NJCAT TECHNOLOGY VERIFICATION

FocalPoint HC Modular Biofiltration System

Convergent Water Technologies

November 2025

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1. Description of Technology

The FocalPoint High Capacity (HC) bio-filtration system (Focal Point HC) is a manufactured treatment device (MTD) that utilizes a high flow engineering bio-filtration soil media (400 in/hr). The system is a scalable bio-filtration system which combines the efficiency of high flow rate soil media with the durability and modularity of a high void space underdrain system. The FocalPoint HC is a complete, integrated system that is typically deployed in a soft-shell configuration near the edge of pavement and within a landscaped area, esplanade strip, traffic island or curb bump out area. Where there needs to be a vertical edge the system can be surrounded by an open top precast structure, planter box, etc.

FocalPoint HC provides the same level of treatment as traditional bio-retention systems and because of its high flow rate, allows significant reduction in footprint, therefore, offering a solution for highly urbanized developments where footprint at the surface is limited.
Stormwater enters the FocalPoint HC the same way water would enter a bio-retention or bio-swale practice, typically as sheet or pipe flow, and runs through a rock apron, tip down or other structure and is conveyed via gravity to a pretreatment chamber containing 2"-4" diameter rounded river stone. The inflow passes over a square notch separator plate and enters the filtration area, where it is conveyed via gravity through a top mulch layer (3"), engineered soil media (18"), bridging stone (6"), structural underdrain (9.45") and outlet pipe. The pretreatment area (also referred to as garden stone area) will be sized to a ratio of 1 SF for every 4 SF of filter bed area. The maximum driving head is set by an overflow drain, typically installed downstream of the filter area, and set no more than 6" above the mulch layer. Where feasible, the modular underdrain component can be configured to infiltrate runoff into native soils; thereby offering a space efficient treatment and volume management solution. Diagrams of the system geometry are shown in **Figure 1 to Figure 4**.

