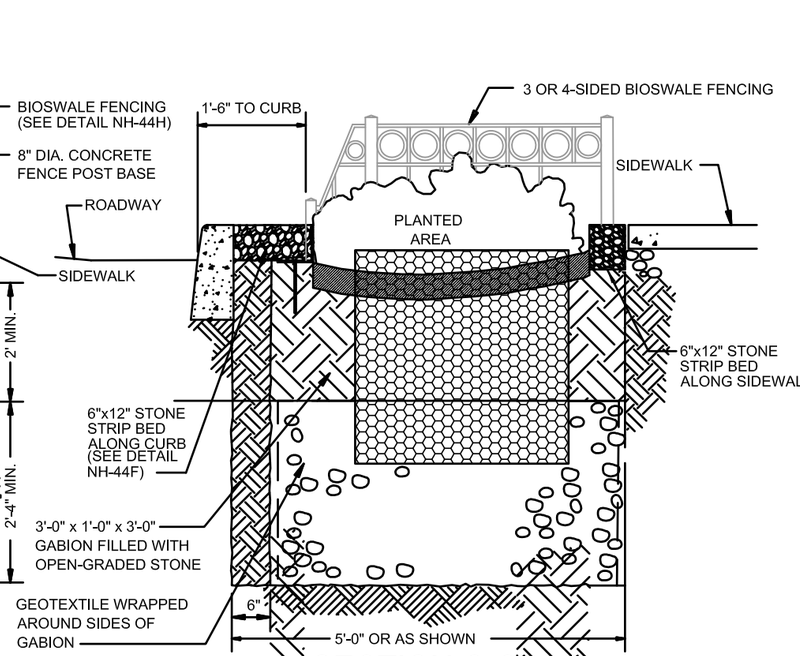
SECTION A-A

AT BIOSWALE INLET



SECTION B-B

AT MIDSECTION [LOWEST POINT]



SECTION C-C

AT BIOSWALE OUTLET

CROSS SECTIONS

STANDARD FOR 15 'x 5' BIOSWALE - STONE STRIP AND FENCING

NOT TO SCALE

CITY OF NEW HAVEN
DEPARTMENT OF ENGINEERING

GIOVANNI ZINN, P.E.
CITY ENGINEER

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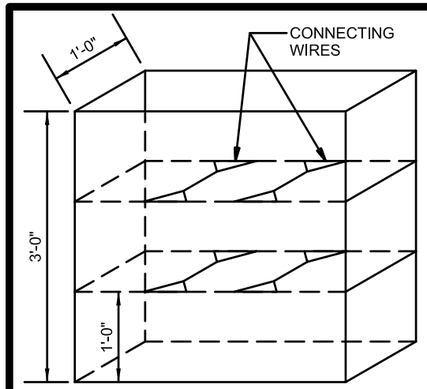
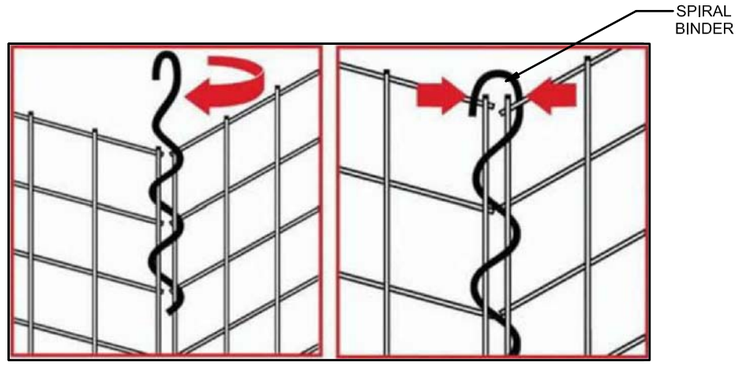
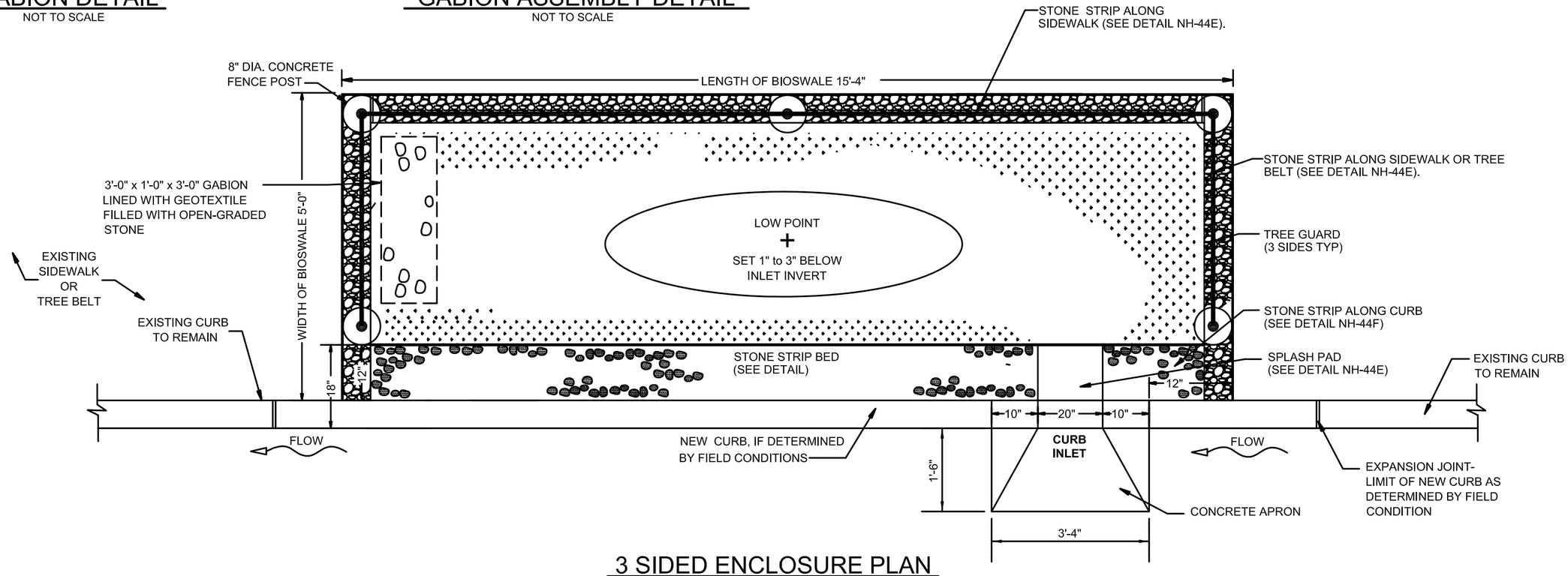
DRAWING NO.: **STD-NH-44A1**



GABION DETAIL
NOT TO SCALE



GABION ASSEMBLY DETAIL
NOT TO SCALE



3 SIDED ENCLOSURE PLAN

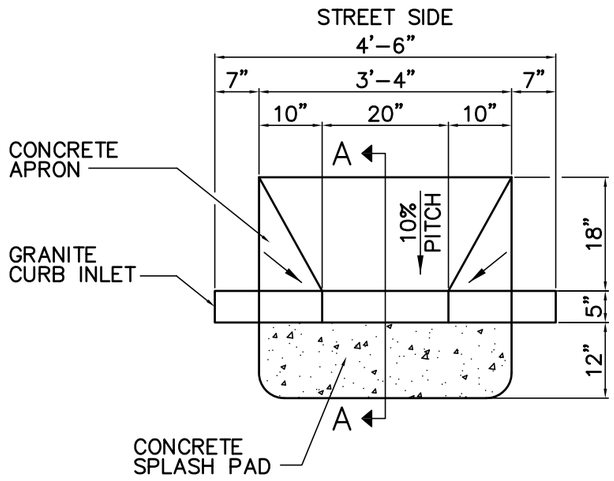
STANDARD FOR 15' x 5' BIOSWALE WITH GABION

NOT TO SCALE

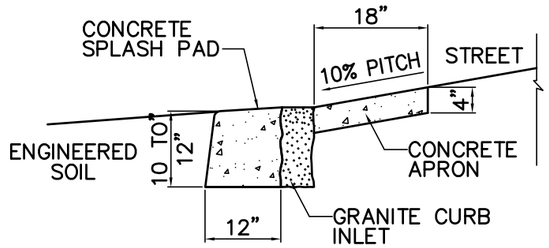
NOTES:

1. NO BIOSWALES SHALL BE INSTALLED IN THE CITY RIGHT-OF-WAY WITHOUT THE EXPRESS PERMISSION OF THE CITY ENGINEER.
2. SOIL LEVEL AT GABION MUST BE AT THE SAME ELEVATION AS THE INVERT OF THE BIOSWALE INLET.
3. GRADING AND GABION LOCATIONS ARE SPECIFIC TO INLET ORIENTATION SHOWN. IF THE INLET ORIENTATION IS MOVED TO THE OTHER SIDE, THE GRADING AND GABION LOCATIONS MUST BE MIRRORED.
4. CONTRACTOR SHALL NOT BE PERMITTED TO STOCKPILE, STORE OR LAY DOWN ANY CONSTRUCTION MATERIAL WITHIN ANY EXISTING TREE PIT OR BIOSWALE.

CITY OF NEW HAVEN DEPARTMENT OF ENGINEERING	DRIVE: K:\ENGINEER\DWG FILE: CITYSTD\DETAILS\2018 DETAILS DATE: JAN. 2018 DRAWING NO.: STD-NH-44E
GIOVANNI ZINN, P.E. CITY ENGINEER	



PLAN



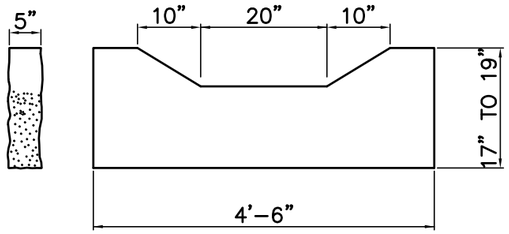
SECTION A–A

BIOSWALE INLET DETAIL

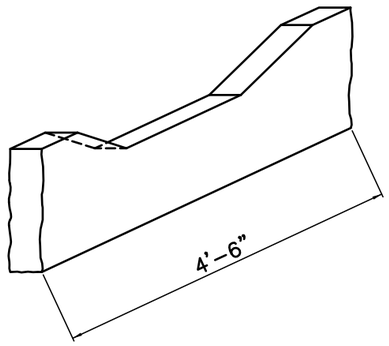
SCALE: $\frac{1}{2}$"=1'–0"

NOTE:

1. CURB HEIGHTS VARY. CONCRETE SPLASH PAD TO BE POURED FROM STREET LEVEL TO THE BOTTOM OF THE CURB. NO EXCESS CONCRETE TO BE PLACED WITHIN BIOSWALE FOOTPRINT.
2. TRANSITION FROM CONCRETE APRON TO CURB INLET TO SPLASH PAD, IS TO BE FLUSH.
3. IF CURB IS MADE OF BLUESTONE, CONCRETE OR ANY OTHER MATERIAL OUTSIDE OF GRANITE, THAN A PRE–CUT SECTION OF GRANITE CURB MUST BE INSTALLED TO CREATE BIOSWALE INLET.



