

Solicitation 2022-02

REQUEST FOR PROPOSALS for Professional Engineering Services

Stormwater Retrofit Projects

Carmel-GL-915 PW-MB-1000 Y-MU-40

EOHWC Solicitation Issue Date: April 27, 2022

Questions Due Date: 4:00 p.m. on May 26, 2022

Proposal Due Date: 4:00 p.m. on June 2, 2022



2 Route 164 Patterson, NY 12563 Tel: 845-319-6349 Fax: 845-319-6391

1. OVERVIEW

1.1 <u>General Information</u>

The East of Hudson Watershed Corporation (EOHWC) is seeking Proposals to provide civil engineering services to the EOHWC for the design, permitting, and construction phase services (CPS) of stormwater retrofit projects (SRPs) for the Projects identified in this RFP. The successful Proposer will demonstrate the required expertise and experience to fulfill all requirements of this Solicitation and any Addenda or modifications to this Solicitation.

This Solicitation includes several attachments and refers to the EOHWC Stormwater Retrofit Project Design Manual (SRPDM). The SRPDM is available on the EOHWC web site (www.eohwc.org). All the information in this Solicitation and attachments, Addenda, and SRPDM shall be considered the Services. The Proposer shall consider the information in the attachments and the SRPDM when preparing their proposal.

All questions and inquires for additional information are to be submitted in writing by the deadline date and time specified on the cover page, as it may be modified by Addendum. Proposals for these projects must be received by the date specified in the cover page, as it may be modified by Addendum.

1.2 <u>Definitions</u>

Engineer: the engineering firm awarded a Contract from their proposal for the Services described in this Solicitation.

Host Municipality: the municipality in which the SRP is located.

Site Owner: If other than the Host Municipality, a School District, private owner, NYCDEP, Metro North, or other owner of the Site.

Proposer: the engineering firm preparing and submitting a proposal for the services described in this Solicitation.

Site: the physical location at which the stormwater retrofit will be constructed.

Solicitation: This document, including all of the items listed in the appendices, forms and exhibits, and any subsequent Addenda or clarifications issued by EOHWC.

Stormwater Retrofit Project or SRP: a stormwater management practice described in the stormwater retrofit plan prepared by either EOHWC, the Dutchess County MS4 Coordinating Committee, Putnam County MS4 Coordinating Committee, or Westchester County Croton-Kensico Watershed Intermunicipal Coalition, including modifications/revisions by EOHWC, and approved by the NYSDEC.



Services: All of the information in this Solicitation and attachments, Addenda, and SRPDM.

1.3 EOHWC Contact:

Kevin Fitzpatrick, P.E., Director of Engineering East of Hudson Watershed Corporation 2 Route 164, Suite 2 Patterson, NY 12563 Kevin@EOHWC.org, (845) 319-6349

[Fax and email are provided for inquiries only; the response to this Solicitation may not be submitted via email]

2. SCOPE OF SERVICES

2.1. <u>Year 6 through 10 Projects.</u> EOHWC has caused to be prepared a preliminary report identifying SRP's that may be undertaken by EOHWC during the Years 6 through 10 funding period. A copy of such report may be found on the EOHWC website at www.eohwc.org. The Proposer must be a professional engineer or firm licensed to perform engineering services in the State of New York. EOHWC anticipates identifying one or more engineering firms capable of providing the requested services for one or more of such Year 6 through 10 SRP's and providing the best value to the EOHWC as determined by EOHWC in its discretion.

In this solicitation round EOHWC anticipates awarding one engineering services contract for the projects identified on the cover page and as more specifically set forth at **Appendix I.** Additional solicitation rounds may be undertaken at any time in EOHWC's discretion.

2.2. <u>SRP Design Requirements</u>. SRP engineering services will be consistent with the requirements of the EOHWC Stormwater Retrofit Project Design Manual (SRPDM). SRP design will be expected to take into account the requirements of the Policy for the EOHWC's Operation and Maintenance of Stormwater Retrofit Practices and the EOHWC's SRP Operations and Maintenance Manual (OMM) available on the EOHWC's website, in order to assist the EOHWC in the achieving a cost-effective balance of installation and maintenance costs.

2.3. <u>Terms and Conditions of Contract</u>. The EOHWC expects to enter into a contract with the selected Proposer(s) in substantially the form attached hereto at **Appendix II**. Submission of a proposal constitutes an acknowledgement that the proposer has thoroughly examined and become familiar with the Services required under this Solicitation, that it is capable of performing quality work to achieve the objectives of the EOHWC, and that it will accept those terms and conditions unless



exceptions are specified in the proposer's submission as set forth in this section. Any objection to the terms and conditions must be expressly identified in a separate section of the respondent's proposal identified as "objections to terms and conditions" and with reference to the specific provisions objected to. EOHWC reserves the right to reject any objections as nonresponsive.

2.4. <u>SRP's.</u> The Scope of Services and schedules for the SRP's shall be authorized on a task order basis that identifies the schedule, Project and specific tasks for which the Engineer is authorized to commence work. All submittals and design milestones are required to meet the structure set forth in the SRPDM.

2.5. <u>Contract Term.</u> It is the intent to award one or more Contract(s) for a one-year period with the option for up to two one-year renewal(s), subject to EOHWC's right of early termination as provided in the Contract. Any decision to renew the Contract(s) will be at the sole discretion of EOHWC.

3. PROPOSAL SUBMITTAL

3.1. <u>Sealed Proposals</u>. Sealed proposals will be received at the EOHWC main office at either of the following:

Postal Delivery:	Parcel Delivery Service:
EOHWC	EOHWC
2 Route 164	2 Route 164
Suite 2	Suite 2
Patterson, NY 12563	Patterson, NY 12563

Proposals must be received by the deadline time on the Proposal Due Date specified on the cover page of this Solicitation. The Proposer shall be responsible for actual delivery of the proposal to the required location before the deadline. Any proposal received after the deadline by any delivery method will not be accepted by EOHWC. All electronically transmitted Proposals will be disqualified by EOHWC. A Proposal may be withdrawn by the Proposer prior to the specified submittal time. No Proposal may be withdrawn by any party after the specified submittal time.

Each proposal shall include one (1) hard copy and one (1) digital (CD/USB Drive/SD Card) containing the required forms and/or certifications provided with this Solicitation including any Addenda, and shall be completed by the Proposer. The Proposer shall submit the required number of copies in one or more sealed opaque envelope(s). The outermost envelope shall include: Solicitation Number, "PROPOSAL ENCLOSED", the name and address of the Proposer; in a location and of sufficient size to be easily identified by any person receiving the envelope. The Proposal shall be written in a legible font style and size (e.g. arial 12 point, Times New Roman 12 point, etc.)



Proposers are required to provide all of the information requested in this Solicitation, along with any additional information or alternates requested by EOHWC. It is the Proposer's responsibility to provide all requested information and to describe clearly the benefits of their service in meeting the needs of the EOHWC established in this Solicitation. The EOHWC will not be responsible for any omissions on the part of the Proposer, and is not required to notify the Proposer of omitted information, nor required to accept omitted information after the specified submittal time. Proposers are cautioned to read the Solicitation carefully and follow the response format, as any deviation from the format and requirements listed may be cause for rejection. No proposal will be accepted which contains any changes, additions, or erasures.

Proposals must be signed in ink by the Proposer. Proposals which are incomplete, conditioned or obscure, or which contain additions not called for (e.g. erasures, alterations, ambiguities or irregularities of any kind) may be rejected as incomplete.

3.2. <u>Site Visits.</u> Informational site visits, if available, will be conducted on the date or dates set forth on the cover page of this Solicitation. Site access to all projects may not be available at the time of this Solicitation.

3.3. Interpretation, Clarifications, and Addenda

Questions regarding this Solicitation must be in writing and must be received by the contact person identified above at the address set forth above no later than the date and time specified as the Questions Due Date specified on the cover page of this Solicitation. No oral modification will be binding.

Any and all such interpretations and any supplemental instructions will be in the form of a written Addendum to the Solicitation. If an Addendum is issued, it will be sent by email to Proposers who have received this Solicitation. Any Addenda so issued shall become part of this Solicitation.

Failure of any Proposer to receive any such Addendum or interpretation shall not relieve such Proposer from any obligation under his Proposal submitted.

4. **PROPOSAL CONTENTS**

- 4.1. <u>Required Information.</u> The Proposal shall include the following:
 - a. Cover Letter:

1 Name, Address, and Telephone number of the licensed Professional Engineer to be assigned as project manager for the project or projects (include local office address if different)

2 Acknowledgement of receipt of any Addenda

3 Printed name and signature by an Officer authorized to bind the Proposer



- b. Statement of Qualifications and Experience. Include the background, qualifications, credentials and experience of the Project Manager and other key project staff proposed to be assigned that would support its ability to do the proposed Services in a professional and timely manner.
- c. Design Approach. The proposal shall describe how the Proposer will provide the SRP design for the designated SRP or SRP's based on the criteria described in the EOWHC Stormwater Retrofit Project Design Manual, most recent edition.
- d. Statement of References (3 references). Describe recent projects similar to the type of Services requested. Include a detailed list of three projects with similar characteristics. For the projects listed, provide the name, title, and telephone number of the client official responsible for the project.
- e. Financial Proposal.

1 A lump sum fee for each project (FORM B). The fee shall be inclusive of direct and indirect fees and/or costs and taxes. The fee shall not include any excise or sales taxes from which the municipalities are exempt. Any contingencies/uncertainties shall be clearly identified.

2 Detailed hourly fee schedule showing the rates for each of the professional or clerical staff proposed to be used. The rate shall be the fully-loaded rate, inclusive of all overhead and profit markup.

3 Identify Project manager, key staff and any proposed Subcontractors.

- f. Conflicts of Interest statement (FORM D): The Proposal shall include a statement describing any potential conflicts of interest the Proposer may have due to work being done for outside parties. Also the Proposal shall describe any business or family associations with any of the Board of Directors of the EOHWC, or of any persons employed by the EOHWC or any municipalities who are members of EOHWC. Refer to the EOHWC's Code of Ethics posted on its website, www.eohwc.org.
- g. Statement of Non-Collusion (FORM E)
- h. Statement of Insurance (FORM F)
- i. Confidentiality Notice (FORM G)
- j. Certification Regarding VENDEX and Value of All Contracts with New York City (Form H)
- k. Any other information that the Proposer may wish to provide to demonstrate that they can complete the Services described in this Proposal.

4.2. <u>Joint Proposals</u>. Where two or more Engineers desire to submit a single proposal in response to this Solicitation, they should do so on a prime-sub Consultant basis rather than as a joint venture.

4.3. <u>Exceptions and Deviations</u>. Any exceptions to the requirements in this Solicitation, including the insurance requirements and the contract terms and conditions, must be included as a separate element of the proposal under the heading "Exceptions



and Deviations." EOHWC retains the right, in its sole discretion, to reject these requests for exception.

4.4. PASSPort

a. The Proposal shall include certification and documentation that the Proposer and all subcontractors retained or to be retained by it have completed the applicable New York City Procurement and Sourcing Solutions Portal (PASSPort) questionnaire, submitted the completed questionnaire to New York City as required therein, and otherwise complied with all PASSPort requirements.

b. If the Proposer's complete PASSPort submission is more than 2½ years old, the Proposer shall submit documentation that it has completed new forms and returned them directly to New York City at the address provided therein. If there have been no changes in information requiring an update of the forms, the Proposer shall provide proof it has executed a Certification of No Change and submitted it to New York City. If there have been changes in information requiring an update of the forms, the Proposer shall provide shall submit proof that it has submitted full questionnaires using new forms to New York City.

4.5. <u>Duration of Proposal.</u> The Proposal shall remain effective for at least ninety (90) days from the submittal date defined in the Advertisement or Addenda.

4.6. <u>Statement of Insurance</u>. Attach evidence of <u>general liability</u>, <u>automobile liability</u>, <u>worker's compensation</u>, and <u>professional liability insurance</u> as set forth at **APPENDIX II**. By signing and submitting a proposal, the Respondent certifies that if awarded the contract, it will have the applicable coverage described at **APPENDIX II** in effect at the time of award and execution, and will maintain this coverage during the entire term of the contract.

4.7. <u>Required Forms.</u> All responses shall include the attached Forms, along with all supporting items. All blank spaces in the Forms must be filled in. Any items which are not applicable should be marked N/A (not applicable).

5. PROCEDURE FOR SELECTION

5.1. <u>Basis of Award.</u> EOHWC anticipates making the award to the proposer or proposers whose proposal represents the best value taking into account all facts and circumstances.

5.2. <u>Review Procedure.</u> A review committee consisting of the EOHWC Technical Committee and the Director of Engineering will review and evaluate proposals taking into account the following factors:



- a. Professional qualifications and specific experience and competence in area needed: 30%
- b. Capacity to accomplish the Services in the required time, past performance on contracts with EOHWC and other agencies, familiarity with location and local regulations regarding project(s), and history of change orders required in construction: 30%
- c. Bid price: 40%.

In reviewing the foregoing factors, EOHWC may further consider such information as it may deem material to the foregoing including: Financial and organizational capacity; legal authority to do business in the State of New York and the Counties of Dutchess, Putnam and Westchester; business integrity of the owners/officers/principals/members and contract managers, including compliance with New York City PASSPort procedures; past performance of the bidder on prior government contracts; sufficiency of proposer's personnel to meet the requirements deliverables of the specifications; ability to meet insurance requirements noted in the specifications; and record of compliance with NYS Labor Law requirements.

EOHWC's review committee may select one or more respondents for interviews based on the review of the responses, and will recommend one or more firms to the Executive Committee.

The Executive Committee will make the final selection and authorization of contract terms in its discretion based on its determination as to the best interests of EOHWC taking into account all facts and circumstances it deems material. Notwithstanding any other provisions of this Solicitation, EOHWC reserves the right to award a contract to the Proposer(s) that best meet the requirements of the Solicitation, and not necessarily to the lowest cost proposal.

5.3. <u>Notice of Award and Contract.</u> The EOHWC will select a firm by means of a Notice of Award issued pursuant to a resolution adopted by the Executive Committee. Neither the selection of a firm nor the issuance of a Notice of Award shall constitute a binding commitment on behalf of the EOHWC to enter into a services contract with the firm, as any binding arrangement must be set forth in definitive agreement signed by both parties and shall be subject to all requisite approvals.



6. EOHWC's RESERVATION OF RIGHTS

6.1. Reserved Rights. The EOHWC in its sole discretion specifically reserves to itself the following rights:

- a. Amend, withdraw or cancel this Solicitation, in whole or in part, at any time;
- b. Award a contract to a Proposer, in whole or in part;
- c. Disqualify any Proposer whose conduct and/or proposal fails to conform to the requirements of this solicitation;
- d. Seek clarifications and revisions of Proposals;
- e. Use proposal information obtained through site visits, management interviews and the EOHWC's investigation of a Proposer's qualifications, experience, ability or financial standing, and any material or information submitted by the Proposer in response to the EOHWC's request for clarifying information in the course of evaluation and/or selection under this solicitation;
- f. Waive any informality or defect;
- k. Negotiate with a Proposer, within the scope of the Solicitation in the best interests of the EOHWC;
- m. Utilize any and all ideas submitted in the Proposals received.

6.2. <u>No Liability for Errors</u>

While the EOHWC has used considerable efforts to ensure an accurate representation of information in this Solicitation, EOHWC makes no representation as to the information provided. All Proposers are urged to conduct their own investigations into the material facts and the EOHWC shall not be held liable or accountable for any error, omission, or inconsistency in any part of this Solicitation. Proposer is solely responsible to establish, verify, and ensure that any and all information is correct, complete and necessary to provide a complete and informed proposal.

6.3. No EOHWC Obligation for Proposal Costs

Costs associated with the preparation of a proposal, including but not limited to any transportation costs to any subsequent interviews shall be the sole responsibility of the Proposer, with the express understanding that there will be no claim whatsoever for reimbursement from the EOHWC.

6.4. <u>Public Announcements.</u> News releases or other public announcements relating to this Solicitation shall not be made by any party without the prior written approval of the EOHWC.



6.5. <u>Freedom of Information Law.</u> All proposals submitted to the EOHWC in response to this Solicitation may be disclosed in accordance with the standards specified in the Freedom of Information Law, Article 6 of the Public Officers Law of the State of New York ("FOIL"). A firm submitting a proposal may provide in writing, at the time of its submission, a detailed description of the specific information contained in its submission which it has determined is a trade secret and which, if disclosed, would cause substantial injury to such firm's competitive position, including completion of **FORM G.** This characterization shall not be determinative, but will be considered by the EOHWC when evaluating the applicability of any exemptions in response to a FOIL request. However, EOHWC assumes no responsibility for any disclosure or use of information submitted.

ATTACHMENTS TO THIS SOLICITATION:

APPENDIX I: Project Description for Projects Subject to this RFP

APPENDIX II: Form of Agreement for Professional Services (Engineering Services), including Insurance Requirements

APPENDIX III: Proposal Forms

The following forms must be completed and returned with the proposal:

- FORM "A" Business Information
- FORM "B" Lump Sum Fee Proposal
- FORM "C" Hourly Fee Schedule
- FORM "D" Conflict of Interest Affidavit
- FORM "E" Statement of Non-Collusion
- FORM "F" Statement of Insurance
- FORM "G" Confidentiality Notice (FOIL)
- FORM "H" Certification Regarding VENDEX and Value of All Contracts with New
- York City



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APPENDIX I

Initial Evaluations for SRPs



INITIAL EVALUATION SUMMARY INFORMATION

Project ID: Carmel-GL-915

Location: Gleneida Avenue, Carmel NY

Land Ownership: Municipal

- <u>Requested services</u>: The proposed stormwater retrofit project includes the design and construction administration services for installation of bioinfiltration systems along municipally owned property in the town of Carmel. The project is located on Gleneida Avenue, along the shoreline of Lake Gleneida. The Engineer is expected to confirm all information provided within the Initial Evaluation.
- <u>Schedule:</u> Engineer to provide documents ready for installation in November 2022.

INITIAL EVALUATION SUMMARY INFORMATION

- Project ID: PW-MB-1000
- Location: Dutchess Drive, Holmes NY
- Land Ownership: Residential
- <u>Requested services</u>: The proposed stormwater retrofit project includes the design and construction administration services for the installation of a tiered bioinfiltration system, the stabilization of several channels and the removal of impervious cover. The Engineer is expected to confirm all information provided within the Initial Evaluation.
- <u>Schedule:</u> Engineer to provide documents ready for installation in November 2022.



INITIAL EVALUATION SUMMARY INFORMATION

Project ID: Y-MU-40

Location: Hallocks Mill Rd, Yorktown NY

Land Ownership: Municipal

<u>Requested services</u>: The proposed stormwater retrofit project includes the design and construction administration services for the installation of a tiered bioinfiltration system within the Yorktown owned property along Rte 202/Saw Mill River Road. This project will also include the replacement of the collapsed pipe and stabilization of the existing channel. The Engineer is expected to confirm all information provided within the Initial Evaluation. Engineer's opinion of probable construction cost is due by August 1.

<u>Schedule:</u> Engineer to provide documents ready for installation in November 2022.

EAST OF HUDSON WATERSHED CORPORATION



Gleneida Ave (Carmel-GL-915)

Gleneida Avenue, Carmel, NY 10512

Owner: Town of Carmel

Prepared by: East of Hudson Watershed Corporation

Date: 11/11/2020

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APPENDICIES

Appendix A

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Appendix B

Contributing Drainage Area Mapping CARMEL-GL-915 Phosphorus Loading Calculations Preliminary Investigation by Ferguson

1.0 INTRODUCTION

The East of Hudson Watershed Corporation (EOHWC) was created to oversee the design and installation of Stormwater Retrofit Projects (SRP's) within the New York City Department of Environmental Protection (NYCDEP) drinking water reservoir system located east of the Hudson River. The major focus of these projects is the reduction of phosphorus (P) from stormwater runoff prior to entering the reservoir system and is monitored and approved by the New York State Department of Environmental Conservation (NYSDEC).

The basis of design for the SRP program is the NYSDEC Stormwater Management Design Manual (SMDM), 2015. Both Water Quality Volume (WQv) calculation and stormwater management practice (SMP) selection follow all SMDM, 2015 regulations and requirements.

The engineering initial evaluation process begins with an estimation of the phosphorus concentration or "loading" within the stormwater runoff from a given drainage area. Once a phosphorus load (P-load) has been determined, an appropriate SMP is selected to remove as much of the P-load as the site constraints will allow.

1.1 **Project Objectives**

The area surrounding Gleneida Avenue currently discharges runoff from residential and commercial areas directly into Lake Gleneida, which is a recognized FAD basin. This project proposes to provide treatment before the stormwater discharges into the Lake.

2.0 EXISTING CONDITIONS

2.1 Project Location

The Gleneida Avenue SRP area is located within the Town of Carmel, New York. This street is a mixed use area with some commercial, municipal and residential buildings throughout, all of which discharge into Lake Gleneida through sheet flow and the existing piped conveyance system. The SRP can be installed in several different locations along the waterfront, all of which is NYCDEP held land. The final SRP location will be evaluated by a design professional. Figure 2.1 shows the proposed location of CARMEL-GL-915.



Figure 2.1 Gleneida Avenue Map

2.2 Current Land Use

The Gleneida Avenue project area is a mixed use space within the Town of Carmel. The mapping figures listed below verify the locations of any existing wetland areas managed by the NYSDEC and the USACE, and those areas designated as flood plains by the

Federal Emergency Management Agency (FEMA). The maps are shown in Appendix A and include the following:

- FIRM Mapping
- NYSDEC ERM Wetland Mapping
- National Wetland Inventory (NWI) Wetland Mapping

2.3 USGS Soil Classification

The Hydrologic Soil Group index is based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). Figure 2.2 shows the soil types in the project area.



Figure 2.2 USGS Soil Types

2.4 Site Topography

The drainage area is graded generally towards the west and into Lake Gleneida. The proposed site location follows the same topography.

2.5 Stormwater Flow Path

Stormwater generally flows south down along Gleneida Avenue. Stormwater is conveyed by sheet flow across the land east of Gleneida Avenue and becomes shallow concentrated flow as it moves along the curbed street. Breaks in the curb and catch basins collect the stormwater to flow into Lake Gleneida.

2.6 Nearest Receiving Waterbody

The nearest receiving water body is Lake Gleneida to the west of the site. This project, and Lake Gleneida, is tributary to the Croton Falls Reservoir.

3.0 ENGINEERING BASIS OF DESIGN

The Gleneida Avenue drainage areas are primarily a commercial land use type. The SRP selected for this project utilizes the area as effectively as possible given the site constraints. The design engineer is encouraged to investigate all possible stormwater solutions.

3.1 Design Considerations

Numerous design considerations were examined as part of this projects SMP selection. The site constraints noted below must be considered as part of the final design:

- 1) Possibly high water table
- 2) Restricted space for installation of an SRP
- Inability to install a practice within NYCDEP property along the shore line of Lake Gleneida

3.2 Stormwater Management Practice (SMP)

Given the location of the SMP, a FocalPoint bioretention filter practice has been chosen by EOHWC. If possible, the practice should be located within the ROW of the street (NYSDOT property). The implementation of a bioretention filter practice can limit the footprint of the SMP. A Site survey of the project area will be performed by the Engineering Firm selected to design this project. A full survey of the drainage area is not required, but the design professional should verify all conveyance which is tributary to the retrofit. A preliminary investigation was completed by Ferguson, see Appendix B.