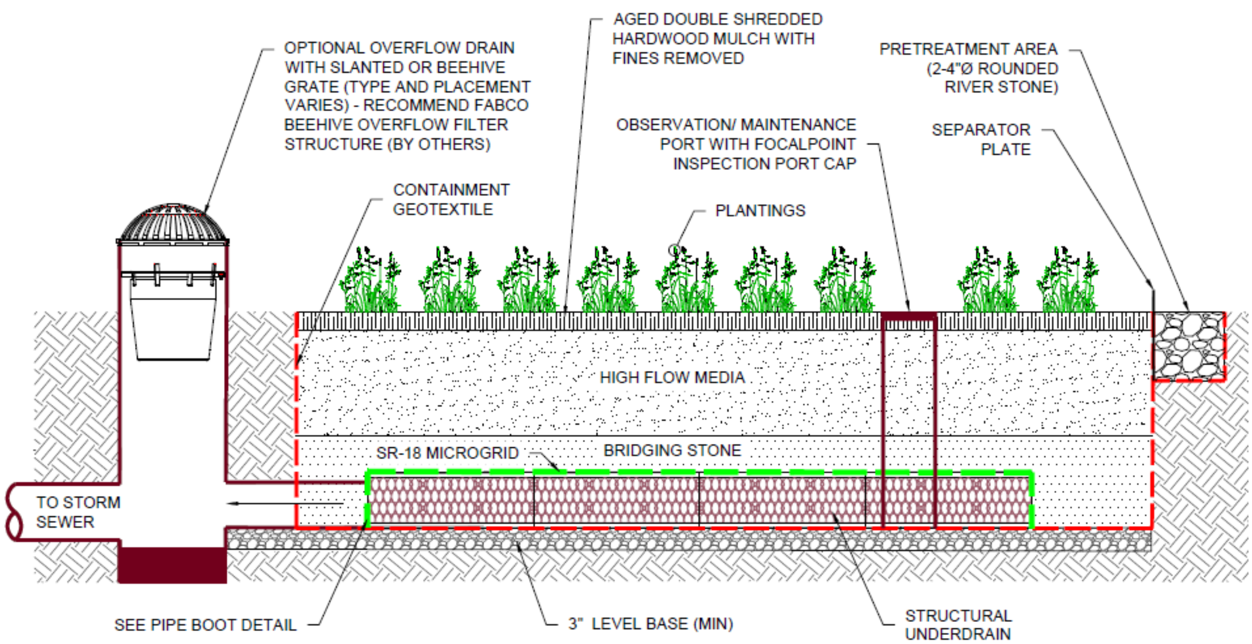

Figure 1 FocalPoint HC Elevation View

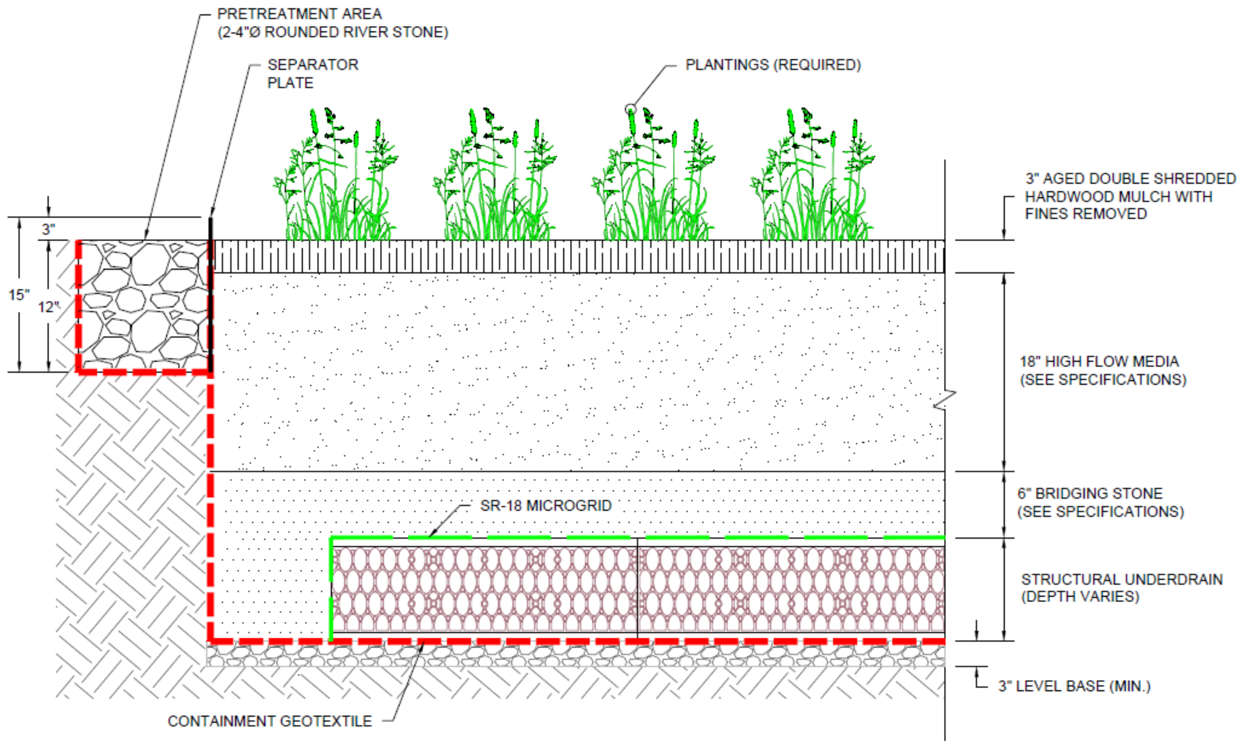

Figure 2 FocalPoint HC Installation Dimensions

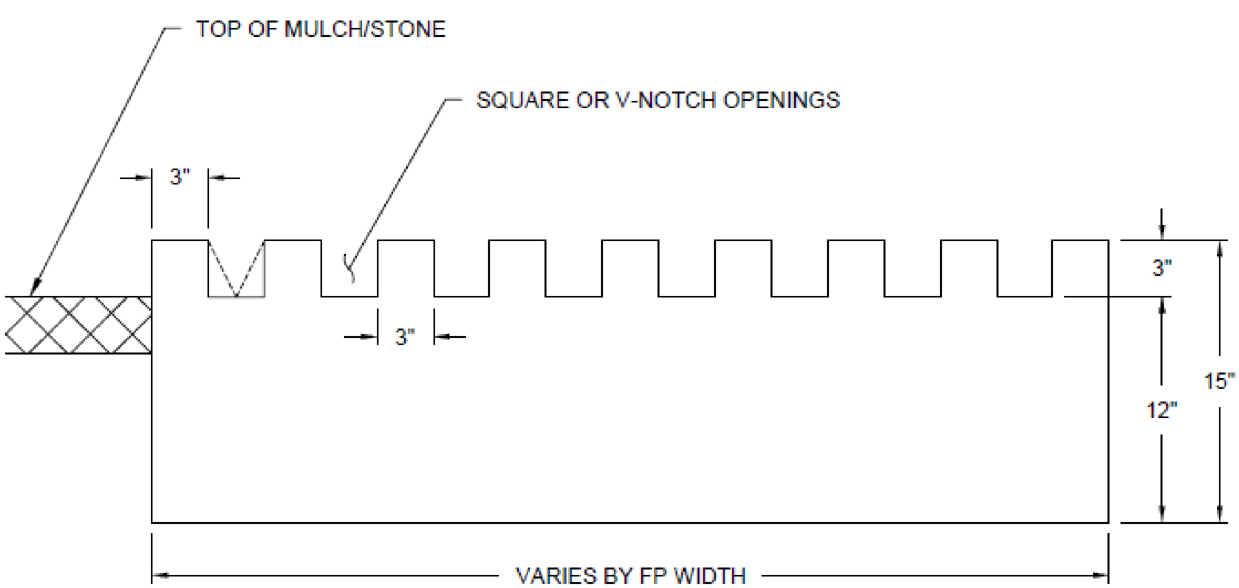

Figure 3 FocalPoint HC Separator Plate Design

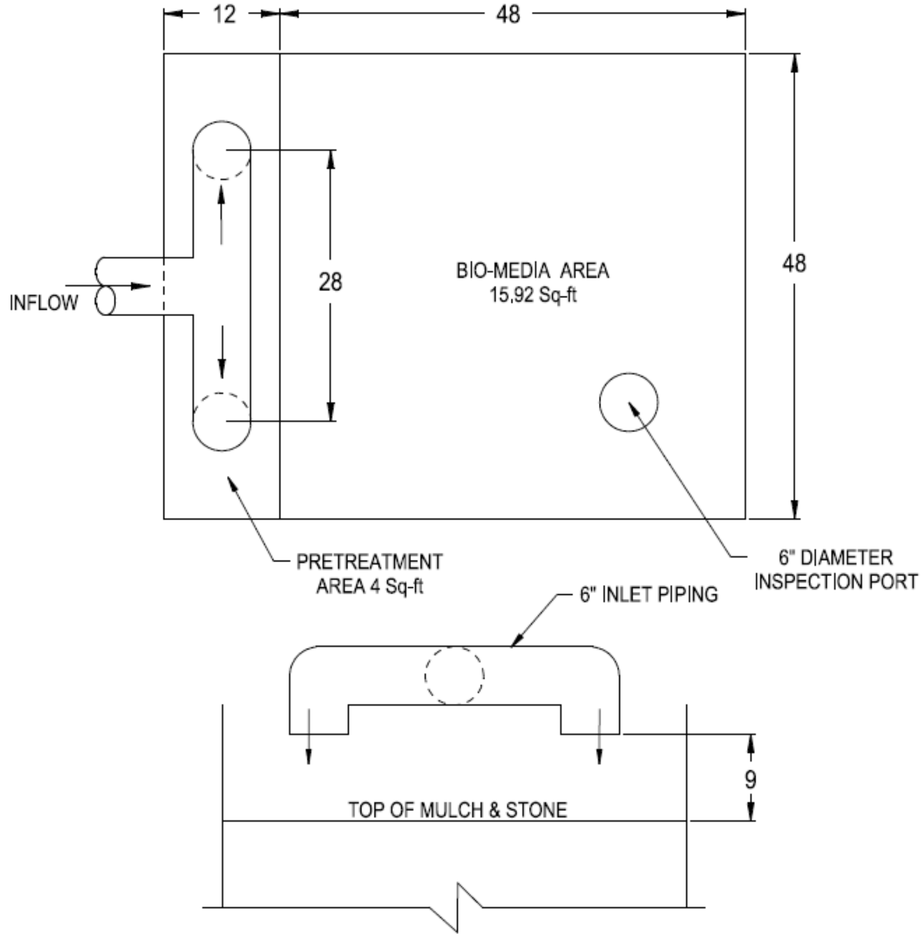

Figure 4 FocalPoint HC Test Inlet Pipe Design

2. Laboratory Testing

The test program was conducted at Verdantas Flow Labs, Alden Campus (Verdantas, LLC), Holden, Massachusetts, under the direct supervision of Verdantas senior stormwater engineer, James Mailloux. Verdantas has performed verification testing on Hydrodynamic Separator and Filtration Manufactured Treatment Devices (MTDs) for manufacturers under various state and federal testing protocols. Particle size distribution (PSD) analysis was conducted by GeoTesting Express, Inc., Acton, Massachusetts, an ISO/IEC 17025 accredited independent laboratory, using ASTM D6913 / D6913M-17 (2017), "Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis" and ASTM D7928-21e1 (2021), "Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis".

The suspended solid concentration (SSC) of the effluent and background water samples were analyzed by Verdantas in accordance with Method B, as described in ASTM Designation: D

3977-97 (Re-approved 2019), "Standard Test Methods for Determining Sediment Concentration in Water Samples". Verdantas is ISO 17025 accredited for conducting the ASTM D3977 analysis. Verdantas has assigned a Method Detection Limit (MDL) of 1.0 mg/L. To be conservative, all concentrations below the MDL were assigned a value of 0.5 mg/L.

Laboratory testing was done in accordance with the New Jersey Department of Environmental Protection "Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" 2022 (updated April 25, 2023)., to establish the following parameters:

- Total Suspended Solids Removal Efficiency
- Sediment Mass Loading Capacity

Prior to starting the performance testing program, a quality assurance project plan (QAPP) was submitted to, and approved by, the New Jersey Corporation for Advanced Technology (NJCAT) as per the NJDEP certification process.

2.1 Test Setup