ELEVATION



PERSPECTIVE

GRANITE CURB INLET DETAIL

SCALE: $\frac{1}{2}$"=1'–0"

NOTE:

GRANITE CURB INLET CAN BE CUT IN PLACE OR INSTALLED AS A PRE–CUT SECTION OF GRANITE CURB. PRE–CUT SECTIONS MUST BE A SINGLE LENGTH OF GRANITE CURB.

BIOSWALE INLET DETAILS

SCALE: AS NOTED

CITY OF NEW HAVEN
DEPARTMENT OF ENGINEERING

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CITY ENGINEER

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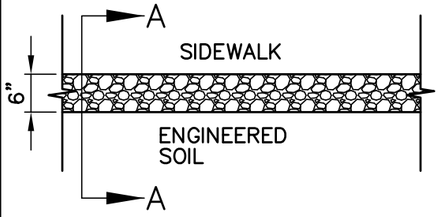
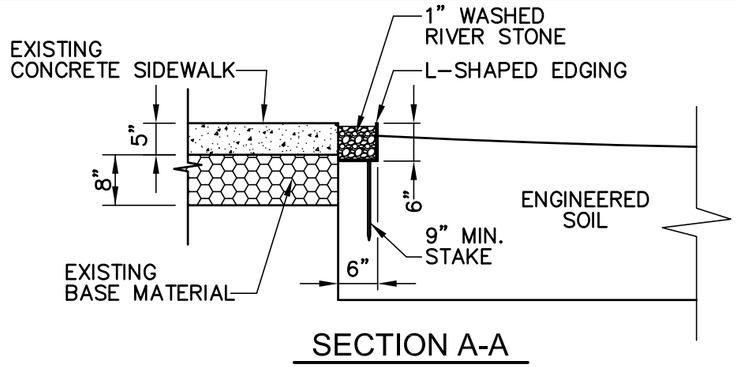
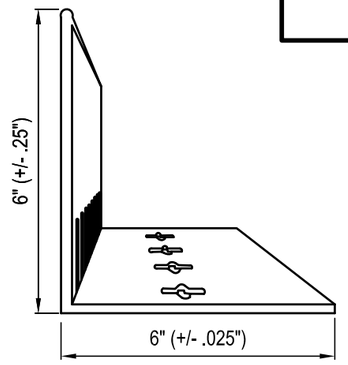
DATE: JAN. 2018
DRAWING NO.: **STD-NH-44F**



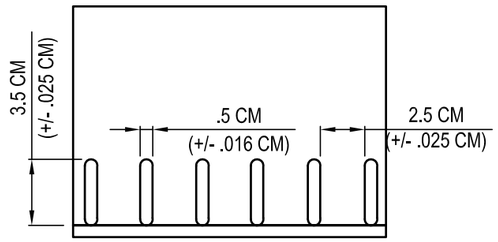
PLAN



SECTION A-A



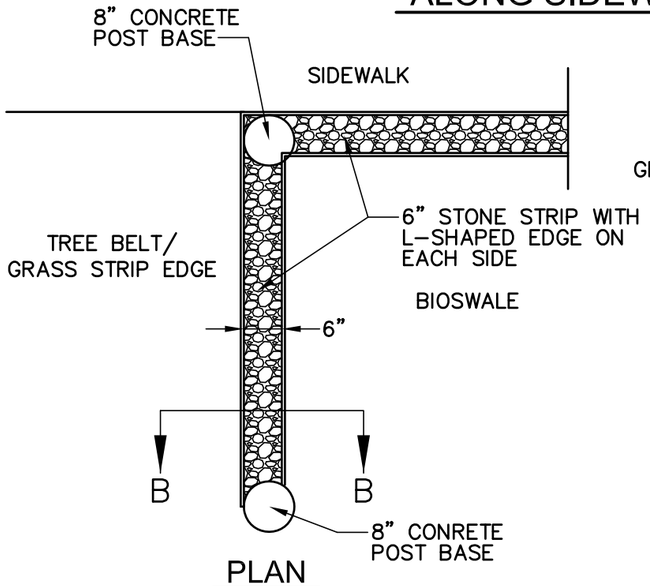
SIDE ELEVATION



FRONT ELEVATION

L-SHAPED EDGING

STONE STRIP DETAIL ALONG SIDEWALK EDGES



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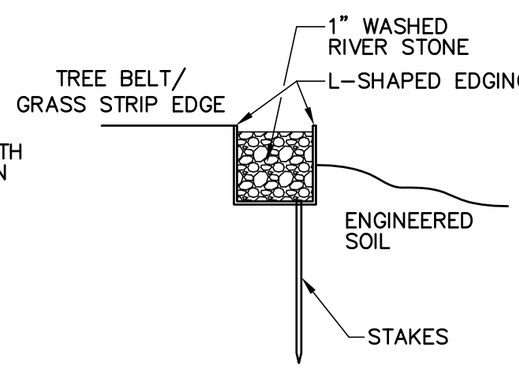
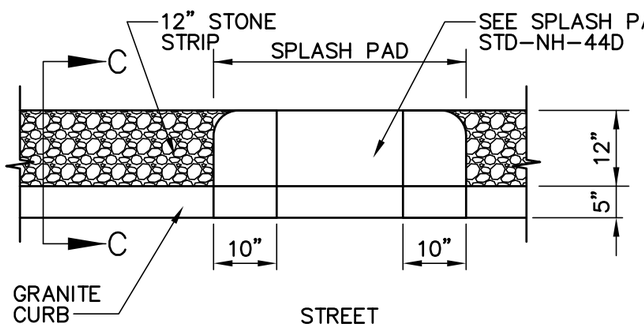
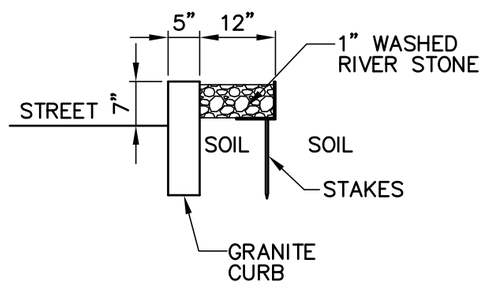


SECTION B-B

STONE STRIP DETAIL ALONG TREE BELT/ GRASS STRIP EDGE



PLAN



SECTION C-C

STONE STRIP DETAIL ALONG CURBING

NOTES:
COMPACT SOIL BELOW EDGING/STONE STRIP.

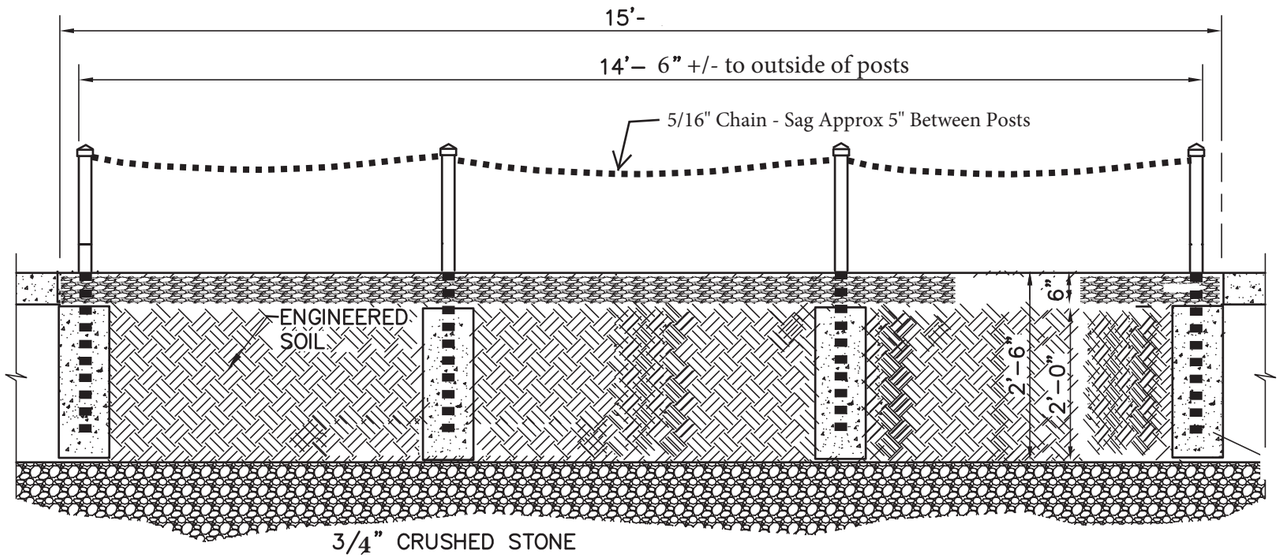
STONE STRIP DETAILS

NOT TO SCALE

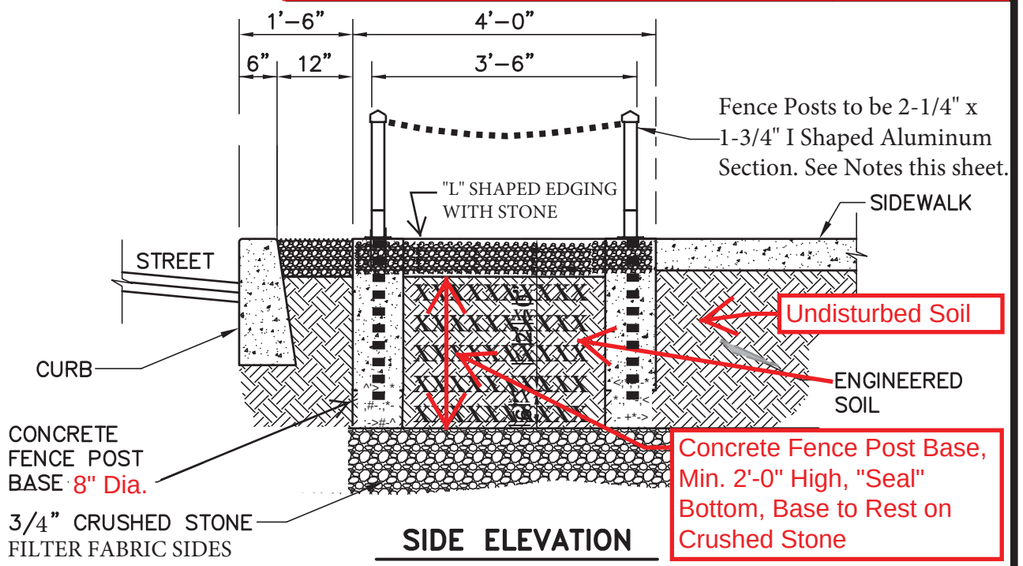
Greater New Haven Water Pollution Control Authority