3.3 Design Parameters

The total drainage area for project CARMEL-GL-915 is approximately 24.8 acres. A Figure showing the drainage areas is included in Appendix B. Table 3.1 below shows the design parameters for the project.

Drainage Area ID	Contributing Drainage Area (ac)	Impervious Area (ac)	
DA-1	4.1	4.1	
DA-2	19.5	11.51	

Table 3.1 CARMEL-GL-915 Site Analysis

3.4 Phosphorus Loading Calculation

As noted above, the contributing drainage area was used to determine the runoff information for the WQv events for the proposed SRP. As part of this design, the simple method was used to calculate the WQv and the P-Loading Rate for the site. The WQv was determined to be approximately $66,355 \text{ ft}^3$, with a P-load of 27.04 Kg/yr. A filtration system will provide up to sixty percent (60%) P-reduction for the amount of WQV treated in the system. The total anticipated P-Reduction of this SMP is approximately 15.96 kg/yr.

4.0 ANTICIPATED REGUALTORY APPROVAL AND PERMITS

A review of the Carmel Town Code was conducted for this project. It was determined that the project will only require coverage under the NYSDEC general permit for construction activity SPDES GP-0-15-002.

Should the project be located within the NYSDOT ROW (NYS RT 301), a NYSDOT work permit will be required.

Appendix A

FIRM Map NYSDEC ERM Wetland Map NWI Wetland Map Soil Characterization and Delineation

National Flood Hazard Layer FIRMette



Legend



Gleneida Avenue



October 19, 2020



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Author: East of Hudson Watershed Corporation Not a legal document



U.S. Fish and Wildlife Service **National Wetlands Inventory**

Gleneida Avenue



October 19, 2020

Wetlands

- Estuarine and Marine Wetland

Estuarine and Marine Deepwater

Freshwater Pond

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Lake Other Riverine This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.



Conservation Service

oil Area ony Spot ry Stony Spot at Spot ner ecial Line Features s eams and Canals	The soil surveys that comprise your AOI were mapped at 1:24,000. Warning: Soil Map may not be valid at this scale. Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale. Please rely on the bar scale on each map sheet for map measurements.
et Spot her ecial Line Features s eams and Canals	Please rely on the bar scale on each map sheet for map measurements.
s eams and Canals	Please rely on the bar scale on each map sheet for map measurements.
erstate Highways Routes ijor Roads cal Roads rial Photography	 Source of Map: Natural Resources Conservation Service Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857) Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required. This product is generated from the USDA-NRCS certified data as of the version date(s) listed below. Soil Survey Area: Putnam County, New York Survey Area Data: Version 17, Jun 11, 2020 Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Dec 31, 2009—Oct 5, 2016 The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

USDA

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	4.7	8.9%
SuB	Sutton loam, 3 to 8 percent slopes	3.8	7.2%
Uf	Urban land	2.1	4.1%
UhB	Urban land-Charlton complex, 3 to 8 percent slopes	18.9	36.2%
UpB	Urban land-Paxton complex, 3 to 8 percent slopes	5.3	10.2%
W	Water	17.3	33.2%
WdB	Woodbridge loam, 3 to 8 percent slopes	0.1	0.2%
Totals for Area of Interest	·	52.1	100.0%



Appendix B

Contributing Drainage Area Mapping CARMEL-GL-915 Phosphorus Loading Calculations Preliminary Investigation by Ferguson

PROVIDE TREATMENT OF GLENEIDA AVENUE WITH MULTIPLE FOCALPOINT BIORETENTION SYSTEMS

Legend

Existing Catch Basin

Drainage Area

6" Curb

3" Curb

Proposed FocalPoint Location

APPROXIMATELY 23.6 ACRES OF COMMERCIAL PROPERTY ESTIMATED PHOSPHORUS LOAD OF 27.04 KG/YR



EAST OF HUDSON WATERSHED CORPORATION Gleneida Avenue Retrofits

East of Hudson Watershed Corporation





STORMWATER RETROFIT SKETCHBOOK GLENEIDA AVENUE RETROFITS

Carmel, NY

Prepared for:

East of Hudson Watershed Corporation

Prepared by:

ACF Environmental

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Date: 1/14/2021



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Gleneida Avenue - Stormwater Retrofit Project

Carmel, NY

PRELIMINARY STORMWATER RETROFIT SKETCHBOOK

Prepared by: Robert Woodman, PE – ACF Environmental

Prepared for: East of Hudson Watershed Corporation

Date: January 14, 2021

Introduction:

Based on the preliminary data provided by the East of Hudson Watershed Corporation and a site visit on Wednesday December 9, 2021 with East of Hudson Watershed Corporation staff (Kevin Fitzpatrick), ACF Environmental (Rob Woodman) and Fabco Industries (Bill Stoecker), ACF Environmental has developed this "Stormwater Retrofit Sketchbook" to provide a set of high performance stormwater quality treatment solutions along the west side of Gleneida Avenue between Stoneleigh Avenue and West Street in Carmel, New York, in an effort to improve water quality in the stormwater entering Lake Gleneida from this watershed.

ACF is proposing the use of a series of small curbside **"FocalPoint"** high rate biofiltration systems along this section of roadway.

Reference Materials:

- GIS mapping excerpts provided by the East of Hudson Watershed Corporation
- Site Photographs by ACF Environmental from December 9, 2020 site visit.
- Available online mapping resources Google maps and associated street view
- "Designing with FocalPoint in NY" design checklist

Site Location:

The graphic below identifies the approximate location of the proposed retrofits:





Stormwater Best Management Practices Considered:

- FocalPoint Biofiltration System (water quality treatment)
- Beehive Overflow Filter by Fabco Industries (major storm overflow)
- Rain Guardian "Turret" system (pretreatment gross pollutant screen structure)

Proposed BMP Technical Data Summary:

As listed above, ACF Environmental proposes the use of **FocalPoint** biofiltration systems with **Beehive Overflow Filters** for this project as well as the **Rain Guardian Turret** for pretreatment and collection of gross pollutants, trash and debris to provide water quality treatment. A summary of these technologies is provided below:

FocalPoint:

Product Overview:

The FocalPoint is an ultra-efficient, modular biofiltration system that treats and drains large volumes of stormwater runoff in a small footprint to meet post construction stormwater treatment requirements. The system can be installed along the edge of a roadway behind curb line, in landscaped stormwater basins and be incorporated into an urban green infrastructure streetscape. Some examples of the system are illustrated below:



Figure 1 (below) shows the basic cross section of the FocalPoint unit.



Figure 1: FocalPoint Cross Section



As shown the system (from bottom up) consists of a geotextile or liner envelope, followed by a nine (9) inch tall box underdrain (RTank). The box underdrain in more efficient at collecting and conveying the runoff than a typical crushed stone and pipe configuration. This is important when considering the rate at which the runoff is passing through the media (discussed below). The box underdrain is wrapped with an open mesh geotextile fabric. This is an **open grid** mesh, not a restrictive 8 oz. fabric (which is commonly a primary source of premature failure of bioretention and biofiltration systems). The purpose of the open grid is to prevent the 6 inch bridging stone layer from entering the box underdrain. Above the bridging stone is an 18 inch layer of high rate biofiltration media followed by a 3 inch layer of clean shredded hardwood mulch. Plants can then be placed in the unit.

From the mulch surface to the bottom of the modular underdrain represents a vertical drop of three (3) feet from surface (inlet) to the invert out (outlet).

The high flow media infiltrates at a rate of 100 inches per hour. As such, the size and volume of the engineered media beds can be reduced by 80% or more, when compared to typical bioretention systems that infiltrate at rates of less than five (5) inches per hour. Reducing system size brings multiple benefits, including reduced and simplified maintenance procedures, savings in the amount of excavation (great benefit when working with contaminated soils), reduction in quantity of impermeable liner, stone, underdrain, materials to name a few. FocalPoint assures performance by providing media testing reports prior to shipment and performing an in-situ test after installation to confirm the infiltration rate. A product specification is provided in Attachment A.

FocalPoint Sizing:

The FocalPoint is sized to treat the entire "water quality volume" prior to overflow (typically set six (6) to eight (8) inches above the FocalPoint). FocalPoint sizing is iterative and site specific based on the available space above the unit for temporary storage of the water quality volume prior to overflow. For example, on a site with little available space for the water quality volume above the unit, the FocalPoint may need to be increased in size to utilize the 100 inch/hr. infiltration rate to ensure the entire water quality volume passes through the unit. Based on the third party field testing a minimum FocalPoint bed area ratio was established at 174 sf of FocalPoint per acre of impervious tributary area. A key design parameter is having the system draw down within 48 hours from the commencement of the storm.

HydroCAD or similar modelling program can be used to refine the size and configuration of the FocalPoint system and to confirm that the volume associated with the water quality rainfall event (based on a Type III 24hr storm distribution) is treated prior to activation of the overflow.

If beyond the treatment component of the design, extended major storm detention or infiltration into native soil is the goal (i.e. quantity control), the R-Tank box underdrain can be expanded to store the runoff and slowly release through outlet control or infiltrate



through the native soils. This provides engineers and designers the ability to handle both quality and quantity control in a space efficient footprint.

The high flow media provides removal of phosphorus, Nitrogen, TSS, Metals, Oils and Grease and Bacteria. Third lab testing and Field (TAPE/TARP level) have been conducted on the FocalPoint and the results for TSS, P and N are provided below. Copies of both the third party lab and field test protocols and results can be provided upon request. **The system is also approved by NYS DEC as a "Verified Proprietary Practice for New Development"**.

Pollutant	Lab Based % Removal	(CONC) TAPE Field Test % Removal	(MASS) TAPE Field Test % Removal
Total Suspended Solids:	91%	84.4%	91.4%
Total Phosphorus	66%	52%	72.5%
Total Nitrogen	48%	58.7%	77.9%

FocalPoint Installation:

An installation guide is enclosed as Attachment B. A typical engineering drawing/detail is enclosed in Attachment C providing all critical dimensions and elevations.

Protecting the FocalPoint Biofiltration System during construction is of the utmost importance. The sediment contained in the runoff from a non-stabilized drainage area may contaminate the biofiltration media and reduce the effectiveness of the FocalPoint system.

Excess filter fabric is provided for each unit to allow for the side wall fabric to be extending up and over the top of the entire unit. The fabric should be wrapped over the mulch with at least a 6" overlap, much like wrapping a present. With a torch, the two fabrics are tackwelded together by melting the top layer with the bottom layer. Non- woven geotextiles are flammable and extreme caution must be taken while doing this. This procedure will create a perfect seam that will prevent sediment entering the system. If the fabric is cut too short, a patch can be made for the uncovered area with another piece of geotextile, welding it all the way around. This fabric should be left in place until the tributary areas are stabilized.

FocalPoint Plantings:

Plants play an important part of the water quality treatment process and uptake of nutrients. A recommended plant list and guidance for layout and spacing of plants is provided in Attachment D.



FocalPoint Maintenance:

Maintenance of the FocalPoint units is simple. Annual removal and replacement of mulch is the main task at hand. This can be performed by public works/maintenance/Landscape contractor as part of regular streetscape maintenance or by local arborist/horticulturist. As it is an open system, it is easy to access the entire surface. Any winter sand gets caught by the mulch and can be easily raked out with the mulch. The first year of maintenance is provided at no charge and ACF Environmental can provide training to the identified maintenance party if needed. A complete operations and maintenance manual is included as Attachment E.

Beehive Overflow Filter:

Product Overview:

The Beehive Overflow Filter utilizes a Harco drain with beehive grate and an Fabco "Stormsok" filter insert within the opening to the structure. The StormSok is a highlyeffective catch basin insert that utilizes a woven geotextile bag to capture sediment, trash and other debris in stormwater runoff.

This solution is effective as an overflow device for any bioretention/biofiltration system to capture mulch, trash and other floatables that wash into the system.

The Bioretention Overflow Filter is available in several sizes: 12", 15" 18", 24" and 30" diameter. Typical engineering details are provided in Attachment F.

Figure 2 provides some images of the Fabco StormSok and Stormsok/Harco drain unit. A basic maintenance guide is included in Attachment G.



Figure 2: StormSok and Harco Drain with Beehive Grate


Rain Guardian Turret:

Product Overview:

The RainGuardian Turret provides a solution to the historical issues associated with curb opening inlets to rain gardens and bioretention cells and helps these curbline green infrastructure practices thrive.

The RainGuardian Turret is a fully reinforced concrete structure. The Turret is ideally suited for use in commercial and industrial applications (e.g. parking lot rain gardens and high traffic areas).



Maintenance and installation are both simple. The top grate captures leaf litter and coarse debris. The chamber base serves as a settling chamber for heavier particles. The filter wall removes finer particles and allows the chamber to dry between rain events while the solid debris walls restrict floatables from existing and entering the biofilter area.



Typical details, installation guide and maintenance instructions are provided in Attachment H.



Preliminary Retrofit Design Concept:

As identified earlier in this document, ACF Environmental is proposing the FocalPoint high rate biofilter to treat the runoff along the west side of Gleneida Avenue between West St and Stoneleigh Avenue. This section of Gleneida Avenue has on-street parking. Based on discussions in the field with the East of Hudson Watershed Corporation, the goal is to split the tributary area to this portion of the curbline into a few smaller sub watersheds, creating curb openings in three locations each with a small FocalPoint biofilter just off the curbline.

Pretreatment will be provided in the form of a Rain Guardian Turret at each curb opening. A Fabco beehive overflow structure will be utilized for major storm by-pass as well as capture of floatables and debris at each location also. Detailed sizing and concept layouts for each system are provided on the following pages.

The Watershed:

Based on the site walk and web based satellite imagery, the approximate watershed area in the section of the roadway is approx 21,500 sf all of which is assumed to be impervious. The graphic on the below shows the assumed watershed extents.



Gleneida Avenue is crowned in the center, so the watershed delineated in the graphic above includes about half of the roadway along with the approximately 34 on-street paved parking spaces.



Existing conditions site photos:



FocalPoint Sizing:

For many stormwater quality retrofits, the goal is to provide treatment for the 1.0 inch of runoff from impervious areas. As such, the goal water quality volume (WQv) would be:

WQv = (1.0" x 21,500 sf) = 1,792 cf

According to the sizing criteria accepted by NYS DEC, the min FocalPoint size is based on 174 sf per acre of impervious area. As such the min FocalPoint size required for this watershed would be as follows:

Min FocalPoint bed area = (21,500/43560 x 174) = 86 sf

HydroCAD is then used to model the FocalPoint system with the associated storage surface to determine if the min size is capable of treating the entire WQv.



An iterative process was used to close in on the 24hr Type III storm event that generates the WQv of 1,792 (listed above). The watershed data above was used to create a subcatchment "node" with a Curve Number (CN) of 98 and a Time of Concentration (Tc) of 6 mins (the typical recognized min Tc).

It was determined that a 1.27 inch Type III 24hr storm event generates 1,792 CF (meeting the goal WQv of 1,792 CF). As such a 1.27 inch rainfall event was selected for modelling the FocalPoint system.

The HydroCAD model was set up as follows:

🚔 2021-01-14 model - HydroCAD 10.10-4a (40 node s/n 08994)		\times	
Project Diagram Node View Print Settings Help			
Cleneida Ave Subcat			
	•		
2021-01-14 model FocaPoint Sample Node			

Modelling in HydroCAD it was found that based on the FocalPoint footprint of 86 sf, and some assumed surface grading (creating a small recessed area around the system) that the entire 1.27 inch rainfall event could be treated prior to bypass. See Attachment I for the HydroCAD output/results.

Siting and Layout:

To avoid long runs of curb length to direct runoff from the entire watershed into a single FocalPoint system. ACF is proposing consideration of splitting the watershed into three smaller sub watersheds, each approximately 7,200 SF in area with a 30 sf FocalPoint. The



diagram on the below shows the proposed location of the three smaller, decentralized systems.



A more detailed layout of each system showing all of the components would be as follows (assuming the elevation at the edge of pavement to be 101.00):



A formal CAD layout of this above image is provided in Attachment J.

From past similar projects, the photos on the following page show examples of what these systems could look like:







Materials and Construction Oversight Cost:

ACF anticipates the following costs associated with materials and construction oversight. It does not include installation.

GLENEIDA AVE FOCALPOINTS

	TOTAL			= \$27,000
•	Construction oversight	1 day @	\$500/day	= \$500
•	12 inch storm drain	?? lf @	??	= ??
•	Plantings for FocalPoint	1 lump sum @	\$400	= \$400
•	Curb work	1 lump sum @	??	= ??
•	Riprap and loam and seed	1 lump sum @	??	= ??
•	Rain Guardian Turret	3@	\$2,200	= \$6,600
•	12" dia Beehive Overflow	3@	\$1,250	= \$3,750
•	FocalPoint System 3	30 sf @	\$175/sf	= \$5,250
•	FocalPoint System 2	30 sf @	\$175/sf	= \$5,250
•	FocalPoint System 1	30 sf @	\$175/sf	= \$5,250

The storm drain connections, trench drain, riprap, loam and seed etc pricing would need to be added to this budget.

Closure:

ACF Environmental appreciates the opportunity to provide the above information regarding stormwater management solutions for the Gleneida Avenue retrofit project in Carmel, NY and looks forward to supporting the project team on the installation of these systems.

Sincerely,

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Robert J Woodman, PE, CPESC Senior Stormwater Engineer

Cc Bill Stoecker, Fabco Industries



Enclosures

Stormwater Treatment Proposal Attachment A



SPECIFICATION HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM (HPMBS) Material, Performance and Installation Specification

I. Summary

The following general specifications describe the components and installation requirements for a volume based High Performance Modular Biofiltration System (HPMBS) that utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban storm water runoff. The modular treatment system in which the biologically active biofiltration media is used shall be a complete, integrated system designed to be placed in Square Foot or Linear Foot increments per the approved drawings to treat contaminated runoff from impervious surfaces.

The High Performance Modular Biofiltration System (HPMBS) is comprised of the following components:

A. Plant Component

- 1. Supplier shall provide a regionalized list of acceptable plants.
- 2. Plants, as specified in the approved drawings/supplier's plant list, shall be installed at the time the HPMBS is commissioned for use.
- 3. Plants and planting are typically included in landscape contract.

B. Biofilter Component

- 1. This component employs a high performance cross-section in which each element is highly dependent on the others to meet the performance specification for the complete system. It is important that this entire cross-section be provided as a complete system, and installed as such.
- 2. As indicated in the approved drawings, the elements of the Biofilter include:
 - A. A mulch protective layer (if specified).
 - B. An advanced <u>high infiltration rate biofiltration planting media bed</u> which utilizes physical, chemical and biological mechanisms of the soil, plant, and microbe complex, to remove pollutants found in storm water runoff.
 - C. A <u>separation layer which utilizes the concept of 'bridging'</u> to separate the biofiltration media from the underdrain without the use of geotextile fabrics.

- D. A <u>wide aperture mesh layer</u> utilized to prevent bridging stone from entering the underdrain/storage element.
- E. A <u>modular, high infiltration rate 'flat pipe'</u> style underdrain/storage system which is designed to directly infiltrate or exfiltrate water through its surface. The modular underdrain must provide a minimum of 95% void space.

C. Energy Dissipation Component

1. An Energy Dissipation Component is typically specified to slow and spread out water as it enters the system. This component is dependent upon the design in the approved drawings, but typically consists of a rock gabion, rock filter dam or dense vegetation element, such as native grasses, either surrounding the Biofiltration Component or located immediately upstream of it.

D. Pretreatment Component

1. Pretreatment, when specified, is typically accomplished by locating the Biofiltration Component within a traditional vegetated BMP such as a vegetated swale, vegetated depression, traditional bioretention system, vegetated filter strip, sediment forebay, etc. These BMPs provide primary TSS removal when desirable.

E. Observation and Maintenance Component

1. An Observation and Maintenance Port shall be installed per the approved drawings to provide for easy inspection of the underdrain/storage element, and cleanout access if needed.

F. Extreme Event Overflow (by others)

1. An Extreme Event Overflow should be located external to, but near the Biofiltration element to provide bypass when needed. This may be an overland flow bypass structure, beehive overflow grate structure, or equivalent that serves the purpose. If a beehive overflow structure is utilized it should include a removable filter insert to provide for effective control of gross pollutants, trash and floatables.

II. Quality Assurance and Performance Specifications

The quality and composition of all system components and all other appurtenances and their assembly process shall be subject to inspection upon delivery of the system to the work site.

Installation is to be performed only by skilled work people with satisfactory record of performance on earthworks, pipe, chamber, or pond/landfill construction projects of

comparable size and quality.

A. Plants

- 1. Plants must be compatible with the HPMBS media and the associated highly variable hydrologic regime. Plants are typically facultative with fibrous roots systems such a native grasses and shrubs.
- 2. Supplier shall provide a regionalized list of acceptable plants.
- 3. All plant material shall comply with the type and size required by the approved drawings and shall be alive and free of obvious signs of disease.

B. Mulch

1. Mulch, typically double shredded hardwood (non-floatable), shall comply with the type and size required by the approved drawings, and shall be screened to minimize fines.

C. Biofiltration Media

- 1. Biologically active biofiltration media shall be visually inspected to ensure appropriate volume, texture and consistency with the approved drawings, and must bear a batch number marking from the supplier which certifies performance testing of the batch to meet or exceed the required infiltration rate (100 in/hr). A third party laboratory test must be provided to certify the 100 in/hr rate.
- 2. Within 90 days after project completion, the infiltration rate shall be confirmed at the supplier's expense, by a wetted condition hydraulic conductivity test.
 - a. Failure to pass this test will result in removal and replacement of all media in the system at no cost to the project owner/operator.
 - b. Test must utilize the equipment and follow the standard operating procedures found in the Harris County Texas manual entitled, Low Impact Development & Green Infrastructure Design Criteria for Storm Water Management (2011).
 - c. Replacement media, if required, must be taken from a different batch than the original.
- 3. Supplier shall provide, at no additional cost to the project owner/operator, maintenance of the biofiltration system for a period of one year.
- 4. Pollutant Removal performance, composition and characteristics of the Biofiltration Media must meet or exceed the following minimum standards as

Pollutant	Removal Efficiency	
TSS	> 80%	
Phosphorus	≥ 60%	
Nitrogen	≥ 48%	
Composition and	l Characteristics	
Sand - Fine	< 5%	
Sand – Medium	10% - 15%	
Sand – Coarse	15% - 25%	
Sand – Very Coarse	40% - 45%	
Gravel	10% - 20%	
Infiltration Rate	>100 inches per hour	
Peat Moss*	5% - 15%	
* Peat Moss Specification		
Listed by Organic Materials Review Institute		
100% natural peat (no composted, sludge, yard or leaf waste)		
Total Carbon >85%		
Carbon to Nitrogen Ratio 15:1 to 23:1		
Lignin Content 49% to 52%		
Humic Acid >18%		
pH 6.0 to 7.0		
Moisture Content 30% to 50%		
95% to 100% passing 2.0mm sieve		
> 80% passing 1.0mm sieve		

demonstrated by testing acceptable to the project engineer:

D. Underdrain/Storage System

- 1. Underdrain/storage components shall be manufactured in an ISO certified facility and be manufactured from at least 90% post consumer recycled materials.
- 2. Underdrain/storage components shall meet or exceed the following characteristics:

Property	Value	
Surface Void Area	≥ 85%	
Unit Weight	3.25 lbs/cf	
Service Temperature	-14° to 167°	
Unconfined Crush Strength	32.48 psi	
180 Day Creep Test		
Load Applied – Initial and Sustained	11.16 psi	
Creep Sustained – After 180 Days	0.20 inches	
Creep Sustained – After 180 Days	1.13 %	
Projected Creep – 40 years	1.72%	

E. Separation Mesh

1. Separation Mesh shall be composed of high-tenacity monofilament polypropylene yarns that are woven together to produce an open mesh geotextile which shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. The mesh shall meet or exceed the following characteristics:

Properties	Test Method	Unit	Min Ave Roll Value	
			MD	CD
Tensile Strength	ASTM D4595	kN/m (lbs/ft)	21 (1440)	25.3 (1733)
Creep Reduced Strength	ASTM D5262	kN/m (lbs/ft)	6.9 (471)	8.3 (566)
Long Term Allowable Design Load	GRI GG-4	kN/m (lbs/ft)	5.9 (407)	7.2 (490)
UV Resistance (at 500 hours)	-	% strength retained	90	
Aperture Size (machine direction)	-	mm (in)	2 (0.08)	
Aperture Size (cross machine direction)	-	mm (in)	2 (0.08)	
Mass/Unit Area	ASTM D5261	g/m ² (oz/yd ²)	197 (5.8)	

F. Bridging Stone

- 1. Bridging Stone shall be 3/8" pea gravel, or other diameter sized to prevent migration of filter media, as specified by supplier.
- 2. Stone must be washed and free from sediment, soil and contaminants.