A 5' x 4' FocalPoint HC test unit was installed in a test loop in the Verdantas Stormwater Testing Facility, shown in **Figure 5**. A water-tight test tank was utilized for the test unit installation, which included a 1' x 4' pretreatment chamber and 4' x 4' biofilter. The actual filtration area of the test unit was 15.92 ft^2. The installation was conducted in the same manner as in the field to meet the specifications of the protocol. All pipe penetrations were sealed prior to testing. Flow was supplied to the unit with a laboratory pump drawing water from a 45,000-gallon supply sump, which can be heated or cooled to maintain a target temperature of approximately 68° F. The test flow was set and measured using a flow control valve and calibrated 1.5" orifice-plate flow meter, constructed to ASME guidelines. Flow measurement accuracy was within ±1%. During all test runs, the allowable flow variation was ±10% of the target flow and the coefficient of variance (COV) was ≤0.03.

Flow was conveyed to the test unit by means of a straight 6" diameter smooth-wall PVC influent pipe, with a length of approximately 60 pipe diameters (30'). The pipe was set with a 1% slope. A 6" saddle tee was located 2' upstream of the test unit for injecting the test sediment into the crown of the influent pipe. Sediment injection was accomplished with the use of a volumetric screw feeder. A calibrated isokinetic sampler was installed in the upstream vertical riser pipe for collection of background samples. A 2' long 6" PVC outlet pipe free-discharged the effluent into a channel containing a calibrated V-notch weir and returned to the sump. Filtration of the supply sump flow was performed with an inline filter wall containing 1-micron rated bag filters.

Water temperature measurements within the supply sump were obtained using a calibrated Omega® DP25 temperature probe and readout device. The calibration was performed at the laboratory prior to testing. The temperature measurement was documented at the start and end of each test run, to assure an acceptable testing temperature of ≤ 80 degrees F. A mid-test temperature reading was not necessary, as the test loop was a recirculating closed-loop system.

The end-of-test water level above the mulch layer was measured with the use of a staff gauge mounted inside the test tank. The drawdown flow through the V-notch weir was measured with the use of a Piezometer tap, water manometer and a calibrated pressure transducer. The flow was measured and recorded every 5 seconds throughout the duration of each test run, including the drawdown period. The end-of-run water elevation within the treatment unit was recorded just prior to shutting off the flow. Photographs of the test setup are shown in **Figure 6, Figure 7** and **Figure 8**.