GREEN INFRASTRUCTURE DETAILS

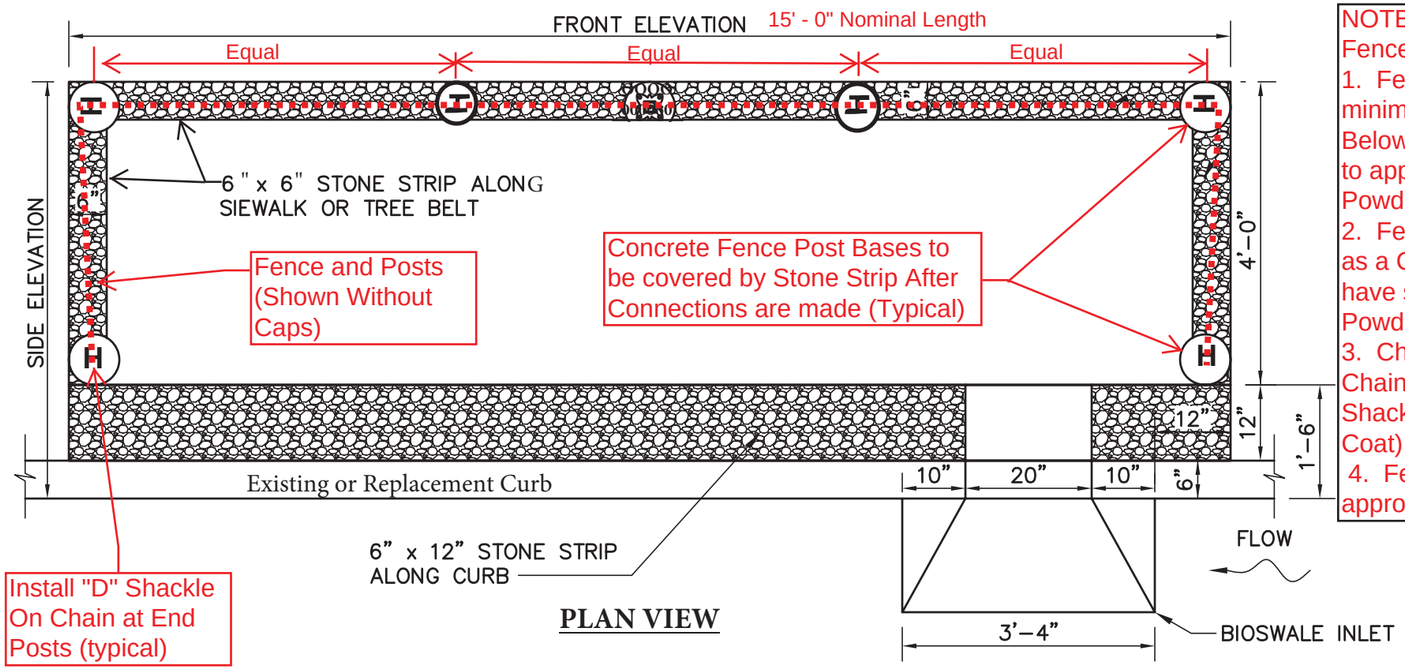
MARCH 2018 Drawing No. **GI 1521-17**



FRONT ELEVATION



SIDE ELEVATION



PLAN VIEW

NOTES:

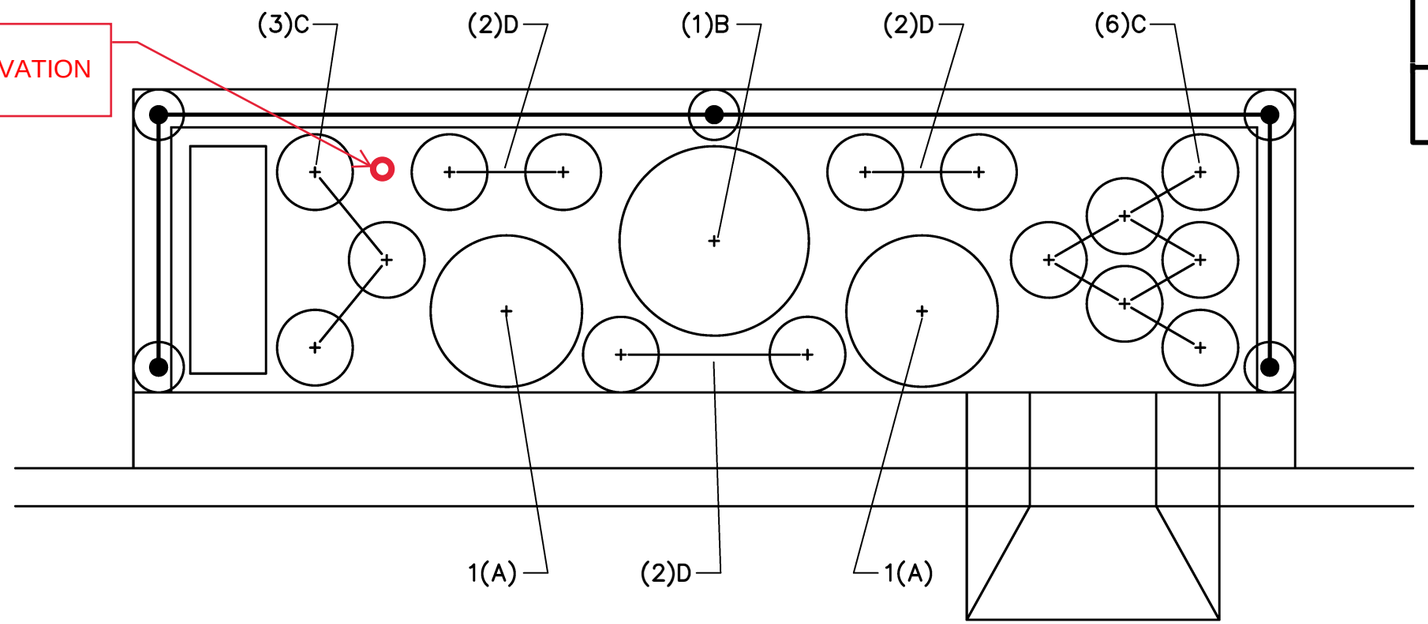
Fence shall be Aluminum Post and Cap with Steel Chain as further specified below:

1. Fence Posts shall be Heavy Aluminum Extruded I Beam Shaped. Posts shall be a minimum of 4'-0" long. They shall be 2-1/4" depth with 1-3/4" flanges (See Photos Below). The web of the Post shall be 3/16" thick and notched to accept the chain, prior to applying the Finish. Flanges shall be 1/4" thick. Finish shall be a Black Polyester Powder Coating. Top of Cap 2' above Sidewalk, Embed Min. 18" into Concrete Base.
2. Fence Caps shall be Cast Aluminum, sized to fit the post, with a sloped top, known as a Central Park Cap. The Cap shall extend onto the post covering the end and shall have set screws to secure the Cap to the Post. The finish shall be a Black Polyester Powder Coating.
3. Chain shall be 5/16" Steel Chain, Hot Dip Galvanized, meeting AIS requirements. Chain shall fit over top of posts. Ends of Chain shall be fitted with Galvanized "D" Shackles. The Chain & Fittings shall undergo an Electrophoretic Painting Process (E-Coat). Finish shall be an Black Polyester Powder Coating matching the Posts & Caps.
4. Fence shall be as supplied by Snug Cottage Hardware, The Hoover Fence Co., or approved equal.

NOTE: *Drawings Based upon City of New Haven Standards - Revised for GNHWPCA Project Use*

FENCING DETAILS

NOT TO SCALE



CITY OF NEW HAVEN
DEPARTMENT OF ENGINEERING

GIOVANNI ZINN, P.E.
CITY ENGINEER

DRIVE: K:\ENGINEER\DWG
FILE: CITYSTD\DETAILS\2018 DETAILS
DATE: JAN. 2018
DRAWING NO.: **STD-NH-44J**

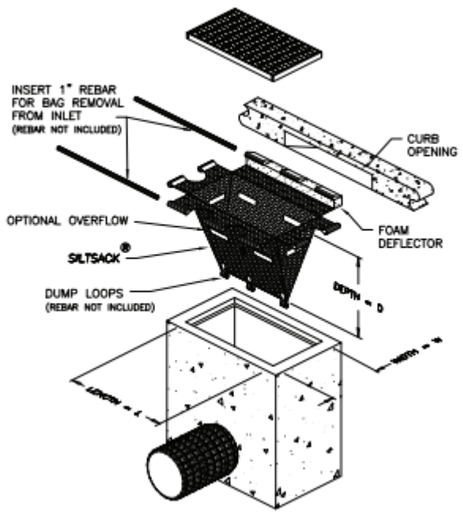
ADAPTED AND MODIFIED FOR USE BY TNC

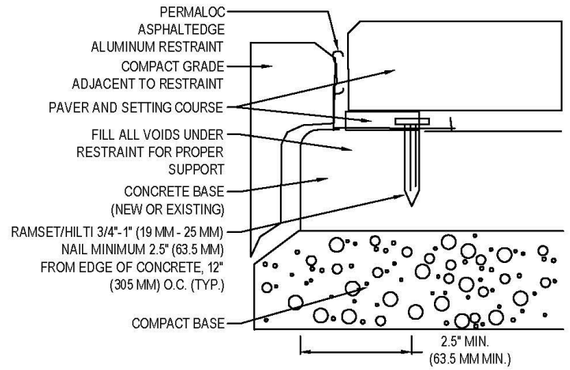
KEY	QTY	TYPE	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
A	2	SHRUB	ILEX GLABRA COMPACTA	INKBERRY	18"–24" HT.	2' O.C.
		SHRUB	PIERIS JAPONICA	LITTLE HEATH JAPANESE PIERIS	18"–24" HT.	2' O.C.
		SHRUB	PRUNUS LAUROCERASUS "OTTO LUYKEN"	DWARF CHERRY LAUREL	24"–30"	2.5 O.C.
B	1	SHRUB	CORNUS SERICEA	RED TWIG DOGWOOD	18"–24" HT.	1' O.C.
		SHRUB	KERRIA JAPONICA	JAPANESE KERRIA	18"–24" HT.	1' O.C.
		SHRUB	CLETHRA AINIFOLIA	SWEET PEPPERBUSH	18"–24" HT.	1' O.C.
C	9	GROUNDCOVER	LIRIOPE SPICATA OR MUSCARI	LILYTURF	1 GAL.	1' O.C.
		GRASS	CAREX "ICE DANCE"	SEDGE	1 GAL.	1' O.C.
		PERENNIAL	TIARELLA WHERRYI	FOAM FLOWER	1 GAL. (8"–10" HT.)	1' O.C.
D	6	PERENNIAL	HOSTA	HOSTA	1 GAL.	1' O.C.
		PERENNIAL	ALCHEMILLA MOLLIS	LADY'S MANTLE	1 GAL.	1' O.C.
		PERENNIAL	HEUCHERA (SP.)	ALUMROOT	1 GAL.	1' O.C.