III. Delivery, Storage and Handling

- **A.** Protect all materials from damage during delivery and store UV sensitive materials under tarp to protect from sunlight including all plastics, when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris.
- **B.** Biofiltration media shall be segregated from any other aggregate materials and shall be protected against contamination, including contamination from any stormwater runoff from areas of the site which are not stabilized.

IV. Submittals

A. Product Data

1. Submit supplier's product data and approved Installation Manual as well as supplier's Operations and Maintenance Manual for the system. It will be the responsibility of the system owner/operator or their contractor to ensure the system is operated and maintained in accordance with the manual.

B. Certification

1. Supplier shall submit a letter of certification that the complete system meets or exceeds all technical and packaging requirements. Biofiltration media packaging must bear a batch number marking from the supplier which matches a letter from the supplier certifying performance testing of the batch to meet or exceed the required infiltration rate.

C. Drawings

1. Supplier shall provide dimensional drawings including details for construction, materials, specifications and pipe connections.

D. Warranty

1. Supplier shall provide a warranty for all components of the HPMBS for a period of one year provided the unit is installed, operated and maintained in accordance with the manual. Improper operation, maintenance or accidental or illegal activities (i.e. dumping of pollutants, vandalism, etc.) will void the warranty. Biofiltration media shall be warranted to pass the post-installation infiltration test described in this document.

E. Design Computations

1. The HPMBS must be sized using a volume based sizing criteria and demonstrate, using a SCS stormwater modeling software/spreadsheet calculator that the required water quality volume (defined by the Engineer of Record) passes through the HPMBS prior to activation of the overflow device (set no lower higher than six (6) inches above the top elevation of the HPMBS (typically defined as top of mulch)). Design computations must be provided as part of the submittal process. Sizing based solely on a filter surface area to drainage area ratio method will not be accepted.

F. Substitutions

1. Any proposed equal alternative product substitution to this specification must be submitted for review and approved prior to bid opening. Review package should include third party reviewed performance data of the biofiltration media that includes saturated conductivity measurements and pollutant removal efficiency. Pollutant removal data must follow specified protocols. All components must meet or exceed Quality Assurance and Performance Criteria indicated herein.

V. Project Conditions

A. Review supplier's recommended installation procedures and coordinate installation with other work affected, such as grading, excavation, utilities, construction access and erosion control to prevent all non- installation related construction traffic over the completed HPMBS.

B. Cold Weather

- 1. Do not use frozen materials or materials mixed or coated with ice or frost.
- 2. Do not build on frozen ground or wet, saturated or muddy subgrade.
- 3. Care must be taken when handling plastics when air temperature is at 40 degrees or below as plastic becomes brittle.
- **C.** Protect partially completed installation against damage from other construction traffic when work is in progress and following completion of backfill by establishing a perimeter with highly visible construction tape, fencing, or other means until construction is complete.
- **D.** Soil stabilization of the surrounding site must be complete before the Biofiltration System can be brought online. Soil stabilization occurs when 90% of the site has been paved or vegetated. Temporary erosion control and/or sedimentation prevention measures shall be implemented to reduce the possibility of sediments being transported into the Biofiltration System prior to full stabilization of the site. Significant sediment loads can damage the HPBMS and lead to failure if not prevented or remediated promptly.

VI. PRODUCTS

A. Acceptable HPBMS

FocalPoint High Performance Biofiltration System

B. Acceptable Beehive Overflow Grate Structure (Optional)

Beehive Overflow Grate Structure with removable StormSack

C. Acceptable System Supplier

Convergent Water Technologies, Inc. (800) 711-5428 www.convergentwater.com

D. Authorized Value Added Reseller

ACF Environmental 2831 Cardwell Road Richmond, VA 23234 (800 448-3636 www.acfenvironmental.com

VII. Packaging

- **A.** HPMBS is assembled on site.
- **B.** Modular underdrain/storage unit is shipped flat and modules are assembled prior to installation.
- **C.** Biofiltration media is delivered in one ton super sacks each labeled with supplier's batch number and/or in bulk with accompanying supplier's certification.
- **D.** Other components are delivered in bulk or super sacks

VIII. Execution

- **A.** Excavation and Backfill
- 1. Base of excavation shall be smooth, level and free of lumps or debris, and compacted unless infiltration of storm water into subgrade is desired. A thin layer (3") of compacted base material is recommended to establish a level working platform (may not be needed in sandy soils). If the base of the excavation is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice. In many cases, a stabilization geotextile and 6" of compactable material that drains well will be sufficient to amend the bearing capacity of the soil.
- 2. Most applications require 8 oz Non-Woven Geotextile or equivalent nonwoven geotextile with a nominal weight of 8 oz per square yard to line the excavation to separate in situ soils and the HPMBS. (Applications requiring water to infiltrate the in situ sub-soils should use a bridging stone rather than geotextile to provide a separation layer between the HPMBS and the in situ soils). Geotextile, when utilized, should be placed on the bottom and up the sides of the excavation. Absolutely no geotextiles should be used in the water column. If an impermeable liner is specified, it shall be installed according to supplier's instructions and recommendations.
- 3. Specified backfill material must be free from lumps, debris and any sharp objects that could penetrate the geotextile. Material is used for backfill along the sides of the system as indicated in engineering detail drawings.

- **B.** Inspection
- 1. Examine prepared excavation for smoothness, compaction and level. Check for presence of high water table, which must be kept at levels below the bottom of the under drain structure at all times. If the base is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice.
- 2. Installation commencement constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found to be unsatisfactory, contact Project Manager or Engineer for resolution prior to installation.

IX. Cleanup and Protection during Ongoing Construction Activity

- **A.** Perform cleaning during the installation and upon completion of the work.
- **B.** Remove from site all excess materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation.
- **C.** If surrounding drainage area is not fully stabilized, a protective covering of geotextile fabric should be securely placed to protect the Biofiltration Media.
- **D.** Construction phase erosion and sedimentation controls shall be placed to protect the inlet(s) to the Biofiltration System. Excessive sedimentation, particularly prior to establishment of plants may damage the HPMBS.
- **E.** Strictly follow supplier's guidelines with respect to protection of the HPMBS between Installation and Commissioning phases.

X. Commissioning

- **A.** Commissioning should only be carried out once the contributing drainage area is fully stabilized. If Commissioning must be carried out sooner, it is imperative that appropriate erosion and sediment controls be placed to prevent the entry of excessive sediment/pollutant loads into the system.
- **B.** Commissioning entails removing the protective covering from the Biofiltration Media, planting the plant material in accordance with the approved drawings, and placing mulch if specified.
 - 1. Dig planting holes the depth of the root ball and two to three times as wide as the root ball. Wide holes encourage horizontal root growth that plants naturally produce.
 - 2. With trees, you must ensure you are not planting too deep. Don't dig holes deeper than root balls. The media should be placed at the root collar, not above the root collar. Otherwise the stem will be vulnerable to disease.

3. Strictly follow supplier's planting guidance.

C. Cover the exposed root ball top with mulch. Mulch should not touch the plant base because it can hold too much moisture and invite disease and insects. Evenly place 3 inches of double-shredded hardwood mulch (if specified) on the surface of the media.

D. Plantings shall be watered-in at installation and temporary irrigations shall be provided, if specified.

XI. Using the HPMBS

- **A.** Maintenance Requirements
- 1. Each correctly installed HPMBS is to be maintained by the supplier for a minimum period of one year. The cost of this service is to be included in the supplier's price of the system.
- 2. Annual maintenance consists of two (2) scheduled visits unless otherwise specified.
- 3. Each maintenance visit consists of the following:
 - 1. Complete system inspection
 - 2. Removal of foreign debris, silt, plant material, trash and mulch (if needed)
 - 3. Evaluation of biofiltration media
 - 4. Evaluation of plant health
 - 5. Inspection of underdrain/storage system via Observation/Maintenance Port
 - 6. Properly dispose of all maintenance refuse items (trash, mulch, etc.)
 - 7. Take photographs documenting plant growth and general system health
 - 8. Update and store maintenance records
 - 9. To ensure long term performance of the HPMBS, continuing annual maintenance should be performed per the supplier's Operations and Maintenance Manual.
- 4. If sediment accumulates beyond an acceptable level in the underdrain/storage system, it will be necessary to flush the underdrain. This can be done by pumping

water into the Observation/Maintenance Port or adjacent overflow structure, allowing the turbulent flows through the underdrain to re- suspend the fine sediments. If multiple Observation/Maintenance Ports have been installed, water should be pumped into each port to maximize flushing efficiency.

Sediment-laden water can be pumped out and either captured for disposal or filtered through a Dirtbag filter bag, if permitted by the locality.

XII. Measurement and Payment

Given the integrated nature of the HPMBS, measurement and payment will be based not on the individual component prices, but on the size of the Biofiltration Media bed. The external dimension as indicated in the approved plans and executed in the installation will be measured in Square Feet and payment will be made per HPMBS system.

Measurement and payment of beehive overflow grate structure with removable filter insert will be based on per unit price.

Stormwater Treatment Proposal Attachment B



FocalPoint BIOFILTRATION SYSTEMS

High Performance Modular Biofiltration System (HPMBS) Installation Guide





Summary

FocalPoint High Performance Modular Biofiltration System (HPMBS) is a scalable biofiltration system which combines the efficiency of high flow rate engineered soils with the durability and modularity of an open cell underdrain/storage/infiltration system.

The following contents of this Installation Guide are the necessary steps required for FocalPoint HPMBS installation, and activation. In this guide you'll find detailed chapters with corresponding photos for each step, to improve ease of installation and your profitability on the project. You'll be advised about specific steps which require extra attention.

ALL STEPS MUST BE COMPLETED IN THE ORDER OUTLINED TO ENSURE A SUCCESSFUL FOCALPOINT INSTALLATION AND ACTIVATION.

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- 6. Install Inspection/Maintenance Port(s)
- 7. Install Microgrid Mesh
- 8. Backfill Sides & Top with Bridging Aggregate
- 9. Place High Performance Biofiltration Soil
- 10. Place & Fill Gabion (If Specified)
- 11. Protect the System to be Activated Later
- 12. Activate the System (REQUIRED)
- 13. Plantings & Mulch
- 14. Performance Verification



General Notes

Be sure to contact your local Convergent Water Technologies Value Added Reseller (VAR) at least two weeks prior to installation. We will provide you with onsite installation support AT NO CHARGE in order to facilitate a successful installation.

All pictures, illustrations and instructions have been included to guide you through a typical installation. The approved engineering drawing should ALWAYS take precedence over these instructions.

It is advised that the FocalPoint HPMBS be installed after site stabilization, or when other landscaping is being done. The components of the FocalPoint system include an engineered, high-flow media that must be protected from site erosion and sediment. The easiest way to prevent this is to not install it until the final phase of construction.

However, if it is necessary that the system be installed prior to final stabilization, this guide provides instructions for our 'cap & seal' procedure that will protect the integrity of the system until activation is deemed appropriate (i.e., after the site is at least 90% stabilized). Failure to adequately protect the system will result in premature contamination and possible system failure.

Throughout this document you will see three types of notes:

TIP: Ideas to improve your efficiency and profitability on the installation IMPORTANT: Steps that require extra attention WARNING: Critical issues that MUST be handled correctly to ensure a successful installation





Pre-Construction Checklist

TOOLS YOU WILL NEED:

- Laser or Transit
- Measuring Tape (Long enough to mark FocalPoint HPMBS footprint)
- 📕 Razor Knife
- Screw Driver / Nut Driver Set
- String Line
- Marking Paint
- Reciprocating Saw (To cut Inspection & Maintenance Port and Receiving Holes)
- Dead Blow Mallet
- Worktable (3/4" plywood placed on saw horses works well)
- Hog Ring Gun and Rings for Gabion (if specified)
- Level
- Torch (etc) to "weld" geotextile for 'cap & seal' step

MATERIALS YOU WILL NEED:

- Modular Underdrain Panels
- 8oz Non-Woven Geotextile to line excavation
- Microgrid Mesh
- Washed Bridging Stone (Typically 3/8" 1/2" pea gravel)
- High Flow Biofiltration Media
- Base Material (95% compactable angular stone (1/2" 11/2") or coarse sand
- Pipe Boot Kits (If not using kits, you will need duct tape and a stainless steel band clamp for each inlet and outlet pipe, and for each inspection or maintenance port.)
- Pipe for Inspection and Maintenance Ports (Typically 6" or 12" SCH 40 PVC)
- Pipe Cap & Serialized FocalPoint Identification Cover
- Gabion basket(s) or other energy dissipation device (If Specified)
- Rock (For Gabions or Flow Dissipation, if Specified)
- Aged, Double Shredded Hardwood Bark Mulch, which has been screened to remove fines
- 10-33mm EPDM, or other impermeable material sized to cover the surface of the media bed, if the system will not be immediately activated.

EQUIPMENT YOU WILL NEED:

- Forklift and other equipment/tools needed to unload box truck
- Walk behind trench roller (plate compactor may also work)

Note: This list does not include equipment or tools needed to excavate or level the floor of the excavation







ASSEMBLE MODULAR UNDERDRAIN

If Modular Underdrain units arrive on your project in flat panels they will need to be assembled on-site. Assembling the units should take 2-3 minutes per module. This is a conservative estimate used to approximate the total man hours needed for assembly. The estimate includes the workers doing the assembly as well as material handling people to keep the assembly workers moving. Figure 1: Attach small plates at locations marked in red. The holes to be used for the middle panels are centered on an "X"



Unit	Mini	Single	Double	Triple	Quadruple	Penta
Time	2-3 minutes	2-3 minutes	4-6 minutes	6-9 minutes	8-12 minutes	10-15 minutes

Assembly Instructions – following the drawings in Fig. 2: Connect four small panels (B) into one large panel (A) using the short pegs (not the long pegs). Attach small panels onto the large panel at the locations marked in red on Fig. 1. Do NOT use the row of pin holes directly in the center or the two interior rows nearest the edges, as marked in red on Fig. 1.

Next, working from one end to the other, attach a second large plate (A) on the opposite side of the first.

Once the top and bottom large plates are attached, two more side plates (A) are attached to complete the sides of the Modular Underdrain unit. The picture in figure 2 shows is a SINGLE MINI Modular Underdrain. A single modular underdrain unit will be assembled in the same manner.

To build a DOUBLE unit (or larger), follow the directions above, starting at "Assembly Instructions:" using the top of the existing unit as the large plate. Bottom of the next module.



Figure 2: Follow these steps to assemble the underdrain units



Figure 3: Assembling on site during excavation will increase speed once the excavation is completed

TIP: To increase the speed of the installation, many contractors choose to assemble the Modular Underdrain units prior to or during excavation (Step 2) and base preparation (Step 3) (Fig. 3). Other contractors wait until these steps are completed and then perform the assembly IN THE EXCAVATION allowing completed units to be placed into their final location as they are assembled. Consider which option will work best for your project.





EXCAVATE

Excavate the designated area according to plans. Typical excavations should include:

- One foot perimeter around underdrain modules to allow for proper compaction of backfill
- Enough depth to accommodate a minimum 3" base (if required) below the underdrain modules

Level the bottom of the excavation (Fig. 4) as shown on plans. Most excavations have a flat bottom while some will slightly slope toward the outlet pipe.



Figure 4: Excavation according to plans, following all governmental regulations

Prepare the subgrade according to plans. This could require compaction for stability or prohibit compaction to promote infiltration.

If the subgrade is pumping or appears excessively soft, the design engineer should be consulted for advice. In many cases a stabilization geotextile and 6" of compactable material that drains well will be sufficient to amend the bearing capacity of the soil.



PREPARE BASE

Standing water in the excavation will prevent proper base preparation and must be removed, if present. In regions with sandy soils meeting the requirements noted and where the subgrade elevation is above the groundwater table, imported base materials may not be needed.

Base materials must be:

Compaction	95% Compaction (If infiltration is not a primary goal)	
Shape	Angular	
Size Not larger than 1.5" in diameter		
Consistency Free of lumps, debris, and sharp objects that could cut geotextile		
Applicability Stone or coarse sand is acceptable if it meets requirements; In no case shall clays be used		

Grade and level base as shown on plans.





TIP: Creating a smooth, level platform will allow for faster installation of Modular Underdrain, as units will fit together evenly, eliminating detail work that can delay your progress (Figure 5)

Figure 5: Base must be smooth to ensure units fit together without gaps



PLACE GEOTEXTILE ENVELOPE

Geotextile will be required on all FocalPoint HPMBS installations to separate the surrounding in-situ soils from the FocalPoint System. Check your plans to ensure that geotextile is to line your entire excavation, or will only be placed on the sides (if infiltration is a primary goal).

Cut full-width strips of Geotextile to the proper length and place them over the base and up the sides of the excavation, covering the floor and beyond walls of the excavation. This will be important in fulfilling step 11.

IMPORTANT: Allow enough geotextile to wrap the top of the system. This will aid in protecting the system until the site is completely stabilized and ready for activation.

Geotextiles are flammable. No smoking should be permitted on the geotextile.

Adjacent panels of material should be overlapped by 12" or more, as shown on the plans (Fig. 6).

Use pins, staples, sandbags or other ballast to hold the geotextile in place, preventing it from blowing or sliding out of position.

TIP: A prefabricated geotextile envelopes are available for smaller systems. This helps cut down waste and speeds up the installation process (Fig.7)



Figure 6: Roll out geotextile cut to fit the excavation in order to keep in-situ soils from migrating into the FocalPoint System. Geotextile strips must be cut generously in order to cover entire excavation on completion of the installation.



INSTALL MODULAR UNDERDRAIN

Determine the starting location. It is often helpful to use an inlet or outlet pipe to guide you. Using a string line, establish two adjacent edges of the Modular Underdrain footprint. Ensure that your corner is square. Mark these two edges with marking paint and remove the string line (Fig. 8).







INSTALL MODULAR UNDERDRAIN continued

Begin placing Modular Underdrain in the corner of the marked area. Do NOT place units on their sides, as this will void the warranty. Check your plans to ensure correct orientation of the Modular Underdrain (Fig. 9).

Check the plans to ensure the Modular Underdrain is running in the correct direction (North/South vs. East/West) to match the footprint shown.



Figure 9: Make sure the tanks are oriented properly in the excavation.



Figure 8: Place modular underdrain in specified configuration within geotextile envelope.



Figure 9A: Minor Variations (less than width of top plate) in tank height are acceptable

Modular Underdrain units should fit together evenly. Minor gaps between units ($< \frac{1}{2}$ ") or variations in the height of the units ($< \frac{1}{2}$ ") are acceptable (Fig. 9A), but reasonable efforts should be made to minimize these variations. Minor gaps will be eliminated during compaction of side backfill material.

No lateral connections between adjacent underdrains modules are required.





INSTALL INSPECTION/MAINTENANCE PORTS

All ports should be made from pipe long enough to extend from the bottom of the Modular Underdrain to a point slightly above finished grade of the FocalPoint HPMBS. Taller is better, as the pipes can be trimmed on completion of the system installation. They are typically Schedule 40 PVC pipe, but can be formed from other types of pipe, as well.



Figure 11: 8" slots cut in to bottom of inspection port caps

Identify the location of all ports as specified on the approved drawings and remove the Underdrain Module(s) which will receive the port from each location.

Cut the pipe to length, leaving enough excess to trim the top when final grade is reached.

Cut several horizontal slots in the pipe starting at the bottom (Fig. 11). Slots should extend as high as the height of the lowest underdrain module being used. No perforations or slots should be visible above the top of the Modular Underdrain once the port is in place.

Using a reciprocating saw, cut the horizontal underdrain module plates in the center, between the two internal vertical plates, to receive the port (Fig. 12). Cut the openings for a tight fit around the port pipe. If the pipe specified will not fit between the two interior plates, one or both plates may be moved to the outer connection locations on the large plate. All horizontally oriented plates will need to be cut EXCEPT FOR THE BOTTOM PLATE. In total you will need to cut:

Unit	Cut
Mini & Single	1 plate
Double	2 plates
Triple	3 plates
Quadruple	4 plates
Penta	5 plates

TIP: If the location of the inspection ports is not shown on your plans, use a single inspection port located in the middle of the underdrain field. Install a port for every X sf of the underdrain system

IMPORTANT: Do not over-cut the Modular Underdrain plates. Minimize the gaps between the pipe and the Modular Underdrain plates. This is particularly important with the top plate.

For all units larger than a Single or Mini Underdrain Module, you will need to disassemble the Underdrain module in order to cut the interior horizontal plates. Reassemble the Underdrain Module when cutting is completed, and replace the Underdrain Module into the proper location.

TIP: If using Prefabricated Pipe Boot Kits, install them onto the pipe now, leaving the band clamps loose so that final adjustments may be made in Step 7.

Install the pipe into the Underdrain Modules.

Place the port pipe with pre-cut slots into hole. (Fig. 13). Be sure to cut the top of the pipe so that once the FocalPoint HPMBS Inspection Port Cap is placed onto the top of the pipe, the top of the Inspection Port Cap will be flush with or just above the finished grade. Once the pipe is in place, put the FocalPoint inspection port Cap or a temporary cap on the port to prevent debris from entering the system during backfill procedures (Fig. 14).



Figure 12: Cut 6" Hole into top panel of underdrain module to accommodate 6" pipe



Figure 13: Place inspection port into underdrain module



Figure 14: Cut inspection port to appropriate height stated on plans. Seal the opening on top of the pipe with the FocalPoint Inspection Port Cap or temporary lid







INSTALL MICROGRID MESH

Clean off any debris that may be lying on top of the exposed geotextile around the perimeter of the Modular Underdrain.

Cut strips of Microgrid Mesh to fit over the top and down both sides of the modular underdrain system. Adjacent strips of Mesh should overlap at least 12" or as shown on plans. Use rock bags or other ballast to temporarily secure overlaps (Fig. 15).