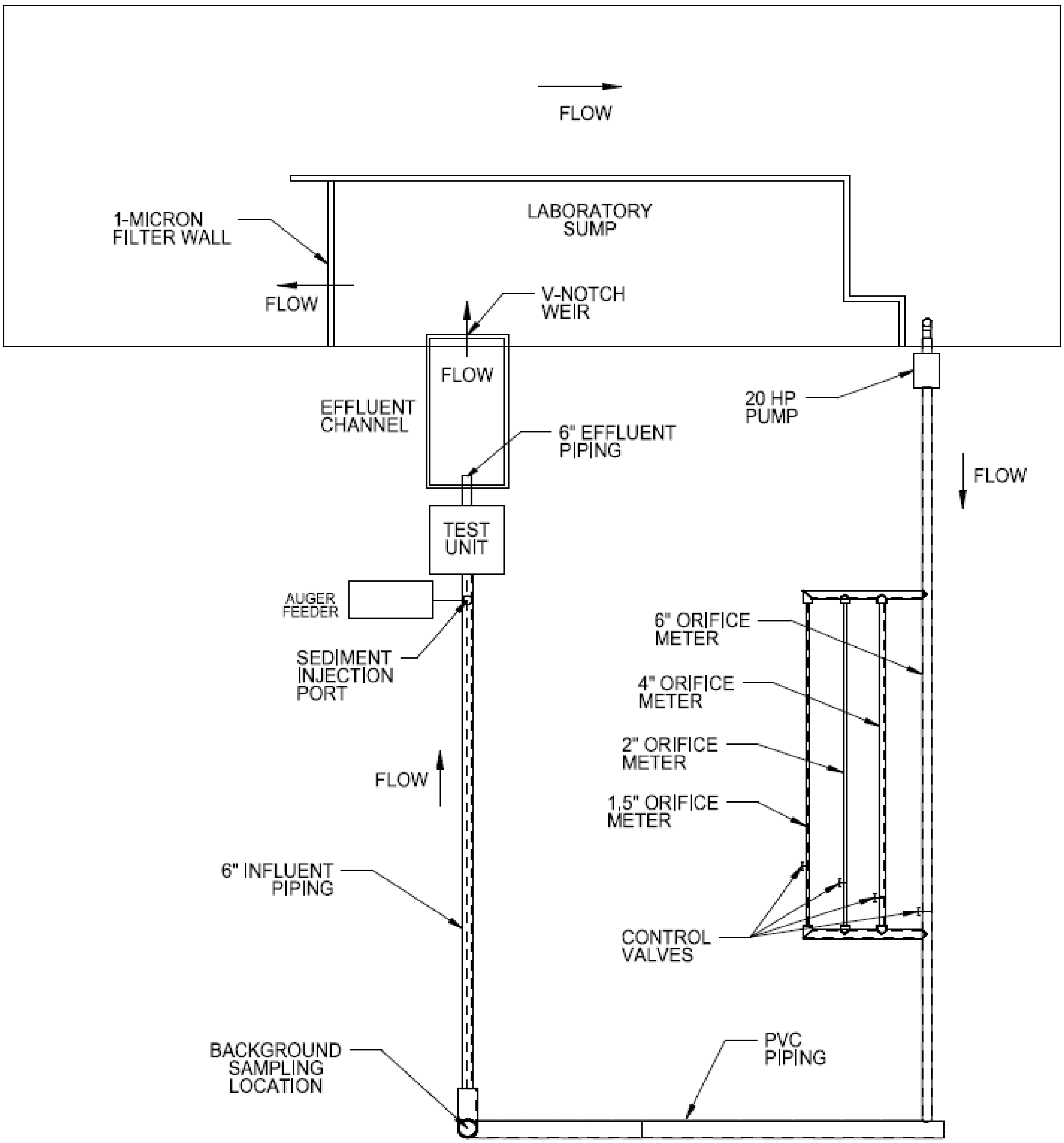

Figure 5 Verdantas Flow Labs Stormwater Test Loop

Figure 6 FocalPoint HC Test Setup

Figure 7 FocalPoint HC Inlet Geometry

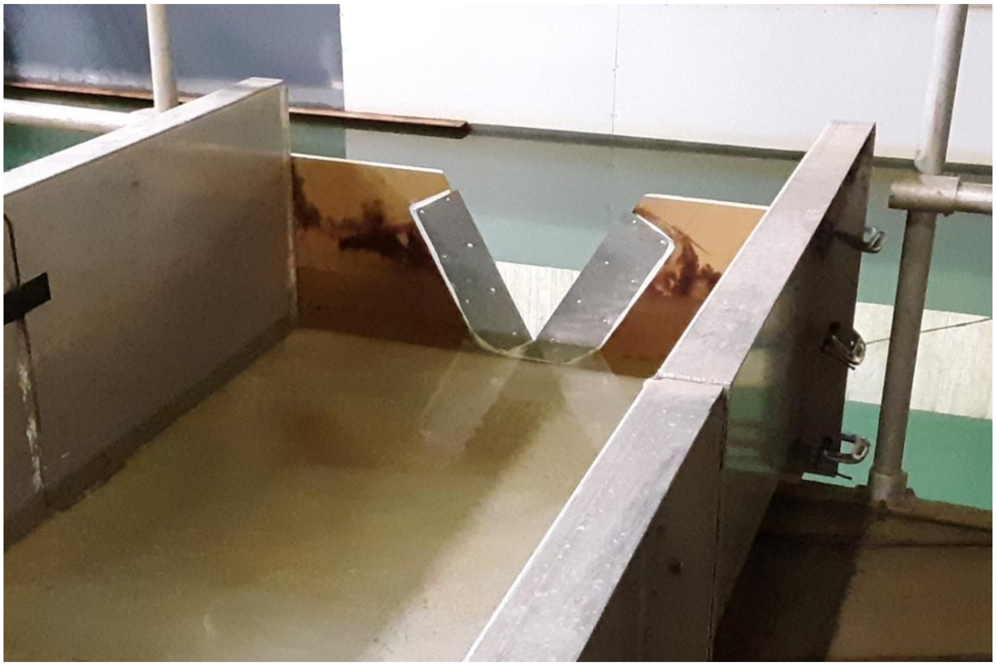

Figure 8 Effluent Channel V-notch Weir

2.2 Removal Efficiency Testing

Sediment testing was conducted to determine sediment removal efficiency, as well as sediment mass loading capacity. The sediment testing was conducted on an initially clean system at the 100% MTFR of 63.7 gpm (4 gpm/sq-ft) selected by Convergent Water Technologies (Convergent)). A minimum of ten (10) 30-minute test runs were required to be conducted to meet the removal efficiency criterion of a cumulative removal efficiency >80%. Additional runs were conducted to determine the maximum mass loading. The captured sediment was not removed from the system between test runs. All test runs were conducted with clean water containing a background suspended sediment solids concentration (SSC) of <20 mg/L

The total mass injected into the system was quantified for each run by subtracting the mass remaining in the feeder and collected for the feed rate calibrations, from the recorded starting mass. This value was used in calculating the influent mass/volume concentration. The total mass captured in the system was quantified at the conclusion of the testing. This data is used for determination of the maximum inflow drainage area (acres) per the NJDEP protocol.

The test sediment was prepared by Verdantas to meet the NJDEP protocol PSD gradation of 1-1000 microns in accordance with the distribution shown in column 2 of **Table 1**. The sediment was silica based, with a specific gravity of 2.65. Three random PSD samples of the test sediment were analyzed by GeoTesting Express, and the average of the samples used for compliance with the protocol.