BIOSWALE PLANTING PLAN
SHADE TEMPLATE

SCALE: $\frac{1}{2}$"=1'–0"

Typical Siltsack® Construction - Type A





NOTES:
1. EDGE RESTRAINT SHALL BE PERMALOC ASPHALTEDGE ALUMINUM RESTRAINT, IN 8' LENGTHS WITH 0.21" THICK EXPOSED TOP LIP, SIZE 3" X 3", BLACK DURAFLEX FINISH, ELECTROSTATICALLY APPLIED BAKED ON PAINT, MEETS AAMA 2603, AS MANUFACTURED BY PERMALOC CORPORATION OR APPROVED EQUAL. CONTRACTOR TO VERIFY HEIGHT OF PAVER AND SAND SETTING COURSE PRIOR TO ORDERING TO ENSURE TOP OF EDGE RESTRAINT WILL BE BELOW GRADE TO PREVENT TRIPPING HAZARD.
2. INSTALL PER MANUFACTURER'S "INSTALLATION GUIDELINES".
3. SECTIONS ALONG PAVER EDGE SHALL BE CONTIUOUS, AND CONNECTORS SHALL NOT BE USED.
4. CORNERS: NOTCH BASE ONLY AND FORM A CONTINUOUS CORNER.
5. DO NOT SCALE DRAWING.
6. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.CADdetails.com/info AND ENTER REFERENCE NUMBER 006-063.

ASPHALTEDGE ALUMINUM ASPHALT RESTRAINT

RESTRAINING PAVER AND SETTING COURSE OVER CONCRETE BASE

The Nature Conservancy Connecticut	Stamford Bioswale Project	February 28, 2019
		Miscellaneous Details
	Drawn by: VWH / Revision No. 1	**MD**

EXHIBIT A

DESCRIPTION OF THE SERVICES

The Nature Conservancy has received permission from the City of Stamford to construct this project. The Services will take place on public property owned by the City of Stamford, and the City of Stamford has provided permission to access the property for purposes of carrying out the Services, per all required licenses and permits secured the Contractor.

The Contractor will provide construction services to build one 5' by 15' right-of-way bioswale on Rippowam Place (see attached site plan) in Stamford, CT as detailed in the following designs and specifications. The site plan shows the approximate location of the bioswale, and exact location will be field-marked at the project kickoff meeting.

Tasks and expectations required of the Contractor to fully construct the right-of-way bioswale include, but are not limited to:

- Be fully bonded, insured and licensed to work in the City of Stamford.
- Secure all necessary permits, including a road closure permit for Rippowam Place.
- Mobilization.
- Brick paver and concrete base removal.
- Installation/cutting of inlet.
- Excavation and disposal of material.
- Backfill of bioswale (including geotextile fabric, stone, and engineered soil).
- Gabion installation.
- Installation of concrete apron and splash pad.
- Fence installation.
- Reinstall brick pavers and edge restraints.
- Installation of stone strip bed.
- Planting.
- Installation of pea gravel.
- Erosion and sediment control.

Full project details are described below.

Table of Contents

PROJECT SPECIFICATIONS
SECTION 1: PROJECT OVERVIEW

SUBMITTALS

The Contractor shall submit all material samples, certificates, testing, etc. as called for in the contract documents promptly after award of the Contract. TNC has up to 10 days to review submitted materials and materials must be reviewed prior to the start of construction. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time

EXCESS MATERIALS

No excess materials, concrete, or other waste may be placed within the footprint of the bioswale at any time. These products contaminate the bioswale and prevent full functioning of the bioswale. Any preventative measures and/or clean-up activities required to comply with this notice are the responsibility of the Contractor and will not be paid for separately.

REPLACEMENT OF DAMAGED CURBING, ASPHALT, AND SIDEWALK

The Contractor is responsible for replacing any curbing, sidewalk, or asphalt pavement damaged during construction to the satisfaction of the City of Stamford at no cost to TNC. Contractor is responsible for taking pre- and post- construction photos to document field conditions.

PERMITS

It is the Contractor's responsibility to obtain any necessary permits from the City of Stamford for the completion of this work. Application for road closure and other applicable permits should be coordinated with TNC and City officials. Fees for required City permits will be waived as this is a City project.

BONDS

The City of Stamford will require a bond for construction work completed within the right-of-way. It is the Contractor's responsibility to secure any required bonds.

SALVAGE

The brick pavers removed to install the bioswale shall be salvaged and returned to the City of Stamford. The City will arrange pickup and transport of the brick pavers to a storage location.

TRAFFIC CONTROL

It is the contractor's responsibility to provide any and all traffic control for any road or sidewalk closures, or as required by the City of Stamford's permits. Traffic control shall follow applicable local ordinances, state laws or regulations, and industry best practices.

BASIS OF PAYMENT

This is a lump sum project. All materials, equipment, tools, disposal, and labor necessary to complete the work outlined in these contract documents shall be included in the lump sum cost.

GENERAL DESCRIPTION OF THE WORK/ORDER OF OPERATIONS

Below is a general description of the work involved. Details on sequencing will be discussed during a pre-construction meeting if awarded contract.

1. Obtain any necessary permits from the City of Stamford.
2. Provide labor and equipment necessary to execute plan as designated in the permit.
3. Remove and salvage pavers for bioswale footprint.
4. Saw cut and remove concrete base under pavers.
5. If replacing curbing and/or installing a granite curb inlet, install curb and/or curb inlet.
6. If using existing curbing, saw cut curb inlet as shown in the detail drawing and concrete apron

footprint.

7. Excavate to required depth and provide any necessary structural support.
8. Install geotextile liner.
9. Begin to backfill with open graded stone base.
10. Install gabion.
11. Complete backfill with stone base and wrap with geotextile liner.
12. Backfill with engineered soil.
13. Engineered soil needs to settle before applying pea gravel. Either fully saturate bioswale or wait until a rainfall occurs before applying pea gravel.
14. Place engineered soil as necessary to bring bioswale back to proper grade.
15. Install concrete apron and splash pad.
16. Install fencing.
17. Reinstall brick pavers with edging support.
18. Install stone strips along roadside edge of bioswale and pea gravel over engineered soil.
19. Remove unsuitable material at the end of every workday throughout the course of the installation.

SECTION 2: CONSTRUCTION

SECTION 2.01 SAW CUTTING

2.01.1 DESCRIPTION
Work under this item shall consist of the concrete saw cutting of sidewalk and/or road for bioswale installation (except curb cut which is covered under a separate section) and locations shown on contract documents.

2.01.2 MATERIALS
Not applicable.

2.01.3 CONSTRUCTION METHODS
Saw cuts to be made shall be clearly marked and indicated according to contract drawings or as specified by the Onsite TNC Representative before work commences. Footprint of the saw cut must be sprayed down prior to making cuts to minimize dust. Saw cut depth shall be no greater than five (5) inches, exceptions may be made at the Onsite TNC Representatives discretion where required to perform relevant activities.

Any unforeseen damage to existing buried structures or utilities caused by saw cutting activities shall be the responsibility of the contractor to remove and replace.

Overlapping saw cuts must be limited to ensure that the sidewalk outside the limits of construction remain free of cuts. Any excess cuts must be filled with grout to the satisfaction of the Onsite TNC Representative.

Contractor is responsible for removing and disposing of sidewalk in bioswale areas.

SECTION 2.02 BIOSWALE EXCAVATION

2.02.1 DESCRIPTION
Work under this item shall consist of excavation up to five (5) feet below top of curb and disposal of excavated material (as required).

Refer to Drawing: NH-44A

2.02.2 MATERIALS
Not applicable.

2.02.3 CONSTRUCTION METHODS
Excavation shall not begin without a valid CBYD ticket. Excavation shall be made in accordance with the requirements of the contract drawings and as ordered by the Onsite TNC Representative. Excavation could include removal of concrete sidewalk, base material, topsoil, brick walkway, native soils, and/or other miscellaneous material present within the right of way.

When excavating, a six (6) inch buffer should be maintained on the curb side of the bioswale as to not undermine the curb. Care shall be taken not to undermine the sidewalk sides of the bioswale as well and excavation methods shall be adjusted if material from under the sidewalk overhang begins to erode. All other material is to be removed and the sides made square (vertical). The bottom of the extracted pit should be scarified and level.

The Contractor shall be responsible for maintaining and protecting all existing utilities encountered in the work under this Contract. Hand digging around utilities is required and adequate bracing and shoring shall be employed as needed to avoid damage to utilities. Any damage to utilities is the responsibility of the Contractor and the Contractor shall repair and replace any damage resulting from

their work. There will be no additional payment for these repairs unless specifically authorized by the Onsite TNC Representative.

The excavated material should not be placed upstream of the bioswale inlet as to prevent fines from running into the bioswale. The Contractor is responsible for removing and disposing any and all excavated material and any associated costs.

Excavation and backfill of the bioswale should occur within the same work day such that no material is left at the work site overnight and no excavated pits are open overnight. Orange construction fencing shall be placed around the entire perimeter of the bioswale site until the bioswale fence is installed. The area where material was stored shall be swept at the end of the day.

Prior to backfilling the bioswale, the Contractor shall conduct an infiltration test on the underlying soils following ASTM D3385 or other method approved by TNC and provide the results to TNC.

SECTION 2.05 BACKFILL OF BIOSWALE

2.05.1 DESCRIPTION

Work under this item shall consist of lining the sides and top of the stone base with geotextile, backfilling with open graded stone, and engineered soil.