Where Modular underdrain intersects an Inspection or Maintenance Port, cut an "X" into the geotextile and pull it over the pipe. The flaps of the "X" should point AWAY from the Modular Underdrain (Fig. 16). Use stainless steel band clamp to seal the flaps to the pipe, being careful not to leave gaps that will allow bridging stone to enter the underdrain.



Figure 15 (Above): 12" overlap of Biaxial Mesh on top of underdrain module

IMPORTANT: Take special care with Inside Corners on the footprint of the system. Cut Microgrid Mesh as needed to ensure that it lays flat against the Modular Underdrain. Use additional pieces to seal the corner and any cuts that are made (12" overlap).



Fold Mesh for outside corners similar to sheets on a bed, and lay excess material flat against Modular Underdrain. Leave corners loose to avoid creating weak spots in the material. Temporarily secure excess fabric with duct tape (Fig. 17 left).



Figure 16 (Below): Cut an "X" into Biaxial Mesh to accommodate pipe penetration

TIP: If using Prefabricated Pipe Boot Kits, install them onto the Inlet and Outlet Pipes, leaving the band clamps loose so that final adjustments may be made.

Figure 17: fold corners flat against the tank

Connect Inlet & Outlet Pipes

Where the inlet and outlet pipes connect to an underdrain module or exits the excavation, cut an "X" into the Microgrid Mesh or geotextile so that the pipe runs through the Microgrid and makes DIRECT contact with the underdrain module (Fig: 18). Pull the flaps of the "X" cut over the pipe so that the flaps of the "X" point AWAY from underdrain module. Use a stainless steel band clamp to seal the flaps to the pipe, being careful not to leave gaps that will allow bridging stone to enter the underdrain.



Figure 18: Cut "X" in Biaxial Mesh and Geotextile to accommodate outlet pipes and seal with stainless steel band clamps





BACKFILL SIDES & TOP WITH PEAGRAVEL

Backfill bridging stone material around perimeter of the underdrain modules, distributing the material evenly to prevent shoving of the underdrain modules.

Use a trench roller, plate compactor, or hand tamper to compact backfill. When using taller underdrain modules, this placement and compaction should be done in 12" lifts.

Continue placing and compacting backfill around underdrain modules until the bridging stone reaches the top of the underdrain modules. Once bridging stone is level with the top of the underdrain, place 6" of bridging stone (or as specified) on top of underdrain modules (Fig 20).





Figure 19: Compaction of side is critical in order to keep soils from settling around the tank.

Figure 20 (Above): Place 6" of bridging stone on top of Microgrid Mesh

Figure 21 (Right): Use Inspection Port as marker for bridging stone depth

9 PLACE HIGH PERFORMANCE BIOFILTRATION SOILS

Level bridging stone and, place 6" of high flow media on top. Use marked stakes to ensure elevations. Once 6" of media has been placed, set Gabions (if applicable). Once Gabions have been installed, continue placing media until it is at the specified depth, (typically 18"). The top of the media should be 6" below the top of the gabion wall (if specified). **TIP:** Before you place bridging stone use your inspection port to mark the different levels of fill as specified (Figure 20)

WARNING High Flow Media is a highly engineered soil - do not mix media with any other site, fill or excavated soils.



Figure 22: Place biofiltration soils, being careful not to mix with any other site soils, to specified depth



Figure 23: Level Soils once they are filled to specified depth







PLACE & FILL GABION (IF SPECIFIED)

(If gabion surround or leading edge is not specified continue to step 11)

Gabions are an optional feature that may not be included on your installation. If they are not included, skip this step and proceed to Step 11.

The gabion baskets are 12" tall. The interior dimensions of the gabion baskets needs to be equal to the exterior diameter of the underdrain unless specified otherwise. The top of the gabion should rise 6" above the top of the high flow media and 3" above the bark mulch.

Place a geotextile separation barrier between the gabion and existing site soils as well as the gabion and media so that soil will not migrate into the rock creating a void. (Figure 24).

Once the gabion baskets are placed, overfill the gabions with $3" \times 5"$ washed bull rock, or other specified material Once filled, seal the baskets with hog rings placed every three inches so that rock cannot be removed.



Figure 24: Place gabion wall so that it is square and level



Figure 25: Overfill rock into gabion and seal tight to prevent sagging. Rock will settle over time.



Figure 26



CAP & SEAL

This step protects the system if it is not to be immediately activated. The system should not be activated (plantings and mulch placed, and stormwater allowed to flow into system) until the surrounding drainage area reaches at least 90% stabilization. Premature activation and/or failure to carry out this 'cap & seal' step may invalidate the warranty on this system.

Protecting the FocalPoint HPMBS during construction is of the utmost importance. The sediment contained in the runoff from

an un-stabilized drainage area may contaminate the biofiltration media, reduce the effectiveness of the FocalPoint HPMBS or cause failure.

Cut an appropriately sized piece of impermeable material (10-33mm) to fit the surface of the media bed. If multiple pieces are required, weld/glue them together to create an impermeable seal over the media bed.

Place the impermeable cover over the media bed.

Pull excess Geotextile Excavation Liner (see step 4) over the top of the FocalPoint System, fully cover the impermeable seal, overlapping the geotextile to fully prevent silt and sediment from reaching the seal and WARNING FAILURE TO INSTALL AND MAINTAIN ADEQUATE ESC PROTECTION FOR THE FOCALPOINT MAY VOID THE WARRANTY AND PERFORMANCE GUARANTEES.



Figure 30: A hose extension added to a blow torch.

TIP: If you add a hose extension onto the torch, it makes the procedure much easier.



Figure 29: Geotextile being melted together with a torch.

underlying media. Using a portable blow torch to 'heat weld' the geotextile and prevent the geotextile from moving or opening. You should practice this procedure on scrap material away from the system prior to attempting to do it over the system. Non-woven geotextiles are flammable and you must take extreme caution in doing this so that you do not leave the torch on the geotextile for too long. This procedure will create a perfect seam that will prevent sediment from bypassing the geotextile (Figure 29). If you cut your fabric too short, just make a patch for the uncovered area with another piece of geotextile, welding it all the way around.

Once the system is capped and sealed, use a sign or any other warning mechanism to warn other contractors not to remove the cover until activation is authorized (Figure 31). This will protect the system until final stabilization. Other erosion control mechanisms may be required upstream of the FocalPoint HPMBS such as check dams, erosion control blankets, wattles or other best management practices. Please contact your local Convergent Value Added Reseller for suggestions.







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ACTIVATE THE SYSTEM

Once 90% stabilization has been achieved; contact your local Convergent Water Technologies Value Added Reseller (www.convergentwater.com) for activation. Activation includes removing the protective 'cap and seal' cover on the biofiltration media bed and in situ testing of the media to insure that it meets performance specifications by means of an hydraulic conductivity test. This activation is provided by Convergent's VAR at no additional charge. At this time you may add specified plants to the media bed and the 3" non-floatable mulch layer if indicated (typical).

IMPORTANT:

The FocalPoint HPMBS should always remain capped until 90% stabilization is achieved and be the last thing planted to ensure that construction sediment does not enter the system.



Figure 33: Planted FocalPoint HPMBS



Figure 32: Protected FocalPoint HPMBS

WARNING

FAILURE TO CONFORM TO THIS STEP MAY VOID THE WARRANTY AND PERFORMANCE GUARANTEE. FOR THE FOCALPOINT HPMBS ACTIVATION CHECKLIST, CONTACT YOUR VALUE ADDED RESELLER.





PLANTINGS & MULCH



Placing the Plants:

1. Dig planting holes the depth of the root ball and two to three times as wide as the root ball. Wide holes encourage horizontal root growth that plants naturally produce.

2. With trees, you must ensure you are not planting too deep!! Don't dig holes deeper than root balls. The media should be placed at the root collar, not above the root collar; otherwise the stem will be vulnerable to disease.

Planting:

1. Remove plastic containers from container-grown plants. For plants in fiber pots, break away the top or remove the pot entirely.

2. If roots are circling around the root ball exterior, cut through the roots in a few places and remove the first inch of roots and planting material around the root ball. Cutting helps prevent circling roots from eventually girdling the trunk. If roots are not circling, the root ball should still be rubbed to loosen roots and promote growth into the media.

- 3. Remove tags and labels from plants.
- 4. Prune broken branches or suckers.

5. Only stake trees with large crowns, or those situated on windy sites or where

SPACING			
Type of Planting Rootball Size Spacing on Cent		Spacing on Center	
Shrubs	< 1 gallon 24 inches		
Shrubs	5 gallons	42 inches	
Shrubs	15 gallon 60 inches		
Clump Grasses		24 inches	
mall Trees 12 feet		12 feet	

people may push them over. Stake for a maximum of one year. Allow trees a slight amount of flex rather than holding them rigidly in place. Use guying or attach material that won't damage the bark. To prevent trunk girdling, remove all guying material after one year. Insure that stakes do not penetrate the bridging stone or underlying modular drainage system.

6. Plants should be watered at planting, especially during drought periods.

DO NOT:

- Mulch in excess of 3 inches
- Compact media around the root ball
- Do not use annuals
- Keep in mind that some perennials (i.e. daylilies, hostas, etc...) die back in fall and re-emerge in spring. If you want greenery year round, be mindful of the perennials used.

Mulching:

Cover the exposed root ball top with mulch. No mulch volcanoes! Mulch should not touch the plant base because it can hold too much moisture and invite disease and insects. Evenly place 3 inches of double shredded, aged hardwood mulch which has been screened to remove fines, on the surface of the media (if specified).

Erosion Control:

Where water is entering a focal point in one location, be sure to place erosion control stones or other scour prevention BMP to prevent scouring





PERFORMANCE VERIFICATION

The Rub-I Infiltrometer is the most effective way to field verify engineered soil performance, construction and long term verification of performance. The Rub-I was designed to test the effectiveness of high flow soils and to ensure post control. Current ASTM standards for infiltration testing are not valid for flow rates exceeding 16 in/hr. To ensure the highest level of effectiveness, Convergent specifies that the FocalPoint HPMBS be tested within 60 days of installation and we recommend the system be tested annually thereafter to provide ongoing quality assurance.

Objective:

To provide as-built confirmation of proper installation and hydraulic performance, to meet minimum high flow rate Infiltration rate requirements, of bioretention media on newly-placed bioretention systems. This procedure measures the entire media profile under saturated conditions to insure a reliable and accurate result.

Example Site Test Layout and Design Schematic:

(FSA = filter surface area, DA = drainage area)

For bioretention systems with a surface area less than 538 sf, in situ hydraulic testing should be conducted at one to

three points that are spatially distributed. For systems with a surface area greater than 50 sf, an extra monitoring point should be added for every additional 1076 sf. (Values are based on recommendations from the Facility for Advancing Water Biofiltration.) Testing should be performed near the perimeter since this is the area most likely to be impacted by sediment in the runoff.



X 10 ft			
43.5ft Figure 1: Site Layout			
	Media Depth (inches)	Max Drawdown Time (min:sec)	
	12	18:18	
	14	21:24	
	16	24:18	
	18	27:00	
	20	29:30	
	22	31:54	
	24	34:06	
ĺ	26	36:12	
ĺ	28	38:12	
ĺ	30	40:00	
ĺ	32 41:42		
ĺ	34	43:24	
ĺ	36	44:54	
ĺ	38	46:18	
ľ	40	47:42	
ĺ	42 49:00		
	44	50:12	
	46	51:24	
	48	52:30	

Test Methodology:

In an area near the location you plan to test, gently scrape away any material covering (e.g. mulch, gravel, leaves) filter media surface and confirm media profile depth by using a shovel to dig to under drain stone and place measuring tape in hole to determine depth from top of under drain stone to top of media bed. A flash light may be needed to ensure the under drain stone has been reached before a depth measurement is taken. Make every effort to minimize disturbance of surrounding media and underlying bridging stone.




PERFORMANCE & VERIFICATION continued



Figure 3: Hammering Pipe Into Media







Figure 6: Dissipater Stones



Figure 7: Infiltrometer Placement

Figure 8: Gradation of Clear Pipe



assembly of Rub - I Infiltrometer see the SOP (Standard Operating Procedure) document available from your Convergent VAR

For information on components &



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Figure 4: Pipe Installed Into Media

Figure 5: Oil Application



1. At the test location carefully clear away mulch without disturbing the underlying media and place base component of the Rub-I infiltrometer, a 6" PVC pipe (beveled end down), on the surface of the media. Ensure testing is not too close to vegetation. Place the wooden board over the pipe and then gently pound with the sledge hammer on top of the board (Figure 3). Hammer the PVC pipe into the entire media profile based on the depth previously determined, until it just breaches into the bridging stone. Drive the pipe straight down, avoiding tilt in any direction (Figure 4). Check with level. Note: It is important that the pipe is driven in slowly and carefully to minimize disturbance of the filter media profile. The media may slightly move downward in the pipe during hammering, but not more than 1 inch, and will not significantly affect hydraulic performance.

2. If pipe is less than 3 inches from media surface, remove media around outside of pipe so that the pipe has 3 inches of freedom from the media bed so that the infiltrometer gate valve coupling will properly slide onto the pipe.

3. Remove board and rub mineral oil on outside of PVC pipe above media (Figure 5).

4. Place 2 inch dissipater stones into pipe (Figure 6).

5. Slide gate valve with clear PVC cylinder down onto the PVC pipe in the media (Figure 7). Note: Disregard black coupling on clear pipe as well as pipe plug in this image.

6. Measure from the original surface of the media within the column to 1 ft, 2 ft, 3 ft, 4 ft and 5 ft gradations, and mark them on the clear PVC cylinder (Figure 8). The 1 ft and 5 ft marks are the critical marks, since the time to fall between these two intervals will provide the pass/fail time for the test. (The time at other intervals between 1 ft and 5 ft can be recorded for additional information, but will not be used in the pass/fail criteria).

7. Fill a 5 gallon bucket with 3 gallons of water.

8. Ensure the gate valve to the infiltrometer is closed. Fill with the 3 gallons of water (Figure 9). To create a worst case flow rate scenario (i.e. saturated condition), an initial wetting of the media using the infiltrometer is conducted by opening up the gate valve completely. The gate valve should be slowly opened by tapping on the handle with a hammer or wrench to prevent disturbance of the media surface by a sudden high flow of water. Pulling open by hand tends to force the valve open too quickly.

9. After the water level disappears from the clear column, a drain down time of 25 minutes is allowed to ensure free water has drained through the media.

10. After 25 minutes, ensure the gate valve is closed. Fill the 5 gallon bucket with water and continue to fill the column until water level reaches the very top of the clear pipe. Water is then re-introduced by opening the gate valve slowly by tapping the handle. A stopwatch should be started as the water level reaches 5 ft gradation and recorded at every 1 ft gradation. The stopwatch is stopped when the water level reaches the 1 ft mark.

11. Pass/fail criteria is based on maximum drawdown times (Table 1). For example, a media profile depth of 12 inches should not exceed a drawdown time of 18 minutes and 18 seconds between the 5 ft and 1 ft gradations.

For bioretention systems with a surface area less than 538 sf, in situ hydraulic testing should be conducted at one to three points that are spatially distributed. For systems with a surface area greater than 50 sf, an extra monitoring point should be added for every additional 1076 sf. These values are based on recommendations from the Facility.



Stormwater Treatment Proposal Attachment C





FOCALPOINT HP SECTION X-X



FOR MORE INFORMATION CONTACT ACF ENVIRONMENTAL WWW.ACFENVIRONMENTAL.COM 800.448.3636





800.448.3636

BIOFILTRATION SYSTEMS







FOCALPOINT OBSERVATION/ MAINTENANCE PORT

WWW.ACFENVIRONMENTAL.COM

800.448.3636



FOR MORE INFORMATION CONTACT ACF ENVIRONMENTAL





LET'S GET IT DONE

Stormwater Treatment Proposal Attachment D





Tech Note

Plant Selection

General Information

It's important to understand that FocalPoint is a biofiltration system that uses a very high flow, coarse sand media with about 10% peat by volume. The media is designed to drain very quickly but through various physical, chemical and biological processes to capture nutrients and other pollutants very efficiently. It is an open system, thus, it receives nutrients and organic material from the contaminated runoff every time it rains.

As a filter it treats a very large impervious surface and is exposed to much more water compared to a typical landscape plant. For example, a typical landscape shrub (on the east coast) would only receive an annual rainfall volume of about 40 inches per square foot or 3.3 ft. of run off per year. A FocalPoint system treating 1/4 acre of impervious surface would receive over 1,200 inches per square ft. or 100 ft. of runoff per year.

As a result of this unique circumstance, the FocalPoint biofiltration system creates a completely different environment when compared with typical growing media or soil, and therefore many common rules and traditional landscape industry concerns about soils and plant productivity are not applicable. This high flow media has been in use as a bioretention system for over 20 years and through experience, a great deal has been learned about the types of plants needed for this unique environment. There are now over 5,000 high flow rate bioretention systems throughout the country and all are working well with the plants thriving.

General Rules

- 1. Native plants are best suited as they adjust well to periodic droughts and temperature extremes. Use USDA hardiness zones as the first guide for plants.
- 2. Root morphology is important. Shallow fibrous root systems are best and generally only grow to depths of 3 ft. Plants with tap roots or that are surface spreading should not be used.
- 3. Small trees, woody shrubs or herbaceous plants are all suitable for the system.
- 4. If the runoff could be contaminated with road salts, salt tolerant plants should be used.
- 5. Generally facultative plants that like well drained soils should be used. Despite the volume of water treated, the soil drains very well so facultative-wet or obligate plants will not do well in these systems.
- 6. Soil moisture is maintained through the use of 10% peat moss in the original media mix and the use of a 3 inch layer of mulch on the media surface. Over the years, due to routine replacement of the mulch and ongoing input of organic material from the runoff (leaf litter, organics and detritus materials), this level of organic content is maintained. Through experience this has been adequate to help the plants survive extended droughts.
- 7. Plant selection can sometimes be a function of the soil depth used for the FocalPoint system. For example, if large canopy trees are required, a soil depth of 5 ft. or more may be needed to prevent wind throw. If there is only 1 ft. of media then flowers or grasses should be used.
- 8. The palette used is often dictated by the list of acceptable materials in local regulations. Most of the time, it is possible to find the proper plant from that list.



Q & A with a Registered Landscape Architect

Q. Are plants suitable for use with FocalPoint limited to a specific palette?

A. There is no need to create a special palette of plants. You can select plants from the general list attached or you can select from a list of approved required landscape materials. All of the plants on the attached list will work in the filter media. This list can be modified based on the USDA hardiness zones.

Q. What specific organic matter exists in the soil?

A. The media contains 10% by volume peat moss. Over the years the decaying mulch, roots, fungi, bacteria and organic inputs from stormwater runoff add to the organic mix as it evolves a more natural soil strata.

Q. Are there specific aged organic substrates used in the mix? If so, what? A. As indicated above, peat and other external organic inputs.

Q. Are any fertilizers incorporated into this mix? If so, are they organic or synthetic? A. No fertilizers are required as the system receives all the nutrient inputs necessary from stormwater runoff.

Q. What is the pH of the soil? A. Soil pH ranges from 6.5 to 6.8, the peat moss and mulch have a tendency to buffer the sand pH.

Q. What is the EC level in this soil?

A. Due to the unique nature of the sandy media and how it receives and captures nutrients from the high volumes of contaminated runoff the EC level of the soil is not a very useful indication of the amount of nutrients available.

Q. FocalPoint is designed to infiltrate water, but does it have any moisture holding capacity?

A. Yes it has soil moisture holding capacity through the use of peat moss and mulch. Additionally this system receives more water, more often, than a typical landscape plant due to its larger impervious drainage area.

Representative Plant List



Boltonia Asteroides / Boltonia



Panicum Virgatum / Switchgrass



Aster Novae Angliae / New England Aster



Vernonia Noveboracensis / New York Ironweed



Helianthus Angustifolius / Swamp Sunflower



Cimicifuga Racemosa / Black Snackeroot



Species/Common Name	Exposure N	Nature Size	Time of Bloom	Comments	
Aster novae angliae/ New England Aster	Full sun to partial	1-6′	September- October	Violet flowers attract butterflies, good food source for birds and mammals; saturated to dry soils	
Helianthus angustifolius/ Swam Sunflower	Sun	6-8′	August- October	Yellow flowers with maroon centers; butterfly nectar plant; birds eat seeds	
Hibiscus militaris/ Halberd Rose Mallow	Full sun	4-6'	July- September	Large plant that assumes shrub-like proportions. Large pink or white blooms; hummingbird nectar plant	
Hibiscus moscheutos/ Rose Mallow	Full sun	3-8'	July- September	Shrub-like plant; very large pink or white flowers; hummingbird nectar plant; can grow with roots in water	
Panicum virgatum/ Switch Grass	Sun	3-6'	July- October	Tolerates wet to well-drained soil; flowers appear to float; high wildlife value; yellow Fall color; buff in Winter; excellent wildlife habitat and erosion control	
Vernonia noveboracensis/ New York Ironweed	Sun	4-8'	August- October	The red-purple flowers of this wet meadow plant attract butterflies; will tolerate seasonal inundation	
Aster laevis/ Smooth or Blue Bird Aster	Sun	2-5'	August- October	Pale blue flowers attract butterflies, good food source for birds and mammals; moist to dry soils; mildew free	
Boltonia asteroides/ Boltonia	Full sun to partial	4-6'	Late Summer to Late Autumn	Easy to grow native with aster-like white or pink flowers. Attractive grey-green foliage. Prefers well drained moist soil	
Cimicifuga racemosa/ Black Snakeroot	Full sun to partial	3-8′	Mid Summer to early Autumn	Bold woodland edge plant with white, wand-like blooms. Handsome foliage	
Elymus virginicus/ Virginia Wild Rye	Partial shade to shade	1.5-5.5	June- October	Found in wooded stream sides, floodplains, and the woodland edge, this grass tolerates from 15-30 days of flooding as well as drought. Spreads easily, good for erosion control	
Eupatorium fistulosum/ Joe Pye Weed	Sun	1.5-6′	July- September	Huge, dusty-pink flowers attract butterflies; good food source for birds and mammals; saturated to dry soils; good Fall color	
Eupatorium perfoliatum/ Boneset	Full sun to partial shade	3-4'	July- October	Large, flat, pearl-white flower heads attract butterflies; mallards and grouse eat seeds	
Eupatorium rugosum/ White Snakeroot	Full sun to partial shade	3-4'	June- September	Flowers so white they glow in twilight; cultivar with purple foliage is available	
Filipendula rubra/ Queen of the Prairie	Full sun to light shade	4-6'	Early to Mid Summer	Prefers well drained evenly moist soils but will tolerate wet soils. Foamy clusters of tiny pink blooms. Prairie native	
Helianthus angustifolius/ Swamp Sunflower (P)	Sun	6-8'	August- October	Yellow flowers with maroon centers; butterfly nectar plant; birds eat seeds	
Myosotis laxa/ Smaller Forget-me-not	Partial shade	3-6″	Early Spring to Mid Summer	Will die back during dry summer and reappear in winter; will not tolerate consistently dry conditions; clusters of clear blue blooms with a yellow eye; found near springs and on muddy shores	