Scour testing was not assessed for the FocalPoint HC system since it is intended for off-line installation

Table 1 NJDEP Sediment Particle Size Distribution

Table 1: Test Sediment Particle Size Distribution[1]	
Particle Size (Microns)	Target Minimum % Less Than[2]
1,000	100
500	95
250	90
150	75
100	60
75	50
50	45
20	35
8	20
5	10
2	5

1. The material shall be hard, firm, and inorganic with a specific gravity of 2.65. The various particle sizes shall be uniformly distributed throughout the material prior to use.
2. A measured value may be lower than a target minimum % less than value by up to two percentage points, A measured value may be lower than a target minimum % less than value by up to two percentage points (e.g., at least 3% of the particles must be less than 2 microns in size [target is 5%]), provided the measured d50 value does not exceed 75 microns..

2.3 Instrumentation and Measuring Techniques

Flow

The inflow to the test unit was measured using a 1.5" calibrated orifice plate differential-pressure flow meter. The meter was fabricated per ASME guidelines and calibrated in Alden's Calibration Department prior to the start of testing. The high and low pressure lines from the meter were connected to manifolds containing isolation valves. Flows were set with a control valve and the differential head from the meter was measured using a Rosemount® 0 to 250-inch Differential Pressure cell, also calibrated at Verdantas prior to testing. All pressure lines and cells were purged of air prior to the start of each test. The test flow was averaged and recorded every 5 seconds throughout the duration of each test run using an in-house computerized data acquisition program. The accuracy of the flow measurement is ±1%.

Temperature

Water temperature measurements within the supply sump were obtained using a calibrated

Omega® DP25 temperature probe and readout device. The calibration was performed at the Verdantas laboratory prior to testing. The temperature measurement was documented at the start and end of each test, to ensure an acceptable testing temperature of ≤ 80 degrees F.

Water Levels

The ponding water level above the mulch layer was recorded to the nearest 1/16" at the end of each test run with the use of a staff gauge mounted to the inside of the test tank.

Sample Concentration Analysis

The suspended solid concentration (SSC) of the effluent and background water samples were analyzed by Verdantas in accordance with Method B, as described in ASTM Designation: D 3977-97 (Re-approved 2019), "Standard Test Methods for Determining Sediment Concentration in Water Samples". Verdantas is ISO 17025 accredited for conducting the ASTM D3977 analysis. Verdantas has assigned a Method Detection Limit (MDL) of 1.0 mg/L. To be conservative, all concentrations below the MDL were assigned a value of 0.5 mg/L.

Verification and Determination of Influent Concentrations

The target influent sediment concentration was 200 mg/L (±20 mg/L) for all tests. Verification of the injected sediment concentration was achieved by taking a minimum of three timed dry samples from the auger feeder, including one sample at the start of dosing, one sample in the middle of each run, and one sample just prior to the conclusion of dosing. The samples were a minimum of 20 grams, with a minimum collection time of 1-minute. The collected samples were weighed to establish the g/min feed rate for each sample. The sediment feed (g/min) was verified with the use of a NIST traceable digital stopwatch and 2200g x 0.1g calibrated digital scale. The tare weight of the sample container was recorded prior to the collection of each sample. The target sample weight was 48.2 g/min. The sample concentration COV did not exceed 0.10. The influent concentration was calculated using the following two methods:

1. The auger sediment feed rate data was used in conjunction with the corresponding recorded flow data to establish an influent concentration of 200 mg/L (±10%) throughout the test run and demonstrate that the feed rate COV was ≤0.10.
2. The sediment mass in the volumetric screw feeder was quantified at the start and end of each test run and corrected for the three feed calibration samples to determine the mass fed into the test unit. This mass was divided by the total volume of water flowing through the test unit during sediment dosing to determine the average influent TSS concentration. This value was used in the removal efficiency calculation.

Sample Collection

All sediment testing was conducted using the indirect (sampling) methodology, as per the NJDEP protocol. Six effluent samples were collected using 2-L beakers and the end-of-pipe grab sampling methodology. The three required background samples were collected upstream of the influent pipe using 2-L beakers and a calibrated isokinetic sampler installed in the center of the upstream vertical riser of the inflow piping, as shown in **Figure 9**. The sampling rate was 18 sec/L.

The effluent samples were collected after a minimum of three detention times after the initiation of sediment dosing, as well as after the interruption of dosing for injection measurements. A minimum of three evenly spaced background samples were collected in correspondence with the odd-numbered effluent samples (first, third, fifth). At the termination of the test run, two evenly volume-spaced effluent samples were collected during the drawdown period and used in the removal efficiency calculation. The drawdown volume was calculated by measuring the effluent using the calibrated V-notch weir located at the end of the effluent channel. All effluent and drawdown concentrations were adjusted for background.

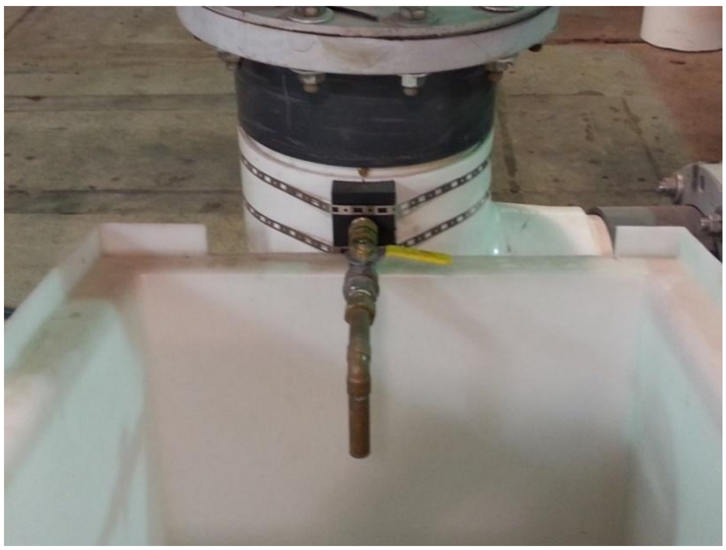

Figure 9 Photograph of the Background Isokinetic Sampler

2.4 Data Management and Acquisition

A designated Laboratory Records Book was used to document the conditions and pertinent data entries for each test conducted. All entries were initialed and dated.