Refer to City Standard Drawing(s): NH-44A, NH-44A1

2.05.2 MATERIALS

See Material Specifications for Open Graded Stone Base (3.01.1), Geotextile (3.05), and Engineered Soil (3.02)

2.05.3 CONSTRUCTION METHODS

Bioswale Backfill: Backfill materials and quantities shall be made in accordance with the requirements of the standard details. For a typical bioswale, the backfill consists of an approximately 2-foot 4-inch layer of Open Graded Stone Base wrapped in geotextile followed by approximately 2 feet of Engineered Soil at the lowest point in the bioswale, slightly more soil needed for grading (see City Standard Detail NH-44A1).

Prior to backfill, the sides of the bioswale should be prepared to avoid any sharp objects that could tear the geotextile. The sides of the bioswale must then be lined with geotextile. The fabric should be free of wrinkles and folds when placed. The edges of the material must overlap by a minimum of 6 inches such that no gaps in material are present. The geotextile must be properly secured and the stone shall be carefully placed to prevent dislocation of geotextile. If the geotextile is damaged during installation, the rupture shall be removed and replaced with undamaged fabric. All repaired fabric costs will be deemed part of the bid item price.

Place gabion*, install observation well (see below), and backfill with 2-feet 4-inches of Open Graded Stone Base. Prior to backfilling with Engineered Soil, unsecure geotextile and wrap stone base completely so that no stone is visible. Cover the top of the gabion to prevent soil from filling voids in the gabion. Fill with Engineered Soil to level as designated on the plans. Engineering Soil is not to be compacted.

* See Section 2.06 Stone Gabion Installation for details.

Observation well shall be 4” PVC perforated pipe through the open graded stone layer, and solid 4” PVC pipe through the engineered soil layer, solvent welded with a PVC union. Geotextile fabric shall be installed around observation well in the engineered soil layer to ensure engineered soil cannot

migrate into open-graded stone layer. 4” PVC threaded cap shall be installed level with pea gravel.

The Contractor assumes responsibility for any contamination of any part of this base and soil material during construction and shall, at his/her own expense, remove any and all portions of the base and soil which do not conform to the requirements of these specifications and replace with specified material.

Excavation and backfill of the bioswale should occur within the same work day such that no material is left at the work site overnight and no excavated pits are open overnight. The area where material was stored shall be swept at the end of the day. Orange construction fencing shall be placed around the entire perimeter until construction of the bioswale is complete.

SECTION 2.06 STONE GABION INSTALLATION

2.06.1 DESCRIPTION

Work under this item shall consist of furnishing, assembling, and tying open wire mesh baskets, lining the inside vertical sides with geotextile, placing within bioswale, and filling with large stone (at least 3” and not to exceed 6”).

Refer to City Standard Drawing(s): NH-44A1

2.06.2 MATERIALS

See Material Specs for Stone Gabion (3.06), Large Stone for Gabion (3.01.2)

2.06.3 CONSTRUCTION METHODS

The gabion baskets shall be fabricated based on manufacturer’s recommendations to meet the details shown on the standard drawings. The gabion shall have a single length of geotextile covering all vertical faces. Geotextile should be attached to the top perimeter of the gabion using lacing wire.

Horizontal connecting wires shall be used to keep the gabion from bulging. Wires shall connect the 3-foot faces of the gabion as shown in the standard drawing NH-44C1. To do this, make a loop from the back to the front of the basket around 2 meshes of the 3-foot walls of the gabion and join the ends with pliers. Then windlass the wire to keep the face even and free from bulging (Put a sturdy flat stone in this loop and turn in circle creating a tourniquet effect which pulls the front tight).

The gabion is to be installed in the location(s) as shown on the standard drawings or as specified by the Onsite TNC Representative. When backfilling the bioswale with stone, be sure to concurrently fill the gabion with the large (3-6”) stone from the inside to avoid bowing of the gabion.

Installed gabion must be at least 6 inches deep into the open-graded stone base. The top of the gabion shall be set to about 1 to 2 inches above street grade. The top of the gabion should be temporarily covered during backfill of engineered soil to avoid soil entering the void spaces of the stone. The soil level at the gabion should be at the same elevation as the inlet as designated on the standard drawings.

Large stones must fill to the top of the gabion. The lid shall be then tightly laced along the edges and corners using lacing wire.

SECTION 2.13 MODIFY EXISTING CURB FOR INLET

2.13.1 DESCRIPTION

Work under this item shall consist of saw cutting, grinding or otherwise shaping of existing granite curb in place to create an inlet of the dimensions specified on the below drawing, and disposing of debris waste.

Refer to City Standard Drawing: NH-44E

2.13.2 MATERIALS

Not applicable.

2.13.3 CONSTRUCTION METHODS

Locations are at the Onsite TNC Representative's direction. Means and methods for creating inlet are determined by the Contractor.

The bottom of the inlet opening is to be flush with the street grade as to allow water from the street to enter.

SECTION 2.15 SPLASH PAD

2.15.1 DESCRIPTION

Work under this item shall consist of constructing a concrete splash pad as detailed in the City Standard Drawing NH-44E, Bioswale Inlet Detail, Section A-A.

Refer to City Standard Drawing: NH-44E

2.15.2 MATERIALS

See Material Specification for Concrete for Small Applications (Section 3.11.2) or concrete as specified in 3.11.1

2.15.3 CONSTRUCTION METHODS

Means and methods for creating splash pad are to be determined by the Contractor. The splash pad must be flush with the curb inlet. The splash pad is to be sloped slightly downwards from the curb inlet towards bioswale.

Care must be taken to keep concrete to the locations specified in the drawing. No excess concrete shall be disposed of within the footprint of the bioswale.

SECTION 2.16 CONCRETE APRON

2.16.1 DESCRIPTION

Work under this item shall consist of constructing a concrete apron on the street side of the bioswale inlet as detailed in the City Standard Drawing NH-44E, Bioswale Inlet Detail, Section A-A.

Refer to City Standard Drawing: NH-44E

2.16.2 MATERIALS

See Material Specification for Concrete for Small Applications (Section 3.11.2)

2.16.3 CONSTRUCTION METHODS

Means and methods for creating concrete apron are to be determined by the Contractor. The asphalt should be cut and removed such that the base material is exposed. The concrete must be poured on the base material. If there is concrete base present under the road, score the concrete prior to pouring the apron.

The apron must be flush with the curb inlet.

Care must be taken to keep concrete to the locations specified in the drawing. No excess concrete shall be disposed of within the footprint of the bioswale.

SECTION 2.21 STONE STRIP BED

2.21.1 DESCRIPTION

This section shall include the installation of a twelve (12) inch wide stone strip bed behind a curb in a

bioswale all in accordance with the requirements of the City Standard Drawings and as directed by the Onsite TNC Representative.

Refer to City Standard Drawing(s): NH-44F, NH-44A1

2.21.2 MATERIALS
See material specifications for Landscape Edging and Stakes (3.07), Small Stone (3.01.4)

2.21.3 CONSTRUCTION METHODS
Landscape edging along the curb shall be located as shown in City Standard Drawing and depending on the location of the bioswale inlet(s).

The soil under the landscape edging shall be compacted by hand. Landscape edging shall be placed in lengths of at least two feet except where smaller lengths are necessary to create the inlet detail. Lengths of edging are to be connected using manufacturer's recommended installation instructions. Stakes are to be placed a minimum of every one (1) foot length of edging.

Corner pieces to be used at the bioswale inlet are to be pre-fabricated before installation. GeoEdge manufactures pre-fabricated corners. Oly-Ola edging manufacturers corner pieces that must be glued onto sections of edging using PVC glue. This work is to be completed at least 24 hours prior to installation.

The edging is to be topped with Small Stone (3/4" to 1" in size)

.

SECTION 2.30 PLANTING AND PEASTONE COVER

2.30.1 DESCRIPTION
The work under these items shall consist of furnishing and planting shrubs, perennials, bulbs, and ground cover plants of the type and size indicated on the plans or special provisions. This item also includes the furnishing and placing of peastone surrounding the plant material. It shall also include all incidental operations, such as the care of the living plants and the replacement of dead and unsatisfactory plants or unsatisfactory materials before final acceptance of the planting.

Refer to City Standard Drawings: NH-44J

2.30.2 MATERIALS
See material specification for Plant Material (3.30) and Peastone (3.01.3)

2.30.3 CONSTRUCTION METHODS
Methods shall be consistent with the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction, Form 817, Section 9.49.03.

Engineered soil needs to settle before planting. Either fully saturate bioswale or wait until a rainfall occurs before planting. Bring engineered soil levels back to grade if necessary. No planting shall be done in frozen ground or when snow covers the ground, or the soil is otherwise in an unsatisfactory condition for planting.

Plants received by the Contractor shall be kept moist, fresh, and protected against exposure to sun, wind, and freezing temperatures whether in the receiving yard, in transit, while being handled, or in temporary storage on the site.

Layout: Plant material locations shall follow the associated City Standard Drawing NH-44J and/or or as assigned by the Onsite TNC Representative. Any plant substitutions must be approved by the Engineer. Strict adherence to the location and elevation of soil and plants is critical to the proper functioning of the bioswale. The center of the bioswale should be at an elevation 1 to 3 inches below the elevation of the invert. The overflow invert (gabion and/or dome grate overflow) shall be set at the same elevation as the inlet. No additional fertilizers or pesticides are to be applied to any area of this

project.

Watering: All plants must be watered upon setting and as many times thereafter as conditions warrant. The following is a guide for minimum requirements:

Shrubs: 6 gallons each
Vines, Perennials, and Ornamental Grasses: 3 gallons each
Groundcovers and Bulbs: 2 gallons per square foot

Water must be applied at a controlled rate and in such a manner that does not dislodge plants, erode soil, or cause damage to the root zone of the plant.

Peastone Cover: Peastone must be hand placed and spread to a depth of 1 inch over the entire surface area of the bioswale creating a smooth surface of consistent depth that maintains the grading shown in the standard drawings. Care shall be taken not to damage the plants during this process.

Guarantee/Warranty: All plant material shall be subject to a One-Year Establishment Period. During this time, the Contractor shall use currently accepted horticultural practices to keep all plant material installed in a healthy, vigorous growing condition at the date of final acceptance. The date of final acceptance shall be one (1) full calendar year following the satisfactory completion of the planting activities as confirmed by the City Stormwater Officer.

SECTION 2.31 BIOSWALE FENCE INSTALLATION

2.31.1 DESCRIPTION

The work under this item shall consist of installing the fence posts, chain, and caps around three sides of the bioswale.