Species/Common Name	Exposure N	Nature Size	Time of Bloom	Comments
Chasmanthium latifolium/ River Oaks (M)	Sun to partial shade	2-3'	July- September	Broad-bladed grass resembles bamboo; bright green in spring, turns copper in Fall and tan in Winter; dangling "oats"; tolerates dry shade
Aronia arbutifolia/ Red Chokeberry (P)	Full sun to partial shade	4-10'	May-June	White flowers with red stamens; bright red, edible berries persist in Winter; salmon to scarlet Fall color; wildlife; bank stabilizer; dry to wet soils
Aronia melanocarpa/ Black Chokeberry	Full sun to partial shade	3-5′	Мау	White flowers with red stamens; black berries persist in Winter; dark purple- red Fall color; wildlife; bank stabilizer; dry to wet soils
Aronia prunifolia/ Purple Chokeberry	Full sun to partial shade	5-12'	April- May	White flowers with red stamens; dark purple berries persist in Winter; dark purple-red Fall color; wildlife; bank stabilizer; moist to wet soils
Baccharis halimifolia/ Groundsel Tree (M)	Sun	6-12′	August- September	White flowers become silver-white seed -heads lasting through November; green twigs and striped bark add winter interest; moist to wet soils
Callicarpa americana/ Beautyberry (M)	Full sun to partial shade	4-8'	June- August	Lavender-pink flowers on new wood; yellow Fall color; purple berries ring branch through winter; dry to wet soils
Cephalanthus occidentalis/ Buttonbush (P)	Sun	3-10′	July -August	White flower buttons turn tan and persist; yellow Fall color; moist to flooded soil; high wildlife value including butterflies and hummingbirds
Clethra alnifolia / Sweet Pepperbush (P)	Full sun to partial shade	6-10′	July- September	Very fragrant white or pink flowers; yellow Fall color; butterfly nectar plant
Cornus sericea / Red Twig	Full sun to partial shade	7-9′	Late Spring- Summer	White flowers; blue or white berries; high wildlife value; red/maroon Fall color; scarlet twigs in winter; good bank stabilizing shrub; Northeastern native
Euonymous americanus/ Hearts-a-bustin (P)	Partial shade	1.5-6′	May- June	Small brown flowers; fuchsia hearts with scarlet seeds; yellow to orange Fall color; green stems add winter interest; moist to wet soils
Hamamelis virginiana/ Witch Hazel (P)	Full sun to partial shade	4-15'	September- December	Tolerates irregular flooding or dry sites; yellow fragrant strap-like flowers; yellow Fall color; green stems add winter interest; moist to wet soils
Hydrangea arborescens/ Wild Hydrangea (P)	Partial Shade	3-8'	June-July	Creamy white flowers on new wood dry tan and persist; dry to moist soil
Hypericum densiflorum/ St John's Wort (P)	Full sun to partial shade	3-6'	Summer	Yellow flowers; tolerates variety of moisture regimes; medium wildlife value
llex glabra / Inkberry (P)	Full sun to partial shade	3-10'	May-July	Slow-growing evergreen; can be formally pruned; creamy-white flowers; tolerates wet soils; need male female for berries; high wildlife value
llex verticillata/ Winterberry (P)	Full sun to partial shade	6-12′	June-July	Can also be trained as small tree; white flowers; yellow Fall color; need male and female for scarlet berries; high wildlife value; tolerates wet soil
Juniperus communis 'Compressa'/ Juniper	Sun	3-6'		Mounded shrub; deep taproot; high wildlife value, evergreen

Species/Common Name	Exposure	Mature Size	Time of Bloom	Comments
Juniperus horizontalis/ Creeping Juniper	Sun	<1-3'		Matted shrub; deep taproot; high wildlife value; 'Bar Harbor' variety has plum foliage in winter; center dies back as plant ages
Leucothoe recemosa/ Fetterbuch (M)	Partial shade to shade	3-8′	May-June	White drooping flowers; evergreen leaves turn red/purple after frost; moist soil
Lindera benzoin/ Spicebush (P)	Sun to shade	6-12′	March-May	Chartreuse flowers; scarlet berries taken by birds; leaves fragrant when crushed; yellow Fall color; butterfly host plant; tolerates wet or dry sites
Myrica cerifera/ Wax Myrtle (P)	Sun to shade	6-10′	March-April	Chartreuse or white flowers; fragrant evergreen leaves; fragrant berries taken by birds and used for candles; can prune as hedge; dry to wet soils
Myrica pennsylvanica/ Bayberry (P)	Full sun to partia	l 6-8′	April-May	Chartreuse or white flowers; semi-evergreen fragrant leaves; fragrant berries taken by birds and used for candles; need male and female plants
Physocarpus opulifolius/ Ninebark (P)	Full sun to partia	l 6-12″	May-June	Peeling bark; pink or white flower clusters; moist or wet soil; medium wildlife value
Rhododendron canescens/ Sweet Azalea (P)	Full sun to partia shade	l 3-10′	May-June	White or pink, fragrant flowers; moist, acid, well-drained soil; red or yellow Fall color
R. periclymenoides/ Pinxterbloom Azalea (P)	Full sun to partia	l 3-10′	April-May	Pink flowers open before leaves are out; moist, acid, well-drained soil; red/wine/orange brilliant Fall Color
Rhododendron viscosum/ Swamp Azalea (P)	Full sun to partia shade	l 6-8'	June-August	Intensely fragrant white flowers; bronze Fall color; moist to wet soils
Rhus aromatica/ Fragrant Sumac (M)	Full sun to partia shade	l 6'	March-May	Spicy smelling leaves turn orange and scarlet in Fall; high wildlife value; variety 'gro-low' makes good groundcover for slopes
Rhus copallina/ Shining Sumac (P)	Sun	20'	June-July	Chartreuse flowers; scarlet fruit; bright red Fall color; wildlife value; tolerates dry, sandy soils; spreads
Rhus glabra/ Smooth Sumac (P)	Sun	9-15′	June-July	Chartreuse flowers; scarlet fruit; bright red Fall color; wildlife value; tolerates dry, sandy soils; forms colonies with interesting growth habit
Rhus typhina/ Staghorn Sumac (P)	Sun	10-25′	June-July	Chartreuse flowers; scarlet fruit; bright orange Fall color; wildlife value; tolerates dry, sand soils; forms groves with interesting growth habit
Rosa carolina/ Pasture Rose (P)	Full sun to partia	l .5-3'	May-June	Pink, fragrant flowers; red hips; high wildlife value; good Fall color; forms thickets; dry to moist soil
Rosa palustris/ Swamp Rose (P)	Full sun to partial shade	8'	July-August	Dark pink flowers; red hips; high wildlife value; good Fall color; moist to wet soil
Sambucus canadensis/ Elderberry (P)	Sun to shade	6-12′	April-May	Large white flower clusters; ornamental, edible purple berries; wildlife value; moist to wet soils; forms thickets; bank stabilizer; fast-growing

Species/Common Name	Exposure	Mature Size	Time of Bloom	Comments
Vaccinium stamineum/ Deerberry (P)	Full sun to partia shade	l 5-10′	April-June	White flowers; edible fruit; scarlet Fall color; wildlife value; dry to moist soil
Viburnum acerifolium/ Maple-leaved Vib. (P)	Full sun to partia shade	l 3-6.5′	April-May	Creamy white flowers; blue berries; pink/ crimson/ purple Fall color; can tolerate dry to moist soil; wildlife value; best in groups
Viburnum cassinoides/ Northern Wild Raisin (M)	Full sun to partia shade	l 6-8′	June	Fragrant white flowers; pink, red and blue berries turn black; wine-red Fall color; high wildlife value including butterflies
Viburnum dentatum/ Arrow Wood (P)	Full sun to partia shade	l 8-10′	May- June	Creamy white flowers; blue berries; crimson Fall color can tolerate wet to dry soil; high wildlife value; wood was used for arrows
Viburnum lentago/ Nannyberry (M)	Full sun to partia shade	l 8-15′	May	White flowers; sweet , edible black berries; purple-red Fall color; very adaptable; high wildlife value
Viburnum prunifolium/ Black Haw (P)	Full sun to partia shade	l 20'	April-May	White flowers; black berries; purple-red Fall color; very adaptable; high wildlife value; dry to wet soils; slow grower
Viburnum trilobum/ American Cranberry	Full sun to partial shade	l 8-12′	May	White flowers; edible red berries; yellow-purple-red Fall color; moist to boggy soil; high wildlife value; Northern native

Stormwater Treatment Proposal Attachment E





FocalPoint BIOFILTRATION SYSTEMS

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM (HPMBS)

Operations & Maintenance





GENERAL DESCRIPTION

The following general specifications describe the general operations and maintenance requirements for the FocalPoint[®] High Performance Modular Biofiltration System (HPMBS). The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, modular, constructed in place system designed to treat contaminated runoff.

Stormwater enters the FocalPoint[®] HPMBS, is filtered by the High Flow Biofiltration Media and passes through to the underdrain/storage system where the treated water is detained, retained or infiltrated to sub-soils, prior to discharge to the storm sewer system of any remaining flow.

Higher flows bypass the FocalPoint[®] HPMBS via a downstream inlet or other overflow conveyance. Maintenance is a simple, inexpensive and safe operation that does not require confined space entry, pumping or vacuum equipment, or specialized tools. Properly trained landscape personnel can effectively maintain FocalPoint[®] HPMBS by following instructions in this manual.



BASIC OPERATIONS

FocalPoint[®] is a modular, high performance biofiltration system that often works in tandem with other integrated management practices (IMP). Contaminated stormwater runoff enters the biofiltration bed through a conveyance swale, planter box, or directly through a curb cut or false inlet. Energy is dissipated by a rock or vegetative dissipation device and is absorbed by a 3-inch layer of aged, double shredded hardwood mulch, with fines removed, (when specified) on the surface of the biofiltration media.

As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the biofiltration media where the finer particles are removed and numerous chemical reactions take place to immobilize and capture pollutants in the soil media.

The cleansed water passes into the underdrain/storage system and remaining flows are directed to a storm sewer system or other appropriate discharge point. Once the pollutants are in the soil, bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a variety of very complex biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

DESIGN AND INSTALLATION

Each project presents different scopes for the use of FocalPoint[®] HPMBS. To ensure the safe and specified function of this stormwater BMP, Convergent Water Technologies and/or its Value Added Resellers (VAR) review each application before supply. Information and design assistance is available to the design engineer during the planning process. Correct FocalPoint[®] sizing is essential to optimum performance. The engineer shall submit calculations for approval by the local jurisdiction when required. The contractor and/or VAR is responsible for the correct installation of FocalPoint[®] HPMBS units as described in approved plans. A comprehensive installation manual is available at www.convergentwater.com.





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MAINTENANCE

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons for maintenance include:

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the lifespan of your FocalPoint[®] HPMBS.
- Avoid costly repairs.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the FocalPoint[®] HPMBS is required to continue effective pollutant removal from stormwater runoff before any discharge into downstream waters. This procedure will also extend the longevity of the living biofiltration system. The unit will recycle and accumulate pollutants within the biomass, but may also subjected to other materials entering the surface of the system. This may include trash, silt and leaves etc. which will be contained above the mulch and/or biofiltration media layer. Too much silt may inhibit the FocalPoint's[®] HPMBS flow rate, which is a primary reason for system maintenance. Removal of accumulated silt/sediment and/or replacement of the mulch layer (when specified), is an important activity that prevents over accumulation of such silt/sediment.

When to Maintain?

Convergent Water Technologies and/or its VAR includes a 1-year maintenance plan with each system purchased. Annual included maintenance consists of two (2) scheduled maintenance visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as when the site is appropriately stabilized, the unit is installed and activated (by VAR), i.e., when mulch (if specified) and plantings are added.

Activation should be avoided until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after storm events of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency.





Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the VAR/Maintenance contractor and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the VAR/Maintenance contractor of any damage to the plant(s), which constitute(s) an integral part of the biofiltration technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance of the FocalPoint[®] HPMBS to the VAR/Maintenance contractor (i.e. no pruning or fertilizing).

EXCLUSION OF SERVICES

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant(s) in the FocalPoint[®] HPMBS.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the VAR/Maintenance contractor maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the FocalPoint[®] (where the cleaned runoff drains to, such as drop-inlet) and block off the point where water enters of the FocalPoint[®] HPMBS. The VAR/Maintenance contractor should be informed immediately.

MAINTENANCE VISIT SUMMARY

Each maintenance visit consists of the following simple tasks (detailed instructions below).

- 1. Inspection of FocalPoint[®] HPMBS and surrounding area
- 2. Removal of debris, trash and mulch
- 3. Mulch replacement
- 4. Plant health evaluation (including measurements) and pruning or replacement as necessary
- 5. Clean area around FocalPoint[®] HPMBS
- 6. Complete paperwork, including date stamped photos of the tasks listed above.

MAINTENANCE TOOLS, SAFETY EQUIPMENT AND SUPPLIES

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes.



MAINTENANCE VISIT PROCEDURE



Inspection of FocalPoint [®] HPMBS and surrounding area										
Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:										
Standing Water Is Bypass Inlet Clear?	yes no yes no	Damage to HPMBS System to Overflow conveyance	yes no yes no							
Removal of Silt / Sediment / Clay										
Dig out silt (if any) and mulch and r	Dig out silt (if any) and mulch and remove trash & foreign items.									
Silt / Clay Found? Cups / Bags Found?	yes no yes no	──── Leaves? ─── Volume of material removed	yes no d (volume or weight)							
Removal of debris, trash and mulch										
After removal of mulch and debris, measure distance from the top of the FocalPoint [®] HPMBS engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this distance is greater than that specified on the plans (typ. 6" - 12"), add media (not top soil or other) to recharge to the distance specified.										
Mulch Replacement										
Most maintenance visits require only replacement mulch (if utilized) which must be, aged, double shredded hardwood mulch with fines removed. For smaller projects, one cubic foot of mulch will cover four square feet of biofiltration bed, and for larger projects, one cubic yard of mulch will cover 108 square feet of biofiltration bed. Some visits may require additional FocalPoint [®] HPMBS engineered soil media available from the VAR/Contractor.										
Add double shredded, aged h biofiltration media bed to a de Clean accumulated sediment entry of trash during a storm e	Add double shredded, aged hardwood mulch which has been screened to remove fines, evenly across the entire biofiltration media bed to a depth of 3". Clean accumulated sediment from energy dissipation system at the inlet to the FocalPoint® HPMBS to allow for entry of trash during a storm event.									
Plant health evaluation and pruning o	or replacement as	necessary								
Examine the plant's health and rep Prune as necessary to encourage g	ace if dead or dyir rowth in the correc	ng. ct directions								
──── Height above Grate (feet) ─── Width at Widest point (feet)		Health Damage to Plant	alive dead yes no							
Clean area around FocalPoint® HPMB	5									
Clean area around unit and re	Clean area around unit and remove all refuse to be disposed of appropriately.									
Complete paperwork	Complete paperwork									
 Deliver Maintenance Report and photographs as appropriate. Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations. 										



FocalPoint Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.



Maintenance Checklist

Element	Problem	What To Check	Should Exist	Action
Inlet	Excessive sediment or trash accumulation	Accumulation of sediment or trash impair free flow of water into FocalPoint	Inlet free of obstructions allowing free flow into FocalPoint System	Sediments or trash should be removed
Mulch Cover	Trash and floatable debris accumulation	Excessive trash or debris accumulation.	Minimal trash or other debris on mulch cover	Trash and debris should be removed and mulch cover raked level. Ensure that bark nugget
Mulch Cover	Ponding of water on mulch cover	Ponding in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils	Stormwater should drain freely and evenly over mulch cover.	Contact VAR for advice.
Plants	Plants not growing, or in poor condition	Soil/mulch too wet, evidence of spill. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact VAR for advice.
Plants	Plant growth excessive	Plants should be appropriate to the species and location of FocalPoint		Trim/prune plants in accordance with typical landscaping and



Stormwater Treatment Proposal Attachment F





Stormwater Treatment Proposal Attachment G



StormSack

StormSok[™]

Servicing and Disposal

The following recommendations are included for guidance only. Actual maintenance schedules should be developed base on site conditions. These specific schedules assume a 75% impervious surface (parking lots or urban streets), limited trees and vegetation, very little slope and an annual rain fall of approximately 40".

Product	Recommended service schedule	Disposal
FormSack	Available Storage volume depending on model selected ranges from 2.2 to 7.3 cubic feet. Recommended cleanout 3 – 4 times per year depending on size/volume	Disposal: Under typical local and state regulations, the collected material in the StormSack is considered equivalent to material collected during street sweeping operations. This material is normally considered contaminated non-hazardous solid waste.
StormSok - round	Available storage volumes: bag only 24", 26", 28", 30" sizes – 3.6 cubic feet Recommended cleanout 2 – 3* times per year * The larger shrouds used on the 26"- 30" StormSoks allow for the collection of significantly more debris than the 24" size. This can extend the service interval especially when used for primarily trash collection.	However as with all waste products intended for disposal, it is up to the generator to properly characterize the waste prior to disposal. After proper characterization the generator can proceed with disposal under the guidance of local, state and federal regulations.
StormSok-square	Available storage volume: bag only 24" – 26" sizes – 3.6 cubic feet Recommended cleanout 3 – 4 times per year	

Stormwater Treatment Proposal Attachment H





Rain Gardens • Swales • Filtration Basins • Infiltration Basins

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RDIAN

FOR



PURPOSE

• THE RAIN GUARDIAN SIMPLIFIES MAINTENANCE IN YOUR RAIN GARDEN BY COLLECTING SAND, LEAVES, GRASS CLIPPINGS, AND OTHER DEBRIS IN A CONFINED LOCATION. EXCESSIVE AMOUNTS OF THESE SUBSTANCES CAN ACTUALLY DECREASE THE EFFECTIVENESS OF YOUR RAIN GARDEN BY STRESSING THE PLANT COMMUNITY AND DIMINISHING THE INFILTRATION RATE. REGULARLY CLEANING THE RAIN GUARDIAN SUSTAINS ITS FUNCTIONALITY BY MAXIMIZING STORAGE CAPACITY AND FILTRATION.

FREQUENCY

- VARIABLE DEPENDING UPON TIME OF YEAR AND FREQUENCY OF RAIN EVENTS
- SPRING AND FALL ARE PERIODS LIKELY REQUIRING MORE FREQUENT MAINTENANCE BECAUSE OF INCREASED INPUTS FROM ROAD SAND AND LEAF LITTER

INDICATIONS YOU SHOULD CLEAN YOUR RAIN GUARDIAN









PROCESS

- FOLLOWING STORM EVENTS, INSPECT RAIN GUARDIAN FOR DEBRIS ON GRATE, FILTER WALL, AND INSIDE OF CHAMBER
- REMOVE METAL GRATE AND PLACE ALL DEBRIS FROM METAL GRATE AND CURB-CUT INTO THE RAIN GUARDIAN OR GARBAGE BIN
- REMOVE FILTER AND USE FLAT SHOVEL TO REMOVE DEBRIS FROM RAIN GUARDIAN AND PLACE IN GARBAGE BIN
- REGULARLY BRUSH OFF AND PERIODICALLY RINSE FILTER
- REPLACE FILTER AND METAL GRATE











SYMPTOMS OF IMPROPER INSTALLATION

- EROSION ALONG SIDE OF RAIN GUARDIAN
- MAXIMUM WATER LEVEL ABOVE TOP OF RAIN GUARDIAN
- CONTACT THE ANOKA CONSERVATION DISTRICT FOR TROUBLESHOOTING ASSISTANCE



Stormwater Treatment Proposal Attachment I





Summary for Subcatchment 1S: Gleneida Ave Subcat

Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr WQ Rainfall=1.27"

	Area	a (sf)	CN D	escription		
*	21	,500	98			
	21	,500	1	00.00% Im	npervious A	Area
	Tc L	ength	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	6.0					Direct Entry,

Summary for Pond FP1: FocalPoint 86sf

[82] Warning: Early inflow requires earlier time span[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=9)

Inflow Area =	0.494 ac,100.00% Impervious, Inflow De	epth > 1.00" for WQ event
Inflow =	0.56 cfs @ 12.09 hrs, Volume=	0.041 af
Outflow =	0.20 cfs @ 12.35 hrs, Volume=	0.041 af, Atten= 64%, Lag= 15.7 min
Primary =	0.20 cfs @ 11.90 hrs, Volume=	0.041 af
Secondary =	0.00 cfs @ 12.35 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Peak Elev= 100.57' @ 12.35 hrs Surf.Area= 86 sf Storage= 252 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 5.6 min (758.4 - 752.9)

Volume	Invert	Avail.Sto	rage	Storage I	Description	
#1	97.75'	;	39 cf	5.00'W x	17.20'L x 2.25	"H FocalPoint
				194 cf O\	/erall x 20.0%	Voids
#2	100.00'	5	00 cf	Custom	Stage Data (Pr	rismatic)Listed below (Recalc) -Impervious
		5	39 cf	Total Ava	ailable Storage	
Flevatio	n Si	ırf Area	Inc	Store	Cum Store	
(fee	t)	(sa-ft)	(cubi	c-feet)	(cubic-feet)	
100.0	0	200	(0001	0	0	
100.0	0	200		0	0	
100.5	0	500		175	175	
101.0	0	800		325	500	
Device	Routing	Invert	Outle	et Devices		
#1	Primary	97.75'	100.	000 in/hr	Exfiltration over	er Surface area Phase-In= 0.10'
#2 Secondary 100.57' 1 8 Li		18.0 Limit	I'' Horiz. Orifice/Grate C= 0.600 ted to weir flow at low heads			

Primary OutFlow Max=0.20 cfs @ 11.90 hrs HW=97.97' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Secondary OutFlow Max=0.00 cfs @ 12.35 hrs HW=100.57' (Free Discharge) —2=Orifice/Grate (Weir Controls 0.00 cfs @ 0.19 fps)

Stormwater Treatment Proposal Attachment J






Dutchess Drive (PW-MB-1000)

Dutchess Drive, Pawling, NY 12564 Owner: Village of Pawling, Multiple Private Owners Prepared by: East of Hudson Watershed Corporation Date: 02/17/2022

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Appendix B

Drainage Area Project Location Map Pipe Retrofit Plan View Pipe Retrofit 3D View Phosphorus Loading Calculation

1.0 INTRODUCTION

The East of Hudson Watershed Corporation (EOHWC) was created to oversee the design and installation of Stormwater Retrofit Projects (SRP's) within the New York City Department of Environmental Protection (NYCDEP) drinking water reservoir system located east of the Hudson River. The major focus of these projects is the reduction of phosphorus (P) from stormwater runoff prior to entering the reservoir system and is monitored and approved by the New York State Department of Environmental Conservation (NYSDEC).

The basis of design for the SRP program is the NYSDEC Stormwater Management Design Manual (SMDM), 2015. Both Water Quality Volume (WQv) calculation and stormwater management practice (SMP) selection follow all SMDM, 2015 regulations and requirements.

The engineering initial evaluation process begins with an estimation of the phosphorus concentration or "loading" within the stormwater runoff from a given drainage area. Once a phosphorus load (P-load) has been determined, an appropriate SMP is selected to remove as much of the P-load as the site constraints will allow.

1.1 **Project Objectives**

The Dutchess Drive project area consists of several areas of stormwater flow. This project proposes to capture and treat some of the stormwater runoff from Holmes Road, Jansen Road and Dutchess Drive, prior to discharge into Lake Dutchess. This will be accomplished through the implementation of a tiered bioinfiltration ACF Environmental FocalPoint unit between houses 19 and 25 on Dutchess Drive. The project will also include the stabilization of several channels entering the lake and the removal of impervious cover.