A personal computer running an in-house Labview® Data Acquisition program was used to record all data related to instrument calibration and testing. A 16-bit National Instruments® NI6212 Analog to Digital (A/D) board was used to convert the signal from the pressure cells. The Verdantas in-house data collection software, by default, collects one second averages of data collected at a raw rate of 250 Hz. The system allows very long contiguous data collection by continuously writing the collected 1-second averages and their RMS values to disk. The data output from the program is in tab delimited text format with a user-defined number of significant figures.

The flow and pressure data were continuously averaged and recorded to file every 5 seconds. The recorded data files were imported into a spreadsheet for further analysis and plotting. Excel based data sheets were used to record all sediment related data used for quantifying injection rate, effluent, and background sample concentrations, flow, pressure, mass, and PSD data. The data were input to the designated spreadsheet for final processing.

3. Performance Claims

Per the NJDEP verification procedure and based on the laboratory testing conducted for the FocalPoint High Capacity Modular Biofiltration System (FocalPoint HC), the following are the performance claims made by Convergent.

Total Suspended Solids (TSS) Removal Efficiency

Based on the laboratory testing conducted, the tested FocalPoint HC system achieved an 86.9% cumulative sediment removal efficiency after 10 test runs and 85.1% at the completion of an additional 10 mass load capacity tests.

Maximum Treatment Flow Rate (MTFR)

The tested system has an MTFR of 63.7 gpm (0.142 cfs) and an effective filtration treatment area (EFTA) of 15.92 ft^2 (loading rate = 4 gpm/ft^2).

Effective Sedimentation Treatment Area (ESTA)

The ESTA for the tested FocalPoint HC is 15.92 ft^2.

Effective Filtration Treatment Area

The Effective Filtration Treatment Area (EFTA) for the test system is equal to the ESTA.

Sediment Load Capacity/Mass Load Capture Capacity

Based on laboratory testing results, the test system has a mass loading capacity of 110.0 lbs and a mass loading capture capacity of 93.6 lbs (5.88 lbs/ft^2 of filter area).

Maximum Allowable Inflow Drainage Area

Per the NJDEP Filter Protocol, to calculate the maximum inflow drainage area, the total sediment load captured mass observed during the test (93.6 lbs) is divided by 600 lbs/acre. Thus, the maximum inflow drainage area for the tested system is 0.156 acres.

4. Supporting Documentation

The NJDEP Procedure (NJDEP, 2021) for obtaining verification of a stormwater manufactured treatment device (MTD) from the New Jersey Corporation for Advanced Technology (NJCAT) requires that “copies of the laboratory test reports, including all collected and measured data; all data from performance evaluation test runs; spreadsheets containing original data from all performance test runs; all pertinent calculations; etc.” be included in this section. This was discussed with NJDEP, and it was agreed that as long as such documentation could be made available by NJCAT upon request, it would not be prudent or necessary to include all this information in this verification report. This information was provided to NJCAT.

4.1 Test Sediment PSD Analysis

The sediment particle size distribution (PSD) used for removal efficiency testing was comprised of 1-1000 micron silica particles, as shown in **Table 2**. The Specific Gravity (SG) of the sediment mixes was 2.65. Commercially-available silica products were provided by AGSCO Corp., a QAS International ISO-9001 certified company, and blended by Verdantas as required. Test batches were prepared in individual 5-gallon buckets, which were arbitrarily selected for the removal testing. A well-mixed sample was collected from three buckets and analyzed for PSD in accordance with ASTM D6913 /D6913M-17 (2017) and ASTM D7928-21e1 (2021) by GeoTesting Express. an ISO/IEC 17025 accredited independent laboratory. The average of the samples was used for compliance to the protocol specifications listed in Column 2 of **Table 1**. The median D_{50} of the samples was 68 microns. The PSD data of the samples are shown in **Table 2** and the corresponding curves are shown on **Figure 10**.

Table 2 PSD Analyses of Verdantas NJDEP 1-1000 Test Sediment

Particle Size µm	B1	B7	B20	Average	NJDEP Minimum Allowed Values
1000	99%	99%	100%	99%	98%
500	95%	95%	95%	95%	93%
250	90%	91%	90%	90%	88%
150	72%	74%	75%	74%	73%
100	59%	59%	61%	59%	58%
75	51%	51%	53%	52%	50%
50	44%	45%	45%	45%	43%
20	36%	35%	32%	34%	33%
8	21%	21%	19%	20%	18%
5	14%	14%	14%	14%	8%
2	5%	5%	5%	5%	3%
D_{50}	70	69	64	68	75