Refer to Drawing: GI 1521-17

2.31.2 MATERIALS

Fence shall be Aluminum Post and Cap with Steel Chain as further specified below:

1. Fence Posts shall be Heavy Aluminum Extruded I Beam Shaped. Posts shall be a minimum of 4'-0" long. They shall be 2-1/4" depth with 1-3/4" flanges (See plans). The web of the Post shall be 3/16" thick and notched to accept the chain, prior to applying the Finish. Flanges shall be 1/4" thick. Finish shall be a Black Polyester Powder Coating. Top of Cap 2' above Sidewalk, Embed Min. 18" into Concrete Base.

2. Fence Caps shall be Cast Aluminum, sized to fit the post, with a sloped top, known as a Central Park Cap. The Cap shall extend onto the post covering the end and shall have set screws to secure the Cap to the Post. The finish shall be a Black Polyester Powder Coating.

3. Chain shall be 5/16" Steel Chain, Hot Dip Galvanized, meeting AIS requirements. Chain shall fit over top of posts. Ends of Chain shall be fitted with Galvanized "D" Shackles. The Chain & Fittings shall undergo an Electrophoretic Painting Process (ECoat). Finish shall be an Black Polyester Powder Coating matching the Posts & Caps.

4. Fence shall be as supplied by Snug Cottage Hardware, The Hoover Fence Co., or approved equal.

2.31.3 CONSTRUCTION METHODS

Fence posts shall be cast 18-inches into 8-inch diameter, 2-foot long concrete fence posts. The base of the fence posts shall sit on the geotextile fabric above the open-graded stone base. The fence posts shall be installed at the dimensions and locations shown on the plans. The chain shall be installed in the fenceposts in a single length and secured with ‘D’ shackles on the end posts and caps on each of

the fence posts. The concrete fence post bases shall be covered by stone strip after installation. Care should be taken when backfilling the open-graded stone to provide adequate room for the installation of the fence post bases, which provided adequate room to install the stone strip.

SECTION 2.40 BRICK PAVER INSTALLATION

2.40.1 DESCRIPTION

The work under this item shall consist of reinstallation of brick pavers along the edge(s) of the bioswale after excavation and backfill.

Refer to Drawing No: MD

2.40.2 MATERIALS

Brick pavers removed prior to excavation shall be salvaged and reinstalled. Edge restraint shall be Permaloc Asphaltedge aluminum restraint, in 8' lengths with 0.21" thick exposed top lip, size 3" x 3", black duraflex finish, electrostatically applied baked on paint, meets aama 2603, as manufactured by Permaloc Corporation or approved equal. Contractor to verify height of paver and sand setting course prior to ordering to ensure top of edge restraint will be below grade to prevent tripping hazard.

2.40.3 CONSTRUCTION METHODS

Following excavation and backfill, but prior to installation of the stone strip, brick pavers shall be reinstalled to the edge of the bioswale. Base shall be prepared to match existing paver base. A soldier course of brick pavers shall be installed along all edges of the bioswale. Any additional brick paver installation required to restore the site shall match existing patterns. An edge restraint shall be installed along the soldier course, inside the bioswale following manufacturer's recommended installation methods. Contractor shall deliver installation free of trip hazards.

Excess bricks not reinstalled shall be salvaged and returned to City Staff.

SECTION 40.01 SEDIMENTATION CONTROL AT CATCH BASIN

40.01.1 DESCRIPTION

Sedimentation control measures are to be installed at catch basins as instructed by the Onsite TNC Representative or as directed by the City of Stamford.

40.01.2 MATERIALS

Materials shall be consistent with the Connecticut Department of Transportation- Standard Specifications for Roads, Bridges, and Incidental Construction, Form 817, Section 2.19.02 Materials for Sedimentation Control, or approved equal.

40.01.3 CONSTRUCTION METHODS

Means and methods for installing sedimentation control at the catch basin are to be determined by the Contractor.

Clean out of accumulated sediment shall be accomplished as necessary to maintain function of the catch basin or as ordered by the Onsite TNC Representative or the City of Stamford. The system shall be maintained or replaced until they are no longer necessary for the purpose intended or are ordered removed from the site at the completion of the project.

SECTION 70.25 TREE PROTECTION

70.25.1 DESCRIPTION

Work under this item shall include the furnishing and installation of tree protection and root removal during and construction activities within the City Right of Way or as directed by the onsite TNC or City representative in accordance with these specifications. Healthy trees within the city right of way shall be appropriately protected during any construction or utility trenching must consider the health and protect ion of the tree(s) for any disturbance of the root zone or canopy. The following section shall apply.

70.25.20 QUALITY ASSURANCE

Prior to any construction activity within the City Right of Way where trees may be affected by the work being proposed, the contractor shall contact the tree warden, at the City of Stamford Parks Department at 203-223-3985. At his/her direction the potential tree(s) that are affected shall be inventoried and a determination made as to its health and anticipated protection required to ensure the construction activities will have a minimal impact on the identified tree(s). If required the contractor may be directed to hire an independent licensed arborist as approved by the Parks Department to guide the contractor on protective measures or work that is necessary to minimize damage to the tree(s) impacted.

70.25.21 MATERIALS AND EQUIPMENT

During construction where pruning is involved the equipment being used must follow OSHA and ANSI standards including bucket trucks, chippers, and personnel safety equipment. When working around tree roots the contactor shall not use any equipment that rips or tears at the root zone. Hand tools and appropriate excavation methods of care around root zones are required. Back fill material, if required in formed tree wells, shall be clean soil.

70.25.30 CONSTRUCTION METHODS

Excavations or sidewalk removals and replacements require careful recognition of the tree(s) that may be affected by the construction activity. Removals of sidewalks where tree roots have raised the walk require special attention after the initial screening by the tree warden. Any sidewalk that has tree root intrusion should be carefully removed by peeling off the slab or broken-up with hand tools and removed.

Where applicable, the contractor shall provide the largest tree well possible creating a root zone for the tree and a minimum sidewalk area for passage at 48". In extreme cases 42" may be required. Any tree roots over 6" in diameter that interfere with the safe minimum passage shall be pruned by a licensed arborist with a minimum of five years experience as approved by the Parks Department. The following provides further guidance:

A. Protection of Existing Trees
    1. All trees shall be protected from damage to trunks, branches and roots.
    2. Do not disturb the existing grade inside the tree root zone unless otherwise indicated or directed in the field by the Onsite TNC Representative. The root zone is considered equal to the branch spread of the tree.
    3. No materials, vehicles or equipment shall be stored, or stockpiled within the root zone of existing trees.
    1. Machinery shall not be driven over the root Zone unless it is absolutely necessary to gain access to the construction site.
    2. The contractor shall exercise caution in operating all machinery so that there is no damage to tree trunk, roots or branches.
B. Root Pruning
    1. All excavation required within the area of existing tree roots shall be carried out by hand.
    2. Roots shall be cut smooth and cleaned using sharp root cutting tools in accordance with good arboricultural practice. Cutting, ripping or tearing of tree roots using a

backhoe or other non-hand tool is not permitted.

3. Pruning of tree roots shall be kept to the absolute minimum necessary to install sidewalk and base course.
4. Root removal and materials covering existing roots shall be trimmed so exposed roots are not left exposed overnight or over non-working days or weekends.
5. All roots that will be left exposed for more than three hours shall be sprayed periodically with water and/or covered with moisture laden material to keep the roots moist.
6. Pruning of a root 6" or greater in diameter shall be done by a licensed/certified arborist in coordination with the tree warden employed by the Stamford Parks Department. To contact the tree warden employed by the Stamford Parks Department call 203-223-3985. The tree warden requires 24 hours notice before coming to the job site.

C. Tree Repair
    1. Any damage caused to trees by the work of this contract through negligence by the contractor shall be immediately remedied by the contractor.
    2. Remedial work may include pruning, wound treatment, cabling, or additional support measures as determined by the onsite TNC Representative.
    3. Contractor shall engage a licensed arborist to perform such work, as approved by the Engineer.
    4. All required remedial work shall be performed to the satisfaction of the Stamford Parks Department at no additional cost to the Owner.
D. Tree Replacement
    1. If damage to any tree is severe, because of negligence by the contractor as determined by the Stamford Parks Department, it shall be replaced with a new tree of equal size caliper and species as that of the damaged tree.
    2. If a replacement tree of equal size caliper is not possible, it shall be a minimum caliper size of 4.
    3. Replacement trees shall be supplied and installed at no additional costs to the Owner, including all incidental costs, including the costs of inspection of the tree at the nursery and any other incidental costs associated with tree replacement.

SECTION 3: MATERIALS

SECTION 3.01: STONE

For all stone classifications below, the Contractor assumes responsibility for any contamination of any part of the stone material during construction and shall, at his/her own expense, remove any and all portions of the stone which do not conform to the requirements of these specifications and replace with specified material.

3.01.1 OPEN GRADED STONE BASE

All materials for this work must comply with the State of Connecticut Department of Transportation- Form 817, Standard Specifications Pervious Structure Backfill Section M.02.05.01 for Broken or Crushed Stone. The material must meet gradation AASHTO No. 57 (3/4" crushed stone) and be washed and free from dirt and debris.

3.01.2 LARGE STONE FOR GABION

The material must be at least 3 to 6 inches in size, can be either crushed or rounded in shape, and be washed and free from dirt and debris.

3.01.3 PEASTONE

The material must meet gradation No. 8 (3/8") according to the State of Connecticut Department of Transportation- Form 817, Gradation of Aggregate Section M.01, be rounded in shape, and be washed and free from dirt and debris. Color to be approved by Onsite TNC Representative. Sample shall be submitted to TNC Representative prior to site delivery.

3.01.4 SMALL STONE

The material must meet gradation No. 6 according to the State of Connecticut Department of Transportation- Form 817, Gradation of Aggregate Section M.01 and be washed and free from dirt and debris. Color to be approved by Onsite TNC Representative. Sample shall be submitted to TNC Representative prior to site delivery.

SECTION 3.02 ENGINEERED SOIL

Engineered Soil is a soil mix that promotes infiltration. The Engineered Soil must consist of 80-85% coarse sand, 10-15% topsoil, and 2- 5% bark or wood fiber mulch. The Engineered Soil shall have an organic content between 3% and 8%. The Engineered Soil must contain no more than 5% fines (material passing through a sieve size of 200). The table below summarizes the components of the Engineered Soil.

Engineered Soil components	**Percent of each component (by volume)**	**Gradation of Material**	
		Sieve Size	Percent Passing
Coarse Sand	80-85%	See "Coarse Sand" section below	
Topsoil	10-15%	200	15-25%
Bark/Wood Mulch	2-5%	200	5% MAX

Engineered Soil must NOT contain any of the following materials: hard clods, roots, clay lumps, stones larger than 1-1/2 inches, concrete slurry, concrete layers or chunks, cement, plaster, building debris, asphalt, bricks, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, solid waste, and any other extraneous materials that are harmful to plant growth.