2.0 EXISTING CONDITIONS

2.1 Project Location

The Dutchess Drive retrofit area is located within the Town of Pawling, New York. The tiered bioinfiltration unit will be installed on the property of 25 Dutchess Drive. The stream at the intersection of Jansen and Dutchess will be stabilized, along with the stream near the intersection of Lake Drive and Holmes. The tennis court to be removed is across from 71 Dutchess Drive.



Figure 2.1 Dutchess Drive Retrofit Location Map

2.2 Current Land Use

The drainage area consists of residential land use. Most of the land is covered in woods, lawns, houses, roads, and driveways. The mapping figures listed below verify the locations of any existing wetland areas managed by the NYSDEC and the USACOE, and those areas designated as flood plains by the Federal Emergency Management Agency (FEMA). The maps are shown in Appendix A and include the following:

- FIRM Mapping
- NYSDEC ERM Wetland Mapping
- National Wetland Inventory (NWI) Wetland Mapping

2.3 USGS Soil Classification

The Hydrologic Soil Group index is based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). Figure 2.2 below shows the soil types in the project area.



Figure 2.2 USGS Soil Types

2.4 Site Topography

The drainage area cascades downward from a high point near the intersection of Jansen Road and Holmes Road and decreases in elevation towards the shoreline of Lake Dutchess. The project location is of considerable slope, decreasing quickly from Dutchess Drive towards the lake.

2.5 Stormwater Flow Path

There are multiple stormwater flow paths of interest on the project site. Stormwater flows mostly by sheet flow across the landscape. There are areas along Jansen, Dutchess and Holmes where stormwater travels via concentrated flow. There is currently no stormwater infrastructure in place in the areas of interest.

2.6 Nearest Receiving Waterbody

The nearest receiving water body is Lake Dutchess to the southeast of the project area, which is tributary to the Middle Branch Reservoir. The ERM map is included in Appendix A.

3.0 ENGINEERING BASIS OF DESIGN

The SRPs selected for this project utilizes the area as effectively as possible given the site constraints and provides treatment of the water quality volume prior to reaching the unclassified stream.

3.1 Design Considerations

Numerous design considerations were examined as part of this projects SMP selection. The site constraints noted below eliminate the use of many SMP's.

- 1) Site is lacking in existing infrastructure.
- 2) Most of the stormwater flows via sheet flow into the lake.
- 3) Potentially high water table.
- 4) Minimal space for project installation.
- 5) Most of the land is privately owned.

3.2 Stormwater Management Practice (SMP)

The EOHWC has selected to implement multiple stormwater retrofit projects along Lake Dutchess to help reduce the amount of Phosphorus entering the lake. To help treat some of the sheet flow directly entering the lake, a tiered bioinfiltration system will be installed at 25 Dutchess Drive, along with two catch basins along Dutchess Drive to help direct flows to this practice. The existing open channel flow from the catch basin on Holmes Road will be redirected to the filter systems as well. Two of the coves around the lake will be repaired and armored to help mitigate the ongoing soil loss, while also enhancing the habitat. Lastly, the existing tennis court located across from 71 Dutchess Drive will be removed and replaced with a grassed area which will act as a space for stormwater infiltration. Site survey of the project area will be performed by the Engineering Firm selected to design this project.

3.3 Design Parameters

The total drainage area for the Dutchess Drive project is approximately 26.05 acres. A Figure showing the drainage area is included in Appendix B. The drainage areas calculations for each section are provided in Appendix B along with each respective phosphorus analysis.

3.4 Phosphorus Loading Calculation

As noted above, the contributing drainage area was used to determine the runoff information for the WQv events for the proposed SRP. As part of this design, the simple method was used to calculate the WQv and the P-Loading Rate for the site. The WQv was determined to be approximately 14,464 ft³, with a P-load of 1.87 Kg/yr. The installation of the bioinfiltration will provide a reduction of 100% if installed with an open and infiltrating bottom soil layer. The removal of the tennis court will provide treatment of 0.52 kg/yr and the channel stabilization efforts will treat 3.04 kg/yr. In total, the anticipated P-Reduction is 4.91 kg/yr.

4.0 ANTICIPATED REGUALTORY APPROVAL AND PERMITS

It is the responsibility of the design engineer to verify which permits are required. A NYSDEC general permit for construction activity SPDES GP-0-15-002 will be required for this project. No other permits are anticipated.

Appendix A

FIRM Map NYSDEC ERM Wetland Map NWI Wetland Map Soil Characteristics and Delineation

National Flood Hazard Layer FIRMette



Legend

73°40'36"W 41°31'23"N SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT Without Base Flood Elevation (BFE) Zone A. V. A9 With BFE or Depth Zone AE, AO, AH, VE, AR SPECIAL FLOOD HAZARD AREAS **Regulatory Floodway** 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X Future Conditions 1% Annual Chance Flood Hazard Zone X Area with Reduced Flood Risk due to AREA OF MINIMAL FLOOD HAZARD Levee. See Notes. Zone X OTHER AREAS OF FLOOD HAZARD Area with Flood Risk due to Levee Zone D NO SCREEN Area of Minimal Flood Hazard Zone X Effective LOMRs OTHER AREAS Area of Undetermined Flood Hazard Zone D - — – – Channel, Culvert, or Storm Sewer GENERAL STRUCTURES LIIII Levee, Dike, or Floodwall 20.2 Cross Sections with 1% Annual Chance 17.5 Water Surface Elevation Town of Pawling **Coastal Transect** 361341 Mase Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary --- Coastal Transect Baseline OTHER **Profile Baseline** 36027C0520E FEATURES Hydrographic Feature eff. 5/2/2012 Zone A **Digital Data Available** No Digital Data Available MAP PANELS Unmapped The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location. This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/27/2021 at 2:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for 73°39'58"W 41°30'56"N Feet 1:6.000 unmapped and unmodernized areas cannot be used for regulatory purposes. 250 500 1,000 1,500 2.000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Environmental Resource Mapper



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



U.S. Fish and Wildlife Service National Wetlands Inventory

Wetlands



August 27, 2021

Wetlands

- Estuarine and Marine Wetland

Estuarine and Marine Deepwater

- rine Wetland
- Freshwater Pond

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Lake Other Riverine This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.





Soil Map—Dutchess County, New York, and Putnam County, New York



MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrB	Charlton-Chatfield complex, undulating, rocky	19.4	5.1%
CrC	Charlton-Chatfield complex, rolling, rocky	77.3	20.3%
CrD	Charlton-Chatfield complex, hilly, rocky	26.2	6.9%
CtB	Chatfield-Hollis complex, undulating, very rocky	6.5	1.7%
CtC	Chatfield-Hollis complex, rolling, very rocky	17.1	4.5%
CtD	Chatfield-Hollis complex, 15 to 35 percent slopes, very rocky	68.8	18.0%
HoD	Hollis-Chatfield-Rock outcrop complex, hilly	37.5	9.8%
НоЕ	Hollis-Chatfield-Rock outcrop complex, steep	36.6	9.6%
НоЕ	Hollis-Chatfield-Rock outcrop complex, very steep	0.9	0.2%
NyA	Natchaug muck, 0 to 2 percent slopes	4.4	1.1%
Su	Sun silt loam	19.8	5.2%
W	Water	48.5	12.7%
Subtotals for Soil Survey Ar	ea	363.0	95.0%
Totals for Area of Interest		381.9	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CIB	Charlton fine sandy loam, 3 to 8 percent slopes, very stony	0.0	0.0%
CrC	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	8.1	2.1%
CsD	Chatfield-Charlton complex, 15 to 35 percent slopes, very rocky	8.8	2.3%
W	Water	2.0	0.5%
Subtotals for Soil Survey Area	3	18.9	4.9%
Totals for Area of Interest		381.9	100.0%

Appendix B

Drainage Area Project Location Map Pipe Retrofit Plan View Pipe Retrofit 3D View Phosphorus Loading Calculation

Dutchess Drive, Pawling, PW-MB-1000 - Multiple Retrofits





Spatial Reference Name: GCS North American 1983



NOTES:

Provide treatment of Lake Dutchess via implementation of bioinfiltration and channel stabilization.

Drainage Area = 26.05 acres Phosphorus Loading = 6.61 kg/yr Phosphorus Removal = 4.91 kg/yr



Ν

Dutchess Drive, Pawling, PW-MB-1000 - Multiple Retrofits



Date Printed: 9/9/2021

Ν

Spatial Reference Name: GCS North American 1983



NOTES:

Provide treatment of Lake Dutchess via implementation of bioinfiltration and channel stabilization.

Drainage Area = 26.05 acres Phosphorus Loading = 6.61 kg/yrPhosphorus Removal = 4.91 kg/yr

<u>Legend</u> Retrofit Drainage Area Retrofit Locations Stormwater Piping Proposed - Open Channel Existing **Catch Basins Existing** Proposed

Dutchess Drive, Pawling, PW-MB-1000 - Bioinfiltration



PROPOSED SITE CONDITIONS



N

Dutchess Drive, Pawling, PW-MB-1000 - Bioinfiltration





PROPOSED SITE CONDITIONS

	Phosphorus Loading		
	Land Use	P conc. (mg/l)	
	Residential	0.41	
	Commercial	0.34	
	Industrial	0.45	
	Actively Grazed Pasture	0.40	
	Forest	0.15	
	Impervious	0.50	
Calculate Phosphorus Loading from Land Usage	Developed Open Space*	0.28	

Label	Area (ac)	Residental	Commericial	Industrial	Actively Grazed P	asture	Forest Im	npervious	Developed Open Space	Percent	EMC	Rv	WQv (ac-ft)	WQv (cu-ft)	P Load (lb/yr)	P Load (kg/yr)	
Jansen CB	8.02	9.7					84.4	5.9		100	0.20	0.10275	0.082	3589	1.48	0.67	
Dutchess CB	13.69	1.5					96	2.5		100	0.16	0.0725	0.099	4322	1.48	0.67	
Tennis Court	0.95						56.7	43.3		100	0.30	0.439427	0.042	1814	1.15	0.52	



Hallocks Mill Retrofit (Y-MU-40)

Hallocks Mill Road, Yorktown Heights, NY 10598 Owner: Yorktown Prepared by: East of Hudson Watershed Corporation

Date: 03/02/2022

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FIRM Map NYSDEC ERM Wetland Map NWI Wetland Map Soil Characterization and Delineation

Appendix B

Pipe Retrofit Plan View Pipe Retrofit 3D View Contributing Drainage Area Mapping Project Area Mapping Phosphorus Loading Calculation

1.0 INTRODUCTION

The East of Hudson Watershed Corporation (EOHWC) was created to oversee the design and installation of Stormwater Retrofit Projects (SRP's) within the New York City Department of Environmental Protection (NYCDEP) drinking water reservoir system located east of the Hudson River. The major focus of these projects is the reduction of phosphorus (P) from stormwater runoff prior to entering the reservoir system and is monitored and approved by the New York State Department of Environmental Conservation (NYSDEC).

The basis of design for the SRP program is the NYSDEC Stormwater Management Design Manual (SMDM), 2015. Both Water Quality Volume (WQv) calculation and stormwater management practice (SMP) selection follow all SMDM, 2015 regulations and requirements.

The engineering initial evaluation process begins with an estimation of the phosphorus concentration or "loading" within the stormwater runoff from a given drainage area. Once a phosphorus load (P-load) has been determined, an appropriate SMP is selected to remove as much of the P-load as the site constraints will allow.

1.1 **Project Objectives**

The proposed Hallocks Mill Retrofit is an area which receives a large amount of stormwater flow from the nearby neighborhood. This project proposes to capture and treat the stormwater runoff prior to discharging into the Hallocks Mill Brook. This will be accomplished through the implementation of a FocalPoint bioinfiltration unit.

2.0 EXISTING CONDITIONS

2.1 Project Location

The Hallocks Mill Retrofit area is located within the Town of Yorktown, New York on Route 35, across from Hallocks Mill Road. The retrofit is proposed to be installed on town owned land along the drainage to the Hallocks Mill Brook.



Figure 2.1 Hallocks Mill Road Retrofit Location Map

2.2 Current Land Use

The drainage area consists of forest, residential and developed open space land use.. The mapping figures listed below verify the locations of any existing wetland areas managed by the NYSDEC and the USACOE, and those areas designated as flood plains by the Federal Emergency Management Agency (FEMA). The maps are shown in Appendix A and include the following:

- FIRM Mapping
- NYSDEC ERM Wetland Mapping
- National Wetland Inventory (NWI) Wetland Mapping

2.3 USGS Soil Classification

The Hydrologic Soil Group index is based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The soils in the United States are assigned to four groups (A, B, C, and

D) and three dual classes (A/D, B/D, and C/D). Figure 2.2 below shows the soil types in the project area.



Figure 2.2 Hallocks Mill Retrofit USGS Soil Types

2.4 Site Topography

Generally, the project drainage area flows southeast. Parker Lane towards Rt 35 in the northwest of the area is a high point from which the elevation lowers eastward toward the project area. The project location maintains a constant and steep slope towards the Hallock Mill Brook.

2.5 Stormwater Flow Path

Throughout the neighborhood, there are catch basins which collect stormwater and likey transports it near the intersection of Route 35 and Hallocks Mill Road. It is expected that piping flows under Route 35 where it outfalls into a small drainage stream in the Yorktown owned property, near the project area.

2.6 Nearest Receiving Waterbody

The nearest receiving water body is the Hallock Mill Brook to the southeast of the project area, which receives all the stormwater from the project drainage area, untreated. The Hallock Mill Brook is tributary to the Muscoot Reservoir. The ERM map is included in Appendix A. - Page 3 -

3.0 ENGINEERING BASIS OF DESIGN

The SRP selected for this project utilizes the area as effectively as possible given the site constraints and provides treatment of the water quality volume prior to reaching the lake.

3.1 Design Considerations

Numerous design considerations were examined as part of this SMP selection. The site constraints noted below eliminate the use of many SMP's.

- 1) Steep slopes limit options for SRP type and location.
- 2) Restricted space for installation of an SRP
- 3) Desire to maintain natural habitat
- 4) Existence of sewer line reducing the available project area

3.2 Stormwater Management Practice (SMP)

The EOHWC has selected to install a FocalPoint bioinfiltration unit at this location as it can provide substantial treatment of the water quality volume and can be successful along the steep slopes of proposed location. The units will be installed in a terraced format to ensure entire treatment of the water quality volume. Dependent on site conditions, each unit may require different amount of cells to treat the stormflows. Site survey of the project area will be performed by the Engineering Firm selected to design this project.

3.3 Design Parameters

The total drainage area for the Hallock Mill Retrofit is approximately 60.8 acres. A Figure showing the drainage area is included in Appendix B. The drainage area calculations are provided in Appendix B along with a phosphorus analysis.

3.4 Phosphorus Loading Calculation

As noted above, the contributing drainage area was used to determine the runoff information for the WQv events for the proposed SRP. As part of this design, the simple method was used to calculate the WQv and the P-Loading Rate for the site. The WQv of the drainage area was determined to be approximately 78,944 ft³, with a P-load of 29.67 kg/yr. The installation of bioinfiltration units will provide a reduction of 100% if they are installed with an open bottom for full infiltration. The total anticipated P-Reduction is 29.67 kg/yr.

4.0 ANTICIPATED REGUALTORY APPROVAL AND PERMITS

It was determined that the following permits may be required by the Town of Yorktown, NYS, NYCDEP, and the USACOEs. It is the responsibility of the design engineer to verify which permits are required.

- NYSDOT Highway Work Permit
- NYSDEC general permit for construction activity SPDES GP-0-15-002 will be required for this project.

Appendix A

FIRM Map NYSDEC ERM Wetland Map NWI Wetland Map Soil Characteristics and Delineation

National Flood Hazard Layer FIRMette



Legend

73°47'14"W 41°17'9"N SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT Without Base Flood Elevation (BFE) Zone A. V. A9 With BFE or Depth Zone AE, AO, AH, VE, AR SPECIAL FLOOD HAZARD AREAS **Regulatory Floodway** 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average Zone depth less than one foot or with drainage FLOODWAY areas of less than one square mile Zone X Future Conditions 1% Annual Chance Flood Hazard Zone X Area with Reduced Flood Risk due to Levee. See Notes. Zone X OTHER AREAS OF FLOOD HAZARD Area with Flood Risk due to Levee Zone D NO SCREEN Area of Minimal Flood Hazard Zone X Effective LOMRs OTHER AREAS Area of Undetermined Flood Hazard Zone D 36119C0041F 36119C0042F - — – – Channel, Culvert, or Storm Sewer GENERAL eff. 9/28/2007 STRUCTURES LIIII Levee, Dike, or Floodwall eff. 9/28/2007 OODWAY 20.2 Cross Sections with 1% Annual Chance AREAOFMINIMALFLOODHAZARD 17.5 Water Surface Elevation 405:38 FEE **Coastal Transect** www. 513 www. Base Flood Elevation Line (BFE) TownofYorktown Limit of Study Jurisdiction Boundary 360937 Zone **Coastal Transect Baseline** OTHER **Profile Baseline** FEATURES Hydrographic Feature **Digital Data Available** No Digital Data Available 383 MAP PANELS Unmapped G OODW, The pin displayed on the map is an approximate Z(m : A/ point selected by the user and does not represent 388.5 FEE an authoritative property location. This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards The flood hazard information is derived directly from the 36119C0043F authoritative NFHL web services provided by FEMA. This map was exported on 3/2/2022 at 12:01 PM and does not eff. 9/28/2007 reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for 73°46'37"W 41°16'42"N Feet 1:6.000 unmapped and unmodernized areas cannot be used for regulatory purposes. 250 500 1,000 1.500 2.000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Environmental Resource Mapper



The coordinates of the point you clicked on are:

UTM 18	Easting:	601982.0305282215	Northing:	4570739.099858327
Longitude/Latitude	Longitude:	-73.78220854887296	Latitude:	41.28166153189906

The approximate address of the point you clicked on is: 2145 Saw Mill River Rd, Yorktown Heights, New York, 10598

County: Westchester Town: Yorktown USGS Quad: MOHEGAN LAKE

If your project or action is within or near an area with a rare animal, a permit may be required if the species is listed as endangered or threatened and the department determines the action may be harmful to the species or its habitat.

If your project or action is within or near an area with rare plants and/or significant natural communities, the environmental impacts may need to be addressed.

The presence of a unique geological feature or landform near a project, unto itself, does not trigger a requirement for a NYS DEC permit. Readers are advised, however, that there is the chance that a unique feature may also show in another data layer (ie. a wetland) and thus be subject to permit jurisdiction.

Please refer to the "Need a Permit?" tab for permit information or other authorizations regarding these natural resources.

Disclaimer: If you are considering a project or action in, or near, a wetland or a stream, a NYS DEC permit may be required. The Environmental Resources Mapper does not show all natural resources which are regulated by NYS DEC, and for which permits from NYS DEC are required. For example, Regulated Tidal Wetlands, and Wild, Scenic, and Recreational Rivers, are currently not included on the maps.



U.S. Fish and Wildlife Service National Wetlands Inventory

Hallocks Mill



March 2, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Forested/Shrub Wetland
 - Freshwater Pond

Freshwater Emergent Wetland

Lake Other Riverine This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.



USDA Natural Resources

Conservation Service

MAP L	EGEND	MAP INFORMATION				
Area of Interest (AOI) Area of Interest (AOI)	Spoil Area	The soil surveys that comprise your AOI were mapped at 1:12,000.				
Soils Soil Map Unit Polygons	Very Stony Spot	Please rely on the bar scale on each map sheet for map measurements.				
Soil Map Unit Lines	☆ Wet Spot△ Other	Source of Map: Natural Resources Conservation Service Web Soil Survey URL:				
Special Point Features	Special Line Features Water Features	Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts				
Borrow Pit	Streams and Canals	distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required				
Clay Spot	↔ Rails ✓ Interstate Highways	This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.				
Gravel Pit Gravelly Spot	US Routes	Soil Survey Area: Westchester County, New York Survey Area Data: Version 17, Sep 1, 2021				
🚳 Landfill 🗎 Lava Flow	Local Roads	Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.				
Marsh or swamp	Aerial Photography	Date(s) aerial images were photographed: Oct 8, 2020—Oct 14, 2020				
Miscellaneous Water		The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor				
Perennial WaterRock Outcrop		shifting of map unit boundaries may be evident.				
Saline Spot						
 Severely Eroded Spot 						
SinkholeSlide or Slip						
Sodic Spot						



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ff	Fluvaquents-Udifluvents complex, frequently flooded	17.2	4.2%
LcA	Leicester loam, 0 to 3 percent slopes, stony	4.5	1.1%
PnB	Paxton fine sandy loam, 3 to 8 percent slopes	135.5	32.9%
PnC	Paxton fine sandy loam, 8 to 15 percent slopes	75.8	18.4%
PnD	Paxton fine sandy loam, 15 to 25 percent slopes	82.0	19.9%
Pw	Pompton silt loam, loamy substratum	14.7	3.6%
RdA	Ridgebury complex, 0 to 3 percent slopes	0.0	0.0%
Sh	Sun loam	11.1	2.7%
Uf	Urban land	2.1	0.5%
UpB	Urban land-Paxton complex, 3 to 8 percent slopes	0.1	0.0%
W	Water	3.4	0.8%
WdA	Woodbridge loam, 0 to 3 percent slopes	31.8	7.7%
WdB	Woodbridge loam, 3 to 8 percent slopes	33.9	8.2%
Totals for Area of Interest		412.0	100.0%
Appendix B

Pipe Retrofit Plan View Pipe Retrofit 3D View Contributing Drainage Area Mapping Project Area Mapping Phosphorus Loading Calculation

Hallocks Mill, Yorktown, Y-MU-40 - Bioinfiltration





PROPOSED SITE CONDITIONS



Hallocks Mill, Yorktown, Y-MU-40 - Bioinfiltration



PROPOSED SITE CONDITIONS



Hallcocks Mill, Yorktown, Y-MU-40 - Tiered Bioinfiltration



Spatial Reference Name: GCS North American 1983



NOTES:

Provide treatment of the nearby neighborhood via implementation of a tiered FocalPoint unit.

Drainage Area = 60.8 acres Phosphorus Loading = 29.67 kg/yr Phosphorus Removal = 29.67 kg/yr



Ν

Hallcocks Mill, Yorktown, Y-MU-40 - Tiered Bioinfiltration



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402

Spatial Reference Name: GCS North American 1983



NOTES:

Provide treatment of the nearby neighborhood via implementation of a tiered FocalPoint unit.