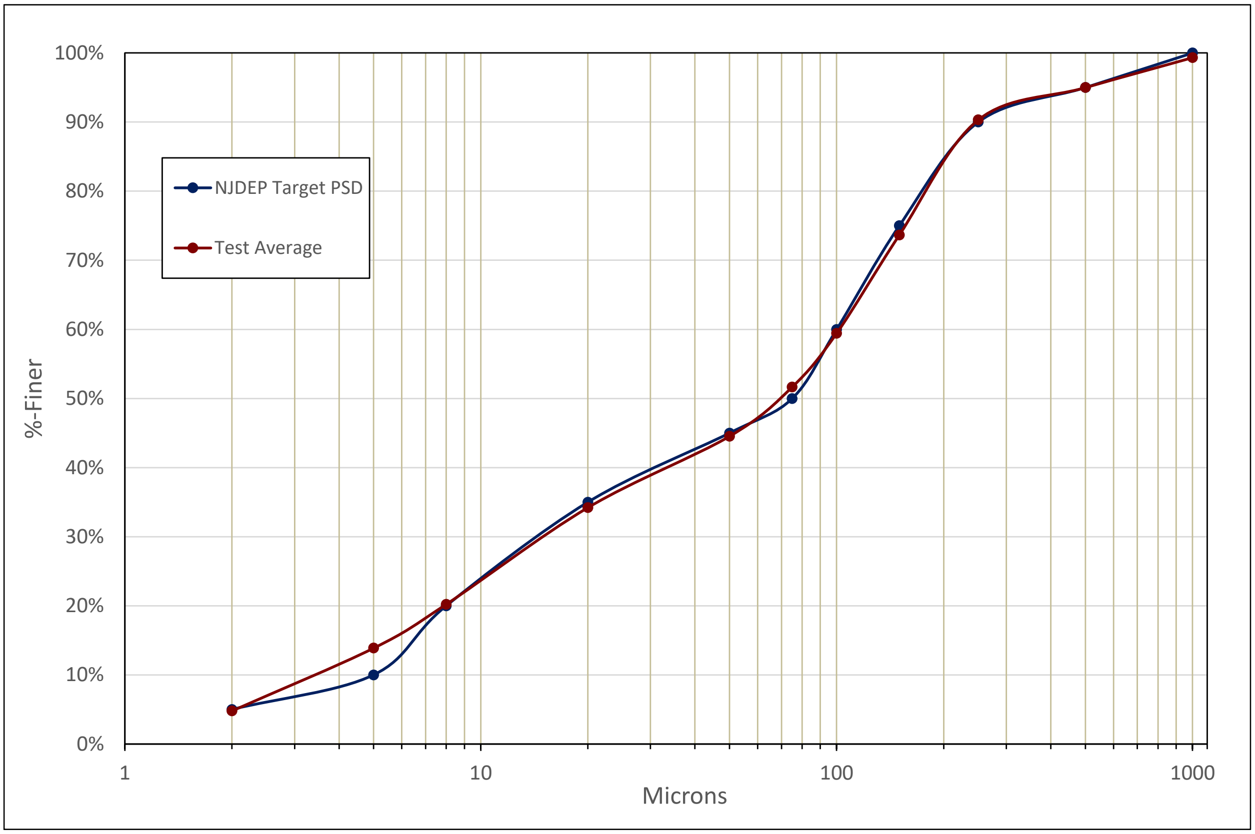

Figure 10 PSD Curves of 1-1000 micron Test Sediment

4.2 Removal Efficiency and Mass Loading Testing

Testing Summary

Ten (10) sediment removal tests were conducted at a target flow of 63.7 gpm (4 gpm/ft^2 x 15.92 ft^2 of filtration area). The maximum COV for the test runs was 0.002. An additional ten (10) mass loading (ML) tests were conducted at 63.7 gpm. The test duration for the mass loading runs was increased to 71 minutes. The maximum COV for the ML test runs was 0.001. The maximum recorded temperatures for all tests ranged from 67.4 to 73.0 degrees F. The measured injected influent concentration averages ranged from 191.0 to 210.2 mg/L. The injection COV ranged from 0.009 to 0.082. The calculated mass/volume influent concentrations ranged from 193 to 215 mg/L. The calculated removal efficiencies ranged from 82.1% to 87.7%, with a total cumulative average removal of 85.1%. The total cumulative injected and captured mass was 110.0 Lbs and 93.6 Lbs, respectively. The maximum end-of-run elevation above the mulch layer was 0 inches. Recorded and calculated test data are shown in **Tables 3 through 7.**

Table 3 shows the sampling times for the sediment mass injection and effluent and background sediment concentration measurements. **Table 4** lists the measured removal efficiency test parameters. **Table 5** contains the background, adjusted effluent and adjusted background concentrations. **Table 6** shows the injected and captured mass for each run and the cumulative masses, as well as the run (**Equation 1)** and cumulative removal efficiency. **Table 7** summarizes the removal efficiency results. **Figure 11** plots removal efficiency vs mass loading for the 20 runs.

$$Removal\ Efficiency\ (\%) = \frac{\begin{pmatrix} Average\ Influent \\ TSS\ Concentration\ X \\ Total\ Volume \\ of\ Test\ Water \end{pmatrix} - \begin{pmatrix} Adjusted\ Effluent \\ TSS\ Concentration\ X \\ Total\ Volume \\ of\ Effluent\ Water \end{pmatrix} - \begin{pmatrix} Average \\ Drawdown\ Flow \\ TSS\ Concentration\ X \\ Total\ Volume \\ of\ Drawdown\ Water \end{pmatrix}}{\begin{matrix} Average\ Influent\ TSS\ Concentration\ X \\ Total\ Volume\ of\ Test\ Water \end{matrix}} \times 100$$

Equation 1 Equation for Calculating Removal Efficiency

Note: Test run #13 had to be shut down after approximately 15 minutes due to a mechanical issue with the volumetric feeder. The feeder was repaired, and the test was repeated. The injected mass of 1.36 pounds was not included in the final mass loading calculation.

Table 3 Sample Collection Timestamps (minutes)

Test Run #	Measured Flow		Maximum Water Temperature	End of Run Water El. Above Mulch	Influent Concentration (mg/L)						QA/QC Compliant
	gpm	COV	Deg. F	inch	#1	#2	#3	Average	COV	Mass/Volume	
1	63.7	0.002	67.8	0.00	198.9	189.3	185.8	191.3	0.036	195.7	Y
2	63.7	0.001	68.9	0.00	209.5	189.3	179.9	192.9	0.079	197.1	Y
3	63.7	0.001	69.5	0.00	209.1	206.4	189.0	201.5	0.054	203.6	Y
4	63.7	0.001	69.4	0.00	212.5	208.1	196.4	205.7	0.040	199.8	Y
5	63.7	0.001	67.9	0.00	208.4	204.7	191.5	201.6	0.044	201.2	Y
6	63.7	0.001	69.2	0.00	214.9	183.0	193.8	197.2	0.082	193.6	Y
7	63.7	0.001	68.7	0.00	214.9	197.9	200.2	204.3	0.045	204.6	Y
8	63.7	0.001	70.8	0.00	215.0	202.4	192.6	203.3	0.055	214.5	Y
9	63.7	0.001	70.0	0.00	205.4	195.2	206.1	202.2	0.030	202.0	Y
10	63.7	0.001	67.4	0.00	194.6	188.3	190.0	191.0	0.017	193.6	Y
11	63.7	0.001	68	0.00	190.5	205.2	184.3	193.3	0.056	196.4	Y
12	63.7	0.001	69.6	0.00	208.3	197.5	185.5	197.1	0.058	192.6	Y
13	63.7	0.001	69	0.00	214.6	206.6	209.3	210.2	0.020	206.4	Y
14	63.7	0.001	69.3	0.00	215.1	197.8	211.2	208.1	0.044	212.1	Y
15	63.7	0.001	70.4	0.00	213.3	207.1	202.7	207.7	0.026	203.6	Y
16	63.7	0.001	69.5	0.00	212.0	210.8	193.6	205.4	0.050	214.1	Y
17	63.7	0.001	69.2	0.00	215.8	196.7	188.7	200.4	0.069	198.5	Y
18	63.7	0.001	70	0.00	203.3	201.8	186.2	197.1	0.048	200.3	Y
19	63.7	0.001	71.2	0.00	205.3	201.7	203.7	203.6	0.009	196.2	Y
20	63.7	0.001	73	0.00	197.8	201.8	184.9	194.8	0.045	206.5	Y