Engineered Soil Components:

Coarse Sand

The coarse sand must be washed and rounded to sub-angular in shape (such as concrete sand). The coarse sand must meet the gradation schedule as shown in the State of Connecticut Department of Transportation- Form 817, Standard Specifications with January 2017 supplement, Aggregates Table M.01.04-1 for Fine Aggregate Gradations as shown below.

Sieve Size	Percent Passing
3/8”	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	10-30
#100	2-10
#200	0-3

Topsoil

The topsoil must comply with the State of Connecticut Department of Transportation- Form 817, Standard Specifications Roadside Development Section M.13.01 for Topsoil. The topsoil shall contain 5-20% organic material and have a pH range of 5.5 to 7.0. The topsoil must be a loamy sand based and meet the gradation standard set above (no more than 25% passing through a sieve size of #200).

Bark/Wood Fiber Mulch

The bark or wood fiber mulch must be made of bark, coniferous, or hardwood trees, moderately fine shredded, of uniform texture, and free of stones, sticks, soil, rot, mold, and foreign or toxic materials. The bark/wood fiber mulch must meet the gradation standard set above (no more than 5% passing through a sieve size of #200).

Compost

Compost is only to be used as an amendment if the organic matter of the Engineered Soil is lower than 3%. The compost must comply with the State of Connecticut Department of Transportation- Form 817, Standard Specifications Roadside Development Section M.13.06 for Compost.

Submittals:

The Contractor must submit the following documentation twenty-one (21) days prior to the start of construction:

A. Proposed material source, vendor, and material testing data for each of the components (sand, topsoil, mulch) including grain size analysis (ASTM C-136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates preferred) and organic content.

B. A sample of the Engineered Soil as mixed, of approximately 1 gallon in volume, indicating the sampling method used and location of sample.

C. Grain size analysis on the Engineered Soil in accordance with the ASTM C-136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates. Engineered Soil must have no more than 5% fines (material passing through a sieve size of 200).

D. Organic matter content of the final mixed Engineered Soil in accordance with the ASTM C 2974 Standard Test Methods for Moisture, Ash, and Organic Matter using loss-by-ignition

method. If the percentage of organic matter content is below 3%, then the Contractor may amend the mix with Compost. Proposed material source, vendor, and material data sheet for the compost along with a sample will be required prior to amendment. After amendment is made, the Engineered Soil must be re-tested for organic matter content and grain size analysis.

The material delivered to the site must be visually and continuously inspected by the Onsite TNC Representative during construction to ensure the material is consistently the same material previously approved and delivered to the site. The Onsite TNC Representative may request additional testing at any time if it is suspected that the material is not the same as previously approved.

SECTION 3.05 GEOTEXTILE

All materials for this work must comply with the State of Connecticut Department of Transportation-Form 817, Standard Specifications Drainage Section M.08.01.19 for Geotextile.

Modification to the 817 includes removal of the sentence, "For each specific use, only geotextiles that are already on the Connecticut Department of Transportation's Qualified Products List for the geotextile type will be used."

Geotextile shall be ADS Geosynthetics 0401T nonwoven geotextile, Mirafi 140N Nonwoven Polypropylene geotextile, or similar as approved by the Onsite TNC Representative. Contractor to provide a submittal of the manufacturer's cut sheet for the selected product.

Geotextile is to be stored and covered such that it is adequately protected from site construction damage, precipitation, ultraviolet radiation, and other conditions that could damage the material as per manufacturer's recommendations.

SECTION 3.06 STONE GABION

3.06.1 STONE GABION MESH, FASTENERS, AND LACING WIRE

The dimensions of the welded mesh gabion are to be three (3) feet wide by one (1) foot thick by three (3) feet tall. The welded mesh, spiral fasteners, and lacing wire are to have the following parameters:

Welded Mesh

	Unit	Value
Wire Diameter	inch	0.120 (min)
Tensile Strength	PSI	80,000 (min)
Weld Shear	Lbs	450 (min)/ 548 (avg)
Zinc Coating Wt.	oz/ft	0.85 (min)
Mesh Opening Dimension	inch	3" x 3" (max)

Spiral Fasteners

	Unit	Value
Tensile Strength	PSI	80,000 (min)
Diameter	inch	0.120 (min)

Lacing Wire

	Unit	Value
Tensile Strength	PSI	60,000 (min)
Diameter	inch	0.086 (min)

The gabion shall be the "Midwest Welded Wire Gabion" manufactured by Midwest Construction Products or similar as approved by the Onsite TNC Representative.

Gabions require fabrication. The front, base, back and lid shall be woven into a single unit using the spiral fasteners. The lid should be left open until gabion is filled with aggregate at which point it shall be wired tightly shut using the lacing wire. Gabions are to be constructed according to manufacturer's recommendations.

SECTION 3.07 LANDSCAPE EDGING AND STAKES

Edging must consist of L-shaped PVC or aluminum edge restraint product, a minimum of six (6) inches high by five (5) inches wide and 0.15 inches thick, in up to ten (10) foot lengths. Drainage slots must be present on the vertical side of edging. The color of the edging must be black. The stakes must be a minimum nine (9) inches in length.

Edging shall be Teco-Edg Specialty Edge Restraint manufactured by Oly Ola Edgings, Inc. in Villa Park, IL, GeoEdge Aluminum Green Building Edging manufactured by Permaloc Corporation in Holland, MI or approved equal. The stakes shall be Oly Ola 9-inch Multi-Purpose Stakes or similar landscape spike as approved by Onsite TNC Representative. Submit product cut sheets as shop drawings for Onsite TNC Representative's approval prior to ordering the product.

Corner pieces are to be pre-fabricated before installation. GeoEdge manufactures pre-fabricated corners. Oly Ola edging manufacturers corner pieces that must be glued onto sections of edging using PVC glue. This work is to be completed at least 24 hours prior to installation. Lengths of edging are to be connected using manufacturer's recommended installation instructions. This is not a pay item and any fabrication-related costs will be paid for in the lump sum cost for each bioswale.

SECTION 3.11 CONCRETE

3.11.1 CONCRETE CLASS "B" AE CONCRETE MIXTURE FOR FLATWORK

Portland cement concrete shall be in conformance with the requirements of the Connecticut Department of Transportation Standard Form 817 Materials Section M.03, and adhere to the mix design proportions and data below.

MATERIAL DATA

Material	Source/Type	Specific Gravity
Water	Domestic supply	1.00
Cement	LaFarge	3.15
Slag	LaFarge Newcem	2.93
Flyash	Headwaters	2.42
3/4" Stone	ASTM C-33	2.90
1/2" Stone	ASTM C-33	2.90

3/8" Stone	ASTM C-33	2.90
Concrete Sand	ASTM C-33	2.67
Water Reducer	ASTM C494 Type A&F	
Air Entraining Agent	ASTM C260	
Retarder	ASTM C494 Type B&D	

MIX DESIGN PROPORTIONS

Material	**Proportions (SSD)**			
	Volume		**Weight**	
Water	4.57	Cu. Ft.	285.0	lb/cy
Cement	3.11	Cu. Ft.	611	lb/cy
Newcem	0.00	Cu. Ft.		lb/cy
Flyash	0.00	Cu. Ft.		lb/cy
% Air Entrained	1.35	Cu. Ft.	5.0	
Total Aggregate	18.11	Cu. Ft.	3120	lb/cy
3/4" Stone (lbs,ssd)	4.91	Cu. Ft.	900	lb/cy
1/2" Stone (lbs,ssd)	2.45	Cu. Ft.	450	lb/cy
3/8" Stone (lbs,ssd)	2.74	Cu. Ft.	450	lb/cy
Concrete Sand (lbs,ssd)	8.01	Cu. Ft.	1320	lb/cy
Total	27.14	Cu. Ft.		lb/cy
Water Reducer	3.0	oz/cwt	18.0	oz/cy
A.E.A.	0.5	oz/cwt	5.0	oz/cy
Retarder			0.0	oz/cy

Aggregate Percentages	
3/4" Stone	**28.85%**
1/2" Stone	**14.42%**
3/8" Stone	**14.42%**
Sand	**42.31%**
Total	**100.00%**

3.11.2 CONCRETE FOR SMALL APPLICATIONS

This concrete material is to be used for small applications such as the concrete apron and splash pad. Quikcrete “Crack Resistant Concrete Mix” (Product No. 1006) or similar. Alternative mix must be submitted for approval.

Placement procedures must adhere to manufacturer’s recommendations.

SECTION 3.15 JOINT MATERIALS

3.15.01 PREFORMED CORK EXPANSION JOINT FILLER

Preformed Cork Expansion Joint Filler, Type I, shall conform to the requirement of A.A.S.H.O. Spec.

M 153-54 Type I. Unless otherwise required by these specifications or the plans, this material shall be used in expansion joints of all walls, bridges, box culverts, buildings and other construction not covered by other articles of this Section.

3.15.02 SELF EXPANDING PREFORMED CORK EXPANSION JOINT FILLER

Self-Expanding Preformed Cork Expansion Joint Filler shall conform to the requirements of A.A.S.H.O. Spec. M153-54, Type II. Unless otherwise required by these specifications or plans, this material shall be used in expansion joints of sewage disposal and water works structures.

3.15.03 PREMOULDED BITUMINOUS-IMPREGNATED CANE FIBER BOARD JOINT FILLER

Pre-molded non-extruding bituminous impregnated cane fiberboard meeting the following requirements and specifications:

a. Core stock: The filler core material shall be made of long tough fibers fitted together to form a rigid board weighing not more than 16 lbs. per cu. ft.
b. Asphalt Content: The core stock shall be uniformly impregnated throughout its cross-section with at least 35% and not more than 50% by weight with a durable asphaltic compound.
c. Compressibility: The load required to compress a test specimen to 50% of its thickness shall be between 100 and 750 lbs. per sq. in.
d. Resiliency: A test specimen shall be given three applications of a load sufficient to compress the material to 50% of its original thickness. The load shall be released, and the compression repeated three times. At the end of an hour after the third application the material shall have recovered to at least 70% of its thickness before test.
e. Extrusion: Specimen confined on three sides shall be compressed to 50% of its original thickness. The amount of extrusion of the free edge shall not exceed 1/8".
f. Loss in Weight: This same specimen when compressed to half its original thickness shall show a loss of asphaltic compound not more than 3% by weight of the original test specimen. The joint filler shall be "Flexcell" Bituminous - Impregnated Cane FiberBoard as manufactured by The Celotex Corporation, Chicago, Illinois, or approved equal. Unless otherwise required by these specifications or plans, this material shall be used in expansion joints of sidewalks and other slabs resting on the ground.