Drainage Area = 60.8 acres Phosphorus Loading = 29.67 kg/yr Phosphorus Removal = 29.67 kg/yr



400-

Date Printed: 3/3/2022

Ν

Y-MU-40

Inputs

DA (acres)	60.8		Retrofit:	Wet ED Pond		
Impervious (acres and %)	15.21	25.02	Removal Efficiency:		0.55	
P (in)	1.3		P Load>		<mark>65.41</mark> lt	₀/yr
Total Annual Rainfall (in)	48				<mark>29.67</mark> k	g/yr
Рј	0.9		P Removal>		<mark>35.97</mark> lt	₀/yr
Existing Channel Area (sf)					16.32 k;	g/yr
Channel length (ft)						
Land Use	% of Total Area					
Residential	0.62		Weighted EMC	_		
Commercial			0.40			
Industrial						
Actively Grazed Pasture						
Forest	0.13					
Impervious	0.25			PERCENTAGE CHECK		
Develped Open Space*					1.00	
*i.e. golf course, parks, ce	meteries, single h	ouses with la	arge lawns		0.40	

Outputs

Water Quality Volume:	WQv (acre-ft)	WQv (cu-ft)	Actual Rv**	Rv
	1.812	78944	0.2751	0.2751

**Minimum Rv = 0.2

L (lbs) = P x Pj x Rv x C x A x 0.227



2 Route 164 Patterson, NY 12563 Tel: 845-319-6349 Fax: 845-319-6391

APPENDIX II

Professional Service Agreement with Insurance Requirements

AGREEMENT FOR PROFESSIONAL SERVICES (Engineering Services) Contract No.: _____

THIS AGREEMENT FOR PROFESSIONAL SERVICES ("Agreement"), is made as of the ____ day of ______, 2019 by and between the **East of Hudson Watershed Corporation**, a not-for-profit local development corporation with its offices at 2 Route 164, Suite 2, Patterson, New York (the "EOHWC"), and ______, an ______, an ______, with its offices at the address specified on the execution page of this Agreement (hereinafter referred to as the "Engineer");

WITNESSETH:

WHEREAS, pursuant to a request for proposals dated ______, 201__ (the "RFP") and as authorized by the Executive Committee of the Board of Directors (the "Executive Committee") on ______, 201___, the EOHWC has determined to enter into this Agreement providing for services of the Engineer for the purposes set forth herein;

NOW THEREFORE, in consideration of the mutual agreements herein contained and other good and valuable consideration, receipt of which is hereby acknowledged, the parties hereto agree as follows:

Section 1. <u>SCOPE OF SERVICES</u>

a. The Engineer shall render the professional services ("Services") described in the RFP and at **Exhibit B** (hereinafter referred to collectively as the "Scope of Services").

b. During the term of this Agreement, the Engineer shall perform such additional services as Engineer as may be requested in writing by the EOHWC, at the hourly rates and actual expenses specified in **Exhibit A** (such additional Services being referred to herein as "Additional Services"). Prior to undertaking any such Additional Services the Engineer shall propose a budget and schedule for in a written change order to be approved by the Executive Committee prior to commencing work. No work shall be considered Additional Services unless specifically agreed to in a written change order signed by the Engineer and approved by the Executive the Engineer and approved by the Executive Services are specifically agreed to in a written change order signed by the Engineer and approved by the Executive Committee.

Section 2. ENGINEER QUALIFICATIONS; REPRESENTATIONS; NO CONFLICTS

a. The Engineer represents and covenants that (i) it is an engineering firm meeting the qualifications set forth in the RFP; (ii) it is experienced in performing work of the types contemplated by the Scope of Services; (iii) at all times during the term of this Agreement the persons assigned to perform Services have and will have the experience, knowledge, and licenses necessary to perform the Services described herein; (iv) the Engineer is fully qualified to perform the Scope of Services, with capability to perform the Scope of Services and timely deliver a work product as required by this Agreement, (v) the Engineer will procure and maintain all licenses and permits necessary to perform the work described in this Agreement, and (vi) the Engineer will comply with the provisions of the Labor Law and all State laws and Federal and local statutes, ordinances and regulations that are applicable to the performance of this Agreement.

b. Unless otherwise authorized in writing in advance by the EOHWC, the persons primarily responsible for performing work under this Agreement, including any subcontractors, shall be as set forth at **Exhibit A**. Any subcontractors shall be bound by the provisions of this Agreement and shall be subject to prior review and approval by the EOHWC as provided in Section 15 hereof.

c. The Engineer represents and warrants that (i) the Engineer has all requisite power and authority to execute, deliver and perform this Agreement; (ii) this Agreement has been duly authorized by all necessary action on the part of the Engineer and has been duly executed and delivered by the Engineer and, assuming due execution and delivery by the EOHWC, constitutes a legal, valid, binding and enforceable obligation of the Engineer; and (iii) the execution and delivery of this Agreement, and compliance with the provisions hereof, do not and will not conflict with or constitute a violation of or default under the organization documents, or any statute, indenture, mortgage, deed of trust or other agreement or instrument to which the Engineer is bound, or to the knowledge of the Engineer, any order, rule or regulation of any court or governmental agency or body having jurisdiction over the Engineer or any of its activities or properties.

d. The Engineer represents and warrants that it has not entered into any agreement for services with any other party with respect to any activities within or relating to the Scope of Services under this Agreement, other than such subcontracts as are specifically set forth at **Exhibit A**. The Engineer shall accept no other compensation, directly or indirectly, from any party, other than the EOHWC, for any services connected with the work described in the Scope of Services. The Engineer represents that it has read the Code of Ethics of EOHWC and will comply with its provisions.

e. The Engineer represents and warrants that it has not employed or retained any company or person, other than a bona fide employee working for the Engineer, to solicit or secure this Agreement, and that it has not paid or agreed to pay any company or person, other than a bona fide employee, any fee, commission, percentage, brokerage fee, gift or any other consideration, contingent on or resulting from the award or making of this Agreement. The Engineer further represents and warrants that neither it nor any of its directors, officers, members, partners, associates or employees, has any interest, nor shall they acquire any interest, directly or indirectly, which would or may conflict in any manner or degree with the performance or rendering of the services. In the event of breach of this provision the EOHWC shall have the option to annul this Agreement without liability or deduct from the Agreement consideration, or otherwise recover, the full amount of any such fee, commission, percentage, brokerage fee, gift or other consideration. Such remedies shall be in addition to and not in limitation of any other remedies available at law or in equity.

Section 3. <u>**TERM AND COMPLETION SCHEDULE**</u> The Scope of Services shall commence upon the delivery by the EOHWC to Engineer of a notice to commence work under this Agreement (the "Commencement Date") and shall be completed within the term set forth at **Exhibit C** except as extended by the EOHWC in writing. Any extension granted shall be for work and payment purposes only and shall not result in any additional fees or expenses other than those agreed to herein. The Engineer acknowledges the importance to EOHWC that the work be completed in accordance with the project schedule and agrees to put forth every reasonable effort in performing the Scope of Services with due diligence in a manner consistent with that schedule. **Section 4**. **<u>REPORTS; RIGHT TO INSPECT</u>** The Engineer shall report to the EOHWC as specified at **Exhibit A** and **Exhibit B**. The EOHWC staff and its duly authorized representatives shall have the right at all times to inspect and receive copies of the work of the Engineer without additional charge. At the request of EOHWC, plans, reports and other documentation shall be submitted in electronic format on a disc.

Section 5. **<u>DELIVERABLES</u>** The EOHWC staff will provide deliverables, if any, as specified in **Exhibit A**. In the event that such deliverables are not provided by the date set forth at **Exhibit B**, the Engineer may request an extension on the term of this Agreement.

Section 6. <u>FEES AND EXPENSES</u>

a. As compensation for the Services performed pursuant to this Agreement, including all expenses, the EOHWC shall pay the Engineer its fees and expenses as set forth at **Exhibit A**, not to exceed the maximum amount set forth at **Exhibit A** ("Fees and Expenses").

b. The expenses provided for herein shall be limited to the expenses actually and reasonably incurred in connection with the performance of the Scope of Services, of the types listed at **Exhibit A.** Unless otherwise approved in advance by the EOHWC, the EOHWC shall not pay for the following: (1) secretarial or word processing time (normal, temporary or overtime); (2) taxis or private cars, (3) meal charges, except for actual and reasonable expenses which are required for business purposes, such as expenses incurred while hosting working group meetings; or (4) time spent in preparing bills.

Any reimbursement for travel, meals and lodging shall be made at the actual cost paid, but such reimbursement shall not exceed the prevailing maximum rates established by the New York State Comptroller or, if less, the rates generally established by the EOHWC's policy for its own officials and staff. Any out-of-state travel must be approved in advance by the EOHWC. Disbursements and expenses shall be itemized by category. Unless otherwise agreed, expenses shall be billed at the same time as the services to which they relate.

All invoices shall include details showing name or class of worker, dates, task and work completed. Upon request, the Engineer shall provide the EOHWC with detailed documentation substantiating all reimbursable expenses and disbursements. This documentation shall be maintained by the Engineer(s) for a period of six years after the completion of the matter. During that period, the EOHWC shall have the right to audit the Engineer's charges.

Section 7. <u>ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST</u> If requested by EOHWC in accordance with **Exhibit A** and **Exhibit B**, the Engineer shall prepare an engineer's opinion of probable construction cost (the "EOPCC") for various project requirements. In requesting an EOPCC, EOHWC understands that the Engineer has no control over the actual cost or availability of labor, equipment or materials, or over market conditions or a contractor's method of pricing, and that the EOPCC is made based on the engineer's professional judgment, experience and knowledge of the work to be constructed.

Section 8. PAYMENT

a. Work within the Scope of Services shall be billed within thirty (30) days of services performed in accordance with the fees and expenses attached hereto at **Exhibit A** unless

otherwise agreed in writing by the EOHWC. Upon request, the Engineer shall provide statements with respect to accrued fees and disbursements for any matters subject to a periodic retainer or cap.

b. For any Additional Services agreed by the EOHWC and the Engineer to be outside the Scope of Services, the EOHWC shall pay for services rendered in accordance with the schedule of hourly rates attached hereto at **Exhibit A**. Prior to undertaking any such Additional Services, the Engineer shall inform the EOHWC that such Services will be billed as Additional Services, shall provide an estimate of the total fees and expenses to be charged for such additional Services, and shall obtain the EOHWC's written authorization of a change order prior to commencing such work. For such other services, the Engineer shall submit invoices not more often than once a month.

c. All statements shall provide (a) the name and position of each individual whose time is billed; (b) the billing rate for each individual; (c) the number of hours expended on behalf of the EOHWC on any day that the individual performed services for the EOHWC; (d) a brief description of the task(s) performed each day for which time is billed; and (e) the total number of hours billed for services rendered to the EOHWC by each individual during the billing period. Copies of detailed documentation substantiating all reimbursable expenses over \$25 shall be provided to the EOHWC. Reimbursable expenses shall be itemized by category. Unless otherwise agreed, any authorized expenses shall be billed at the same time as the services to which they relate. Invoices shall be submitted to the EOHWC at the address set forth above, to the attention of the Controller. The Engineer shall maintain separate billing records with respect to each matter undertaken by the Engineer. At the EOHWC's request, the Engineer shall submit invoices on forms provided by the EOHWC.

d. A five percent retainage will be withheld by EOHWC from each invoice paid. The retainage will be released to the Engineer upon final acceptance of the work by EOHWC with payment of the final invoice. The acceptance by the Engineer of final payment under this Agreement shall operate as and be a release to the EOHWC from all claims and liability to the Engineer, its representatives and assigns for any and all things done, furnished for or relating to the services rendered by the Engineer under or in connection with this Agreement or for any part thereof.

Section 9. <u>**OWNERSHIP OF DOCUMENTS**</u> All documents, reports, opinions, plans, source code, system documentation, and other materials prepared for or relating to the Services provided hereunder shall be at all times the sole and exclusive property of the EOHWC, and shall be treated as confidential by the Engineer except as expressly authorized by the EOHWC. All work product created in connection with this Agreement, including working papers, data, maps, drafts, and other information in whatever form shall at all times be and remain the property of the EOHWC.

Section 10. INDEPENDENT STATUS; TAXES

a. The Engineer and its employees, agents, contractors, subcontractors and/or engineers, are independent contractors and not employees of the EOHWC. In accordance with their status as independent contractors, the Engineer covenants and agrees that neither the Engineer nor its employees or agents will hold themselves out as, nor claim to be, officers or employees of the EOHWC.

b. Nothing in this agreement shall impose any liability or duty on the EOHWC for the acts, omissions, liabilities or obligations of the Engineer, or any person, firm, company, agency, association, expert, engineer, independent contractor, specialist, trainee, employee, servant, or agent of the Engineer for the payment of taxes of any nature including but not limited to sales tax, unemployment insurance, worker's compensation, disability benefits and social security, or, except as specifically stated in this Agreement, to any person, firm or corporation.

c. To determine whether the Engineer must receive a form 1099 at year end and as a condition precedent to any payment by EOHWC hereunder, the Engineer shall submit to EOHWC a Form W-9 with the Engineer's correct taxpayer identification number.

Section 11. INSURANCE

a. The Engineer shall at all times maintain in force during the term of this Agreement, and shall provide evidence satisfactory to EOHWC, of the policies of insurance set forth in **Exhibit D**.

b. Any policy required to be maintained under this section shall be from a company rated at least A/X by Best's Rating Service and properly licensed in the State of New York, and shall provide that the policy shall not be canceled, materially changed, or not renewed without thirty (30) days' prior notice thereof to the EOHWC.

c. Prior to the effective date of this Agreement, and as a condition precedent to this Agreement, the Engineer shall furnish the EOHWC with certificates of insurance listing the EOHWC as a certificate holder and, except for worker's compensation, additional insured, and upon demand, shall provide such policies to the EOHWC. At least thirty (30) days prior to expiration of any policy required by this Agreement, the Engineer shall furnish the EOHWC evidence satisfactory to the EOHWC of the continuation of such coverage in accordance with this Agreement.

d. To the extent required pursuant to an applicable Installation Agreement, the Host Municipality shall be listed as certificate holder and, on policies other than worker's compensation, additional insured. The Engineer shall further comply with the requirements of **Exhibit E** required by the Funding Agreement with New York City.

e. This contract shall be void and of no force and effect unless the Engineer shall provide and maintain coverage during the life of this contract for the benefit of such employees as are required to be covered by the provisions of the Workers' Compensation Law.

Section 12. **INDEMNIFICATION** The Engineer shall defend and indemnify the EOHWC, the Host Municipality (to the extent required pursuant to the applicable Installation Agreement defined herein), The City of New York (to the extent required pursuant to the Funding Agreement defined herein) and their respective directors, officers, employees and agents (the "Indemnified Parties"), and save the Indemnified Parties harmless from any liability, damage, claims, demands, costs or loss arising directly and indirectly out of the Engineer's or its officers', employees', agents', contractors', subcontractors' or engineers' respective negligent acts or omissions pursuant to this Agreement, including without limitation negligent performance of Services under this Agreement, and such indemnity may not be limited by reason or enumeration of any insurance coverage required. Negligent performance of services, within the meaning of this section, shall include, in addition to

negligence founded upon tort, negligence based upon Engineer's failure to meet professional standards and resulting in obvious or patent errors in the progression of its work.

Section 13. <u>RIGHT TO AUDIT AND RECORDS</u>

a. The Engineer shall maintain accurate and complete records detailing the back-up documentation required by this Agreement, and shall maintain such documents for a period of six years from document generation and shall allow the EOHWC access thereto for inspection and photocopying at all reasonable times.

b. All receipts and disbursements are subject to audit by the EOHWC, and the Engineer agrees to cooperate with any audit of this Agreement undertaken by the EOHWC or any entity with jurisdiction to audit the EOHWC.

Section 14. <u>SUBCONTRACTORS</u> The Engineer shall not employ subcontractors to perform the Scope of Services, without the express consent of the EOHWC. EOHWC reserves the right to approve all subcontractors in its discretion. The Engineer will notify the EOHWC of the name, address, scope of services, and schedule of a subcontractor it intends retaining, the portion of the work which it is to do and/or the material which it is to furnish, and any other information requested by EOHWC. EOHWC will use the requested information to verify that the subcontractor is reputable, reliable, and able to perform the work required in this Agreement. Subcontractors shall be subject to the terms and conditions of this Agreement. By use of a subcontractor, the Engineer shall not be released from any liability or obligation assigned from executing this Agreement. The Engineer shall be held wholly responsible for subcontractor's performance, and shall be responsible to remedy any deficiencies in the subcontractor's work or performance.

Section 15. <u>COMPLIANCE WITH LAW</u> The Engineer shall comply with all Federal, State and local laws, rules and regulations applicable to performing the Services herein.

Section 16. DEFAULTS AND REMEDIES

a. If either party defaults in the observance or performance of any material term of this Agreement, and such default continues for more than thirty (30) days after written notice of such default is received by the defaulting party from the non-defaulting party, such non-defaulting party may take any action available at law or in equity to enforce the terms of this Agreement, and may suspend work or terminate this Agreement upon thirty (30) days written notice to the defaulting party. If the default is not capable of being cured within thirty (30) days and the defaulting party has commenced cure within thirty (30) days and is diligently pursuing efforts to cure, such thirty (30) day period shall be extended for a reasonable period of time.

b. If either party is required to enforce the terms of this Agreement, the prevailing party will be entitled to recover its reasonable attorneys' fees and costs. No remedy herein conferred upon or reserved to the EOHWC is intended to be exclusive of any other available remedy or remedies, but each and every such remedy shall be cumulative and shall be in addition to every other remedy given under this Agreement or now or hereafter existing at law or in equity or by statute.

c. No delay or omission in exercising any remedy shall impair any such remedy or construed to be a waiver thereof. It shall not be necessary to give any notice other than as expressly

required under this Agreement. In the event any provision contained in this Agreement should be breached and thereafter duly waived by the party or parties so empowered to act, such waiver shall be limited to the particular breach so waived and shall not be deemed to be a waiver of any other breach hereunder. No waiver, amendment, release or modification of this Agreement shall be established by conduct, custom or course of dealing.

Section 17. <u>EARLY TERMINATION</u> EOHWC shall have the right to postpone, suspend, abandon or terminate this Agreement with or without cause, and such action shall in no event be deemed a breach of contract. Upon termination by EOHWC without cause under this section, the Engineer shall be entitled to compensation for acceptable completed Services performed through the date of postponement, suspension, abandonment or termination, such Services to be verified by audit. In the event that this Agreement is terminated by the EOHWC for any reason, then within ten days after such termination, the Engineer shall make available to the EOHWC all records, documents and data pertaining to the Services rendered under this Agreement.

Section 18. <u>STOP WORK</u> If construction phase services ("CPS"), including construction observation, are requested of Engineer by EOHWC, the Engineer has no authority to stop work during construction, unless otherwise authorized in writing by EOHWC, provided that the Engineer may issue a stop work order to the contractor on behalf of EOHWC if 1) the Engineer observes a condition that compromises worker safety and/or 2) the Engineer observes a condition that presents immediate risk to immediately-adjacent structures or infrastructures. If the Engineer is authorized and issues a stop work order in accordance with this Agreement, the Engineer shall immediately notify the EOHWC Director of Engineering by telephone, and the Engineer shall fully document the condition causing the stop work order to be issued and provide documentation to EOHWC within 24 hours of the stop work order and the reason therefor. Such documentation shall include, but not be limited to field notes, sketches and photographs, and shall include names of individuals involved, company names, time, and date.

Section 19. <u>NO MECHANIC'S LIEN</u> The Engineer shall not permit or suffer any mechanic's lien filed by any subcontractor, employee, or material vendor of the Engineer to remain upon the premises of EOHWC or any EOHWC member municipality, provided such lien arises from the execution of work under this Agreement. Upon final payment due under this Agreement, the Engineer agrees, for himself and his subcontractors, that the Engineer will issue to EOHWC such certificate or certificates to the effect that no mechanic's lien or claims of the Engineer or its subcontractors have arisen or are outstanding with respect to this Agreement and that there is, to the best of the Engineer's knowledge, no basis for any future liens to be filed, but that if any such liens or claims are filed, the Engineer shall defend and hold EOHWC harmless against such liens.

Section 20. Procurement and Sourcing Soluions Portal ("PASSPort")

a. The Engineer hereby certifies that it and all subcontractors retained or to be retained by it under this Agreement have enrolled in the New York City PASSPort system and have completed the applicable vendor and principal questionnaires as required therein.

b. If during the term of this Agreement, the Engineer's completed PASSPort questionnaires are more than 2½ years old, the Engineer shall update the questionnaires online prior to the expiration of three years from the initial questionnaire completion or last update. If there have been no changes in information requiring an update, the Engineer shall, if required, certify no change online prior to the expiration of three years from the initial questionnaire completion or last update.

c. The Engineer shall promptly submit to EOHWC upon request documentation of compliance with New York City's PASSPort system, including documentation of the submission of completed questionnaires and updates within the last 2¹/₂ years.

Section 21. <u>NOTICES</u> Unless otherwise specified, all notices required or permitted for herein shall be in writing and sent by certified mail, postage prepaid, or by hand, by overnight courier, or by telecopy confirmed by any of the previous methods, addressed to the parties as indicated below or to such addresses as they may designate in writing from time to time:

To the Engineer: At the address specified on the execution page of this Agreement.

To the EOHWC: At the address specified at the beginning of this Agreement, Attention: Director of Engineering

With a copy to:

Rodenhausen Chale LLP 20 Spring Brook Park Rhinebeck, NY 12572

Section 22. <u>FUNDING AGREEMENT</u> To the extent all or a portion of this Agreement is to be funded from moneys received by EOHWC directly or indirectly pursuant to a Funding Agreement with NYC Department of Environmental Protection ("Funding Agreement"), this agreement shall be subject to the supplemental provisions set forth at **Exhibit E.**

Section 23. MISCELLANEOUS

- a. <u>SEVERABILITY</u> In case any one or more of the provisions of this Agreement shall for any reason be held to be illegal or invalid, such illegality or invalidity shall not affect any other provision of this Agreement, but this Agreement shall be construed and enforced as if such illegal or invalid provision had not been contained therein.
- b. <u>AGREEMENT IS A LEGALLY BINDING CONTRACT</u> Each party hereto represents and warrants that this Agreement has been duly authorized and executed by it and constitutes its valid and binding agreement, and that any governmental approvals necessary for the performance of this Agreement have been obtained.
- c. <u>NON-ASSIGNMENT CLAUSE</u> This contract may not be assigned, and no part or portion may be subcontracted, by the Engineer nor may its right, title or interest therein be assigned, transferred, conveyed, sublet or otherwise disposed of without the previous consent, in writing, of the Municipality and any attempts to assign the contract without the Municipality's written consent are null and void.
- d. <u>NO THIRD PARTY BENEFICIARY</u> Nothing in this agreement shall act to confer third party beneficiary rights on any person or entity not a party to this Agreement, except as expressly provided in Section 12 as to Indemnity and 13 as to Insurance.
- e. <u>NO ARBITRATION</u> Disputes involving this contract, including the breach or alleged breach thereof, may not be submitted to binding arbitration (except where statutorily authorized) but must, instead, be heard in a court of competent jurisdiction of the State of New York.
- f. <u>SERVICE OF PROCESS</u> In addition to the methods of service allowed by the State Civil Practice Law & Rules, Engineer hereby consents to service of process upon it by registered or certified mail, return receipt requested. Service hereunder shall be complete upon

Engineer's actual receipt of process or upon the Municipality's receipt of the return thereof by the United States Postal Service as refused or undeliverable. Engineer must promptly notify the Municipality, in writing, of each and every change of address to which service of process can be made. Service by the Municipality to the last known address shall be sufficient.