3.15.04 PREFORMED BITUMINOUS JOINT FILLER

Preformed Bituminous Joint Filler shall be the bituminous cellular type and shall conform to the requirements of A.A.S.H.O. M-153-54 Type III. This material shall not be used unless specifically called for in the specifications, contract plans or by the Onsite TNC Representative.

3.15.05 SPONGE RUBBER EXPANSION JOINT FILLER

Sponge Rubber Expansion Joint Filler shall conform to the requirements of A.S.T.M. Designation D-544-29, Type III. This material shall not be used unless specifically called for in the specifications, contract plans, or by the Onsite TNC Representative.

3.15.06 POURED RUBBERIZED ASPHALT JOINT SEALER

Poured joint sealer shall be a rubber compound of the hot poured type and shall conform to the requirements of A.S.S.H.O. M-173-60, (Fed. Spec. SS-S-164 A.S.T.M. Spec. D 1190-52T). The contractor shall furnish notarized statements from a qualified commercial testing laboratory attesting that the joint sealing materials meet A.A.S.H.O. M- 17360. Results of the tests shall be submitted in triplicate. No material shall be delivered or used until laboratory results have been examined and material approved of by the Onsite TNC Representative. The containers of sealant shall be marked by lot number to coincide with the lot number shown on the test report by the laboratory. Costs of testing, sampling, etc., required shall be included in the cost of this item and no separate payment will be made by the City for such costs. Unless otherwise required by these specifications or the plans, the material shall be used to seal horizontal expansion joints of concrete pavements, and other slabs

not normally subject to foot traffic, except as required in articles below.

3.15.07 TWO-COMPONENT POLYSULFIDE SEALING COMPOUND

Two-Component Sealing Compound shall be a polysulfide liquid polymer consisting of base material and separate activator. The material shall be such as to adhere to concrete and shall not lose its adhesion when the adjacent surfaces are subject to water and moisture after the application has been made. The material shall be mixed and applied by mechanical means and in accordance with the manufacturer's instructions. Physical requirements shall be as follows:

Color	Light Gray
Min. Tensile Strength, psi 300-400,	ASTM D412-51T
Min. Elongation, percent Hardness, Shore A	500
Gun grade	25 - 30
Pour grade	40 - 50
Water Absorption, percent	0.0
Min. peel strength, lbs.	17 - 19, ASTM D-903-49
Pot life of mixture at 75 Deg.	4 hrs.
Pot life of mixture at 85 Deg. F.	3 hrs.

The sealing compound shall be regular cure, Florak-Thiocalk, as manufactured by the Chargar Corporation, Hamden, Connecticut. Unless otherwise required by these specifications or the plans, this material shall be used to seal exposed joints in walls, bridges (including bride decks), box culverts, and buildings. Pour grade shall be used to seal horizontal joints in these structures normally subjected to foot or vehicular traffic.

3.15.08 QUICK-CURING SEALING COMPOUND

The sealing compound shall be quick curing type Allied Jet Seal, Product 9021, as manufactured by Allied Stroud Corporation, Oklahoma City, or approved equal. Unless otherwise required by these specifications or the plans, this material shall be used in walls, bridged, box culverts and buildings to seal joints where specified, against which backfill will be placed.

3.15.09 PREFORMED COMPRESSION NEOPRENE JOINT SEALER

The sealer shall be a preformed, elastic poly-chloroprene joint sealer, shall be compatible with concrete, and shall be resistant to abrasion, oxidation, oils, gasoline, salt and other materials that may be spilled on or applied to the surface. The sealer shall be so shaped that when installed, at minimum joint opening, it shall be so completely compressed as to be substantially solid and have a minimum of air spaces. It shall also be so shaped that in its compressed condition the top center of the exposed surface shall be depressed below the surface of the installed sealer. The sealer shall be furnished in a sufficient number of widths to accomplish this kind of closure. The sealer shall conform to the following ASTM requirements and in addition must be compounded using the low crystallizing polychloroprene base. The Preformed Compression Joint Sealer shall conform to the specification requirements using ASTM procedures as a method of testing

PROPERTY	ASTM TEST PROCEDURE	TRANSVERSE OR LONGITUDINAL REQUIREMENT
Tensile Strength, psi, MIN.	D-412	2000
Elongation at Break, % MIN.	D-412	250
Hardness, Type A. Durometer	D-676	55 ± 5
Permanent Set at Break, % MAX.	D-412	10
Compression Set, % MAX.	D-395 Method B. Paragraph 5 (b)	
22 Hrs./158 Deg. F.		15
70 Hrs./212 Deg. F.		40
Oven Aging, 70 Hrs./212 Deg F.	D-573	
Tensile Strength, Change, MAX. %		-30
Elongation, change, MAX. %		-40
Hardness, points change, MAX.		+10
Oil Swell, ASTM Oil No. .3 70 Hrs./212Deg F.	D-471	
Volume Change, Max. %		80
Ozone resistance, 20% Strain	D-1149	
300 pphm in air 70 Hrs./100 Deg. F. (WIPE WITH SOLVENT TO REMOVE SURFACE CONTAMINATION)		no cracks
Low Temperature Stiffening	D-1053	
Temperature to reach 10,000 psi modulus, MIN. Deg.		-30

All test sections used in the testing methods, shall be cut and buffed from the actual extruded Compression Joint Seal. Each lot of the Joint Seal shall be identified with the Manufacturer's name or Trade Mark and shall be accompanied by the Manufacturer's affidavit attesting conformance with the specification. The sealer shall be that manufactured by Acme Highway Products Corp., 33 Chandler Street, Buffalo, New York, and shall be Type S-497 for Item 22 (a) and Type S-502 for Item 22 (b) or an approved equal. The lubricant-adhesive shall be a one component polychloroprene compound containing only soluble phoenolic resins blended together with anti-oxidants and acid acceptors in an aromatic hydrocarbon solvent mixture and shall have the following physical properties: Average net weight per gallon - 7.84 lbs. + 5% Solids Content - 24 - 26% by weight Brookfield Viscosity @ 77 Deg. F., #2 Spindle at 10 RPM -7,000 - 7,500 cps. The adhesive shall remain fluid from 5 Deg F. to 120 Deg. F. Film strength (ASTM-D412) - 2,300 minimum tensile strength, 750% minimum elongation before breaking. Test specimens composed of 2 pieces of 0.064-gauge 6061 Aluminum alloy bonded together with the adhesive on a joint 1" wide with 1/2" lap and aged 14 days shall show the following minimum strength when tested by the laboratory: Dynamic Strength 1,300 psi @ 70 Deg. F. 1,300 psi @ 0 Deg. F. Static (1 minute) 700 psi @ 70 Deg. F. 700 psi @ 0 Deg. F. Each lot of the adhesive shall be delivered in Containers plainly marked with the Manufacturer's Name or TradeMark and date of manufacture and shall be accompanied by the Manufacturer's affidavit attesting conformance with this specification. The lubricant-adhesive shall be "Acme Neo-Lube" as manufactured by Acme Highway Products Corp. or approved equal. Inspection of Material: All sealers and adhesives will be furnished to comply with the material as approved as a result of tests. For all such sealer and adhesive furnished and installed on a contract, the contractor shall furnish to the Onsite TNC Representative a certification that the materials placed are the same as those approved and shall back this up with a certification by the Manufacturer as to the nature and characteristics of the materials purchased by the Contractor. The exact details of the certification will be furnished at the time the material under test is approved. Preformed compression neoprene joint sealer shall be used only where specifically called for in the specifications, contract

plans, or by the Onsite TNC Representative.

3.15.10 JOINT SEALER BOND BREAKER

The bond breaker shall be an approved transparent tape of a color which contrasts with the surface to which it is applied or an approved masking tape, equal to "Scotch Brand", as manufactured by the Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. The tape shall be non-bituminous and of the size shown on the contract plans. Bond breaker shall be used only where specifically called for in the specifications, contract plans or by the Onsite TNC Representative.

3.15.11 JOINT DAMMING MATERIAL

Damming material shall be an inert material meeting the approval of the Onsite TNC Representative. Paper rope, or other material, which will decompose, will not be approved. Damming material shall be used only when ordered by the Onsite TNC Representative, shown on the plans or required by the Special Conditions.

SECTION 3.30 PLANT MATERIALS

Plant Materials shall be in conformance with the requirements of the Connecticut Department of Transportation Standard Form 817 Materials Section M.13.07- Plant Materials.

SHRUBS

Clethra alnifolia 'hummingbird', Sweet pepperbush: 18-24" Ht., heavy well branched tops.
Cornus sericea, Red Twig Dogwood: 18-24" Ht., heavy, well-branched tops
Ilex glabra, Inkberry: 18-24" Ht., Heavy symmetrical top with at least 8 canes 18" and up, furnished to the ground, spread of top 18". 'Shamrock' or 'Compacta' when specified.
Ilex verticillate 'Red Sprite", Female Winterberry Holly: 24-30" Ht., Heavy symmetrical top, furnished to the ground, spread of top 15".
Kerria japonica, Japanese Kerria: 18-24" Ht.
Pierus japonica 'compacta', Japanese Andromeda**:** 18-24" Ht.
PJM Rhododendron, Rhododendron**:** 18-24" Ht.
Prunus laurocerasus 'otto luyken', Dwarf Cherry Laurel: 18-24" Ht.
Rosa radrazz, Knockout Rose: 18-24" Ht., must have at least 3 canes 15" and up.
Spirea sp., Spirea (multiple): 18-24" Ht., #3 can, well-branced top with at least 4 canes 18" and up. Multiple species to be specified including but not limited to japonica, nipponica 'Snowmound', x Bumalda.

PERENNIALS

Ornamental perennials including but not limited to the genus Alchemilla, Coreopsis, Echinacea, Geranium, Hibiscus, Hosta, Heuchera, Liriope, Rudbeckia, Sedum, and Tierella. Must be in full leaf, well established in pot.

Species as specified in the plans.

GRASSES

Grasses including but not limited to the genus Carex, Juncus, Panicum, Pennisetum, and Schizachyrium.

PLANT MATERIAL APPROVAL

The Contractor shall provide the TNC the opportunity to inspect and approve plant materials upon delivery to the site, prior to planting. The Contractor shall replace dead or diseased plant material.

VIGOROUS SPECIMENS TYPICAL OF THE SPECIES SPECIFIED IN THE PLANS.