- g. <u>NO RECOURSE</u> All covenants, stipulations, promises, agreements and obligations of the EOHWC contained in this Agreement shall be deemed to be the covenants, stipulations, promises, agreements and obligations of the EOHWC, and not of any member, director, officer, employee or agent of the EOHWC in his individual capacity, and no recourse shall be had for the payment of any claim based under this Agreement against any member, director, officer, employee or agent of the EOHWC.
- h. <u>COUNTERPARTS</u> This Agreement may be executed in one or more counterparts, each of which shall be deemed an original.
- i. <u>NONDISCRIMINATION</u> During the term of this Agreement, the Engineer agrees as follows:
 - i) In accordance with Article 15 of the Executive Law (also known as the Human Rights Law) and all other State and Federal statutory and constitutional nondiscrimination provisions, the Engineer will not discriminate against any employee or applicant for employment because of race, creed, color sex, national origin, age, disability or marital status.
 - ii) In accordance with Section 220-e of the Labor Law, if this is a contract for the construction, alteration or repair of any public buildings or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this Agreement shall be performed within the State of New York, the Engineer agrees that neither it nor its subcontractors shall, by reason of race, creed, color, national origin, sex or disability: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this Agreement. The Engineer is subject to possible termination of this Agreement and forfeiture of all moneys due hereunder for a violation of this clause.
- j. <u>PUBLIC WORKS CONTRACTS</u> A portion of the funds for the work is or may be provided pursuant to the Funding Agreement or other public entity sources. Even if a project is located on private property, for purposes of this section such property may be treated as if it were public property.
 - i) If all or any portion of the Scope of Services constitutes a public work contract covered by Article 8 of the Labor Law or a building service contract covered by Article 9 thereof, neither Engineer's employees nor the employees of its subcontractors may be required or permitted to work more than the number of hours or days stated in said statutes, except as otherwise provided in the Labor Law and as set forth in prevailing wage and supplement schedules issued by the New York State Labor Department. Furthermore, Engineer and its subcontractors must pay at least the prevailing wage rate and pay or provide the prevailing supplements, including the premium rates for overtime pay, as determined by the New York State Labor Department in accordance with the Labor Law. Additionally, if this is a public work contract covered by Article 8 of the Labor Law, the Engineer understands and agrees that the filing of payrolls in a manner consistent with subdivision 3-a of this Section 220 of the Labor Law shall be a condition precedent to payment by the EOHWC of any sums due and owing to any person for work done upon the project.
 - ii) OSHA 10 HOUR CONSTRUCTION SAFETY AND HEALTH COURSE. If all or a portion of the Scope of Services constitutes a public work contract covered by Article

8 of the New York State Labor Law, it shall be required that on all public work projects of at least \$250,000.00, all laborers, workers and mechanics working on the site be certified as having successfully completed A MINIMUM OF 10 HOURS OF CONSTRUCTION AND HEALTH SAFETY TRAINING, as approved by the United States Department of Labor's Occupational Safety and Health Administration (OSHA). The Engineer, subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall provide proof of certification for successfully completing the course for each employee prior to performing any work on the project.

- k. <u>NON-COLLUSIVE BIDDING REQUIREMENT</u> In accordance with General Municipal Law § 103-d, if this contract was awarded based upon the submission of bids or proposals, Engineer warrants, under penalty of perjury, that its bid was arrived at independently and without collusion aimed at restricting competition. Engineer further warrants that, at the time Engineer submitted its bid, an authorized and responsible person executed and delivered to the Municipality a non-collusive bidding certification on Engineer's behalf.
- <u>INTERNATIONAL BOYCOTT PROHIBITION</u> In accordance with Section 220-f of the Labor Law, if this contract exceeds \$5,000, the Engineer agrees, as a material condition of this Agreement, that neither the Engineer nor any substantially owned or affiliated person, firm, partnership, or corporation has participated, is participating, or shall participate in an international boycott in violation of the Federal Export Administration Act of 1979 (50 USC App. Sections 2401 et seq.) or regulations thereunder. If such Engineer, or any of the aforesaid affiliates of Engineer, is convicted or is otherwise found to have violated said laws or regulations upon the final determination of the United States Commerce Department or any other appropriate agency of the United States subsequent to the contract's execution, such contract amendment or modification thereto shall be rendered forfeit and void. The Engineer shall so notify the EOHWC within five (5) business days of such conviction, determination or disposition of appeal.
- m. <u>NO INVESTMENT ACTIVITIES IN IRAN</u> A person that is identified on a list created pursuant to paragraph (b) of subdivision three of section 165-a of the State Finance Law as a person engaging in investment activities in Iran as described in such section, shall not be deemed a responsible party for purposes of any RFP. By signing this Agreement, the Engineer and each person signing on behalf of the Engineer certifies, under penalty of perjury, that to the best of its knowledge and belief such Engineer is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State Finance Law.
- n. <u>SET-OFF RIGHTS</u> The EOHWC shall have rights of set-off. These rights shall include, but not be limited to, the EOHWC's option to withhold for the purposes of set-off any moneys due to the Engineer under this contract up to any amounts due and owing by the Engineer to the EOHWC with regard to this Agreement, or any other contract with the Municipality, including any contract for a term commencing prior to the term of this Agreement. This also includes amounts due and owing the EOHWC for any other reason including, without limitation, monetary penalties, adjustments, fees, or claims for damages by the EOHWC and third parties in connection therewith.
- o. <u>SERVICE OF PROCESS</u>. In addition to the methods of service allowed by the State Civil Practice Law & Rules, Engineer hereby consents to service of process upon it by registered or certified mail, return receipt requested. Service hereunder shall be complete upon Engineer's actual receipt of process or upon the Municipality's receipt of the return thereof by the United States Postal Service as refused or undeliverable. Engineer must promptly notify the Municipality, in writing, of each and every change of address to which service of process can be made. Service by the Municipality to the last known address shall be sufficient.

p. ENTIRE AGREEMENT; GOVERNING LAW AND JURISDICTION; AMENDMENT This Agreement contains the entire understanding between the parties with respect to the subject matter herein and supersedes any prior agreements or understandings, either oral or written. This Agreement shall be governed by, and construed in accordance with, the laws of the State of New York. The parties agree that any dispute or controversy arising out of this Agreement shall be venued in the jurisdiction of the EOHWC's headquarters. This Agreement may be amended only upon mutual written agreement signed by both parties.

[Remainder of page intentionally left blank]

IN WITNESS WHEREOF, the EOHWC has caused this Agreement to be signed by its duly authorized officer, and the Engineer has caused this Agreement to be signed by its duly authorized officer, as of the day and year first above written.

By:	Peter Parsons	
Its:	President	
		. as ENGINI
		,
Bv		
By: _ Print	Name:	
By: _ Print Title:	Name:	
By: _ Print Title:	Name:	

This Agreement consists of the Agreement together with the following Exhibits:

EXHIBIT A FEES AND EXPENSES
EXHIBIT B SCOPE OF SERVICES
EXHIBIT C TERM AND COMPLETION DEADLINES
EXHIBIT D INSURANCE REQUIREMENTS
EXHIBIT E SUPPLEMENTAL PROVISIONS REQUIRED BY FUNDING AGREEMENT

EXHIBIT A

FEES AND EXPENSES PURPOSE: Engineering Services; CONTRACT NO.:

Scope of Services

<u>I. (See attached "Form B" as provided within the RFP response)</u>

All such lump sum fees shall <u>include</u> all expenses in connection with the Services, including without limitation site transportation, analysis, results, data validation reports, expenses (telephone, meals, travel, computer time, fax costs, postage, Federal Express or other delivery service, overhead, profit, reproducing), and administrative costs.

II. <u>Additional Services</u>: All Additional Services require the advance written approval of the EOHWC Executive Committee by change order. Services performed without such authorization are at the Engineer's risk and under no circumstances shall the EOHWC be obligated for payment.

Project Manager and Key Professional Staff: EOHWC reserves the right to terminate this Agreement should certain personnel specifically named in the Engineer's proposal cease to be employed by the Engineer and assigned to the Projects, unless the EOHWC has determined in its discretion that alternate Project personnel are acceptable. Project Manager: ______ Key Professional Staff: ______ Subcontractor(s), If Any, to Perform Services: ______

*See attached

EXHIBIT B

SCOPE OF SERVICES

The Consultant will provide the following services for the Project or Projects indicated below based on the criteria described in the EOHWC Stormwater Retrofit Project Design Manual, most recent edition:

SRP Design SRP Construction Administration Additional Services to the extent authorized as provided herein.

Project(s):

The list of Projects included within the Scope of Services may be amended from time to time by addenda approved by the Executive Committee and executed by the President or Vice President on behalf of the EOHWC and by the Consultant by their duly authorized officer.

For purposes of this Agreement the owner of a project may be a Town, Village or County ("Host Municipality"), a school district ("School District"), or a private entity ("Private Owner"), as preliminarily identified in the Year 6 through 10 Stormwater Retrofit Report. EOHWC has or expects to enter into an installation agreement and/or easement and/or access agreement providing for access to and conditions to construction of the SRP. The Scope of Services includes the preparation of exhibits to such agreements.

EXHIBIT C

TERM AND COMPLETION DEADLINES PURPOSE: Engineering Services; CONTRACT NO.:

Commencement Date: TBD

Completion Date: TBD

Completion Deadlines for Deliverables: TBD

The Services shall be performed in two phases, of which the first phase shall be the initial project evaluation as defined in the EOHWC "Stormwater Retrofit Project Design Manual," available for review at <u>www.EOHWC.org</u>. The initial project evaluation shall include the estimated Phosphorus reduction from the stormwater retrofit project, the cost of the project, including both engineering and construction services, and a calculation of the cost per kilogram of Phosphorus reduction. Upon completion of the initial project evaluation, the Engineer shall provide same to EOHWC and stop work.

The Engineer is not authorized to proceed with work beyond the initial project evaluation without the express written approval of the EOHWC President or, where permitted by the EOHWC Fiscal Policy, the Director of Engineering.

Engineer shall inspect the stormwater retrofit project within one (1) year of the completion of construction to determine if EOHWC may release the contractor's maintenance bond. The term of the contract may be extended at EOHWC's option solely to permit the completion of this inspection, as part of the lump sum fee unless otherwise specifically provided specified at Exhibit A.

EXHIBIT D

INSURANCE REQUIREMENTS

Worker's Compensation Statutory per New York State law without regard to jurisdiction

Employer's Liability Statutory

Commercial General Liability CG 00 01 (ed. 10/02) or equivalent Combined Single Limit - Bodily Injury and Property Damage \$2,000,000 per occurrence \$2,000,000 products/completed operations aggregate \$4,000,000 general aggregate \$25,000 maximum deductible

Automobile Liability: CA 00 01 (ed. 6/92) or equivalent. Combined Single Limit - Bodily Injury and Property Damage \$500,000 each occurrence The following coverage must be provided: Comprehensive Form, Owned, Hired, Non-Owned

Professional Errors and Omissions policy with a U.S. domiciled company, with extended reporting period or automatic coverage of not less than two years, providing limits of not less than:

\$1 Million per claim\$1 Million aggregateDeductible or self-insured retention not to exceed \$25,000 per claim.

Additional Insureds: East of Hudson Watershed Corporation; Town of (Name); and the City of New York and their respective directors, officers, employees and agents.

EXHIBIT E

SUPPLEMENTAL PROVISIONS REQUIRED BY FUNDING AGREEMENT

To the extent all or a portion of this Agreement or any subcontract thereof is to be funded from moneys received by EOHWC directly or indirectly pursuant to a Funding Agreement with NYC Department of Environmental Protection, this Agreement shall be subject to the following supplemental provisions.

- 1. Engineer shall perform all work in accordance with the terms of the Funding Agreement;
- 2. Engineer shall perform all acts to be performed under this Agreement in compliance with all applicable federal, State and local laws, rules, regulations and orders, including that all projects, facilities or other measures funded with Stormwater Retrofit Funds requiring review and approval by NYCDEP under the Watershed Regulations or required to be designed, constructed or implemented in accordance with standards set forth in the Watershed Regulations, be submitted for such review and approval and be designed, constructed, and implemented in accordance with the Watershed Regulations;
- 3. [Intentionally Omitted]
- 4. Engineers shall have liability insurance in sufficient amount and scope to protect the interests of New York City and the EOHWC, as provided in Exhibit D of the Agreement and the Funding Agreement located on the EOHWC.org website at: http://eohwc.org/wp-content/uploads/2013/05/NYCDEP-CRO-522-Funding-Agreement.
- 5. Engineer agrees to indemnify The City of New York and assume liability for injuries as provided in Section 12.
- 6. Engineer shall comply with a budget, a scope of work, a progress schedule for completion of the work within specified milestones and payment schedule which is dependent upon completion of the work within the specified period of performance;
- 7. Engineer represents and warrants that no payment, gift or thing of monetary value was made, given or promised to a the EOHWC officer, director, or employee to obtain the Contract or any other agreement with The City of New York or the EOHWC;
- 8. Nothing contained in this Agreement shall impair the rights of The City of New York under the Funding Agreement or the Watershed MOA;

- 9. EOHWC or The City of New York shall have the right from time to time to conduct random, unannounced inspections of the work performed under this Agreement to determine whether such work is being performed in accordance with the terms of the Agreement, except that, where work is being performed on private property, the EOHWC and The City of New York shall provide reasonable notice of such inspections or conduct them during normal business hours;
- 10. Nothing contained in this Agreement shall create any contractual relationship between the Engineer and The City of New York; and
- 11. Engineer shall not engage in any unlawful discrimination in hiring employees under this Agreement based upon race, creed, color, national origin, sex, age, disability, marital status or sexual orientation.
- 12. Engineers performing public work within the meaning of Section 220 of the New York State Labor Law shall pay not less than the prevailing wage to laborers, workmen and mechanics performing such public work and comply with all other applicable provisions of Section 220 of the Labor Law. Such Engineers shall maintain records evidencing their compliance with this Subsection.



2 Route 164 Patterson, NY 12563 Tel: 845-319-6349 Fax: 845-319-6391

APPENDIX III

Proposal Forms

FORM A

Business Information

This form must be submitted along with all other forms included in this RFP package. All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized.

1. **Entity Information**

b.

- Legal Name of entity: a.
- Permanent main office address: b.
- Federal Employer ID #: c.
- 2. Contact person regarding RFP:
 - Telephone number: a. Email:

Fax number:

3. Names of all officers and/or principals in the firm and their titles:

Name of Officer and/or Principals	Titles	Legal Residence State and City

If proposer is a closely held corporation or partnership, list stockholder's or partner's 4. information below:

Name	Legal Residence	Office Held

- 5. Entity organization
 - a. Date organized (month, day, year):
 - b. If a corporation, LLC, Partnership, or other organization, state of origin:
 - c. Number of years entity in business:
- 6. List names of any affiliated corporation of proposer, business affiliation with respondent and specify relationship:

Name of affiliated corporation	Business Affiliation	Specify Relationship

7. Identify all subcontractors proposed to be used to fulfill any part of the obligations anticipated by this proposal:

Name of subcontractor	Address	Type of work to be performed

8. Current licenses, permits and certifications are listed on Schedule A and <u>copies of same are attached.</u>

9. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by East of Hudson Watershed Corporation and/or his designee on behalf of East of Hudson Watershed Corporation in verification of the recitals comprising this Business Information Form.

		(Name of Entity)
		By:
		(Principal)
		(Title)
State of New York)	
County of) ss.	being duly sworn, deposes and says that he/she is
	of	and that the answers to
the foregoing question	as and all statemer	nts therein contained are true and correct.

Subscribed and sworn to before me this

_____day of ______, 2019

Notary Public

SCHEDULE A

Licenses, Permits & Certifications

[List Attached]

Project Manager NYS PE#:_____

FORM B

LUMP SUM FEE PROPOSAL

SOLICITATION NUMBER:	
PROJECT ID:	
PROJECT TITLE:	

ITEM#	TITLE	TOTAL PRICE (IN WORDS)	TOTAL PRICE (\$)
1	30% Engineering Design		
2	60% Engineering Design		
3	100% Engineering Design and Bid Documents		
4	Construction Administration and Record Documents		
TOTAL PRI	CE		

*Must be completed for each individual project within any given Solicitation

All such lump sum fees shall <u>include</u> all expenses in connection with the Services, including without limitation site transportation, analysis, results, data validation reports, expenses (telephone, meals, travel, computer time, fax costs, postage, Federal Express or other delivery service, overhead, profit, reproducing), and administrative costs.

FORM C

HOURLY FEE SCHEDULES, PROJECT MANAGER, KEY STAFF AND SUBCONTRACTORS

<u>Additional Services</u>: Any approved Additional Services are to be billed at the Hourly Rates specified below. All Additional Services require the advance written approval of the EOHWC Executive Committee by change order. Services performed without such authorization are at the Engineer's risk and under no circumstances shall the EOHWC be obligated for payment.

Hourly Fees and Expenses for Other Services:

Services identified in the Scope of Services as hourly matters are to be billed at the Hourly Rates and Expenses specified below. Prior to performing such services the Engineer shall provide an estimate of the hourly fees and expenses for the specific task for approval by the EOHWC. Services performed without such authorization are at the Engineer's risk and under no circumstances shall the EOHWC be obligated for payment.

Name and Hourly Rate of all Employees to Perform Services:

(See attached Exhibit A-1 "Estimated Direct Labor")

<u>Applicable Overhead and Profit Percentages</u>: (See attached Exhibit A-2 "Fee Summary") <u>Expense Items and Rate</u>: (See attached Exhibit A-3 "Estimated Expenses")

<u>Project Manager and Key Professional Staff</u>: EOHWC reserves the right to terminate this Agreement should certain personnel specifically named in the Engineer's proposal cease to be employed by the Engineer and assigned to the Projects, unless the EOHWC has determined in its discretion that alternate Project personnel are acceptable.

Project Manager: _

Key Professional Staff: ____

Subcontractor(s), If Any, to Perform Services:

(If applicable, attach equivalent of A-1, A-2 and A-3 for Subcontractor).

FORM D

CIVIL ENGINEERING SERVICES

EAST OF HUDSON WATERSHED CORPORATION

AFFIDAVIT REGARDING REQUIRED DISCLOSURE **OF RELATIONSHIPS TO THE EOHWC**

Name of Proposer:	
Address:	
Telephone:	Fax:
The Reporting Entity is: (Please check one)	x.
Individual Corporation	Partnership
A.) Related Employees:	
1. Are any of the employees that you w also an officer or employee of the EO EOHWC officer or employee? Yes	vill use to carry out this contract with the EOHWC OHWC, or the spouse, or the child or dependent of a s No
If yes, please provide details:	
B.) Related Owners:	
1. If you are the owner of the Company EOHWC? Yes	y, are you or your spouse, an officer or employee of the No

If yes, please provide details:

To answer the following question, the following definition of the word "interest" shall be used. Interest means a direct or indirect pecuniary or material benefit accruing to a EOHWC officer or employee, his or her spouse, child or dependent, whether as the result of a contract with the EOHWC or otherwise. For the purpose of responding to these questions, an EOHWC officer or employee shall be deemed to have an "interest" in the contract of:

- a. His/her spouse, children and dependents, except a contract of employment with the EOHWC;
- b. A firm, partnership or association of which such officer or employee is a member or employee;
- c. A corporation of which such officer or employee is an officer, director or employee; and
- d. A corporation of which more than five (5) percent of the outstanding capital stock is owned by any of the aforesaid parties.
- 2) Do any officers or employees of the EOHWC have an interest in the Contractor or in any subcontractor that will be used for this contract? Yes_____ No_____

If yes, please provide details:

I am the ______(title or Office) of the reporting entity listed above.

CIVIL ENGINEERING SERVICES FOR STORMWATER RETROFIT IMPLEMENTATION

REQUEST FOR PROPOSAL

I make this affirmation based upon my personal review of the books and records of the reporting entity. All of the foregoing information is true to the best of my knowledge, after inquiry. I make these statements under penalty of perjury.

Signature		Print Name and title	
STATE OF)		
COUNTY OF)		
S.S.	1.:.	day of	2017

FORM E

CIVIL ENGINEERING SERVICES

EAST OF HUDSON WATERSHED CORPORATION

GENERAL MUNICIPAL LAW: Section 1039d) "NON-COLLUSIVE BIDDING CERTIFICATE"

- 1. By submission of his bid, each bidder and each person signing on behalf of any bidder, certifies, and in the case of a joint bid, each party thereto, certifies as to its own organization under penalty of perjury that to the best of their knowledge and belief:
 - a. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder, with any competitor;
 - b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder, and will not knowingly be disclosed by the bidder prior to opening, directly, to any other bidder or to any competitor; and
 - c. No attempt has been made or will be made by the bidder to include any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

Name of Bidder

By

Address

Accepted

CIVIL ENGINEERING SERVICES FOR STORMWATER RETROFIT IMPLEMENTATION

REQUEST FOR PROPOSAL
FORM F

Statement of Insurance

PROPOSER ______HAS

[Name of]

THE FOLLOWING POLICIES OF INSURANCE IN FULL FORCE AND EFFECT:

[Attach certificates showing endorsements & dates of coverage. Copies of policies to be made available upon request]

CIVIL ENGINEERING SERVICES FOR STORMWATER RETROFIT IMPLEMENTATION

REQUEST FOR PROPOSAL

FORM G

Confidentiality Notice

The data on page(s)

of this proposal, identified by an asterisk (*) or marked along the margin with a vertical line, contain technical or financial information which are considered to be proprietary information or trade secrets, the disclosure of which would cause substantial injury to the Proposer's competitive positions. The Proposer requests that such data be used only for the evaluation of the proposal, but understands that such data may otherwise be disclosed to the extent that East of Hudson Watershed Corporation determines is necessary or proper for compliance with any law, order or decree of any court or agency of competent jurisdiction, or necessary or proper in East of Hudson Watershed Corporation's view to show compliance with any law, order or decree of any competent jurisdiction.

Note:

Proposer is urged to only designate as confidential those materials which, in its opinion, clearly represent proprietary information or trade secrets. Cost proposal information and all proposed forms shall not be considered confidential.

Proposer

Signature of Authorized Official

Date

CIVIL ENGINEERING SERVICES FOR STORMWATER RETROFIT IMPLEMENTATION

REQUEST FOR PROPOSAL

FORM H

CERTIFICATION REGARDING VENDEX AND VALUE OF ALL CONTRACTS WITH NEW YORK CITY

Name of Proposer/Bidder ("Contractor"):		
Address of Proposer/Bidder:		
Project Name:	("Contract")	
Date of this Certification:		

This is to certify to the East of Hudson Watershed Corporation that Contractor has completed the appropriate VENDEX questionnaire on-line via New York City's Procurement and Sourcing Solutions Portal ("PASSPort"), or such revised standard VENDEX questionnaire as New York City provides from time to time, and submitted the completed VENDEX questionnaire to New York City Department of Environmental Protection electronically.

Please check applicable box:

- □ This is to certify to the East of Hudson Watershed Corporation that the proposed Contract, when aggregated with the value of all other contracts funded with funds provided by the City of New York awarded to the same Contractor during the immediately preceding twelve-month period, is valued at less than \$250,000.
- □ This is to certify to the East of Hudson Watershed Corporation that the proposed Contract, when aggregated with the value of all other contracts funded with funds provided by the City of New York awarded to the same Contractor during the immediately preceding twelve-month period, is valued at \$250,000 or more.

All of the foregoing information is true and complete to the best of my knowledge, after inquiry. I make these statements on behalf of the Contractor under penalty of perjury.

Signature

Print Name and Title

Sworn to before me this day of , 20

Notary Public