Table 4 Measured Removal Efficiency Test Parameters

Test Run #	Measured Flow		Maximum Water Temperature	End of Run Water El. Above Mulch	Influent Concentration (mg/L)						QA/QC Compliant
	gpm	COV	Deg. F	inch	#1	#2	#3	Average	COV	Mass/Volume	
1	63.7	0.002	67.8	0.00	198.9	189.3	185.8	191.3	0.036	195.7	Y
2	63.7	0.001	68.9	0.00	209.5	189.3	179.9	192.9	0.079	197.1	Y
3	63.7	0.001	69.5	0.00	209.1	206.4	189.0	201.5	0.054	203.6	Y
4	63.7	0.001	69.4	0.00	212.5	208.1	196.4	205.7	0.040	199.8	Y
5	63.7	0.001	67.9	0.00	208.4	204.7	191.5	201.6	0.044	201.2	Y
6	63.7	0.001	69.2	0.00	214.9	183.0	193.8	197.2	0.082	193.6	Y
7	63.7	0.001	68.7	0.00	214.9	197.9	200.2	204.3	0.045	204.6	Y
8	63.7	0.001	70.8	0.00	215.0	202.4	192.6	203.3	0.055	214.5	Y
9	63.7	0.001	70.0	0.00	205.4	195.2	206.1	202.2	0.030	202.0	Y
10	63.7	0.001	67.4	0.00	194.6	188.3	190.0	191.0	0.017	193.6	Y
11	63.7	0.001	68	0.00	190.5	205.2	184.3	193.3	0.056	196.4	Y
12	63.7	0.001	69.6	0.00	208.3	197.5	185.5	197.1	0.058	192.6	Y
13	63.7	0.001	69	0.00	214.6	206.6	209.3	210.2	0.020	206.4	Y
14	63.7	0.001	69.3	0.00	215.1	197.8	211.2	208.1	0.044	212.1	Y
15	63.7	0.001	70.4	0.00	213.3	207.1	202.7	207.7	0.026	203.6	Y
16	63.7	0.001	69.5	0.00	212.0	210.8	193.6	205.4	0.050	214.1	Y
17	63.7	0.001	69.2	0.00	215.8	196.7	188.7	200.4	0.069	198.5	Y
18	63.7	0.001	70	0.00	203.3	201.8	186.2	197.1	0.048	200.3	Y
19	63.7	0.001	71.2	0.00	205.3	201.7	203.7	203.6	0.009	196.2	Y
20	63.7	0.001	73	0.00	197.8	201.8	184.9	194.8	0.045	206.5	Y

Table 5 Measured Sample Concentrations

Run #	Max Background	Adjusted Effluent Concentrations (mg/L)							Adjusted Drawdown Concentrations (mg/L)		
	mg/L	E1	E2	E3	E4	E5	E6	**Average**	DD1	DD2	**Average**
1	0.5	23.8	25.7	24.7	23.8	25.6	26.7	**25.1**	36.7	58.5	**47.6**
2	1.2	23.5	22.9	23.4	23.8	23.2	22.7	**23.2**	28.8	58.3	**43.6**
3	0.5	23.2	25.2	24.6	27.0	23.9	26.9	**25.1**	27.7	43.3	**35.5**
4	0.5	25.7	25.3	25.3	25.8	23.8	26.7	**25.4**	25.1	53.8	**39.5**
5	0.5	26.0	26.4	27.4	24.9	24.9	24.0	**25.6**	26.3	52.2	**39.3**
6	0.5	20.1	21.7	24.6	25.4	26.4	26.1	**24.0**	25.2	48.0	**36.6**
7	0.5	26.9	27.3	27.9	26.3	28.3	29.5	**27.7**	28.7	54.4	**41.6**
8	2.9	28.7	28.8	28.0	26.6	24.2	25.5	**27.0**	26.4	55.3	**40.9**
9	0.5	24.3	24.0	24.2	23.2	24.9	26.1	**24.4**	30.0	55.1	**42.6**
10	2.3	23.2	22.3	22.3	21.3	23.1	25.6	**23.0**	24.6	43.2	**33.9**
11	1.4	26.4	27.3	26.8	27.4	28.3	27.3	**27.2**	40.1	82.7	**61.4**
12	1.6	25.5	26.5	26.1	24.5	26.0	26.2	**25.8**	36.9	75.7	**56.3**
13	1.1	28.0	27.8	28.2	32.2	30.2	33.2	**29.9**	47.6	91.0	**69.3**
14	1.3	31.4	31.3	31.3	30.6	29.0	31.3	**30.8**	43.1	82.8	**62.9**
15	1.8	25.4	27.7	28.8	29.7	27.2	31.0	**28.3**	50.1	91.1	**70.6**
16	4.3	29.7	30.7	30.8	31.4	34.9	29.9	**31.3**	70.0	117.1	**93.5**
17	1.6	33.3	25.5	35.3	33.2	36.0	34.2	**32.9**	67.8	113.8	**90.8**
18	2.6	30.9	30.4	27.1	34.1	31.4	30.4	**30.7**	47.9	96.7	**72.3**
19	2.0	31.6	30.6	32.9	30.7	32.0	30.8	**31.5**	66.9	117.0	**92.0**
20	2.7	33.4	30.3	31.4	27.5	31.2	27.4	**30.2**	70.5	111.5	**91.0**

Table 6 Injected and Captured Mass and Run and Cumulative Removal Efficiency

Run #	Test Duration	Injected Mass	Total Mass Injected	Mass Captured	Total Mass Captured	Removal Efficiency	Cumulative Average
	minutes	lbs	lbs	lbs	lbs	%	%
1	31.5	3.28	3.28	2.83	**2.83**	**86.3**	**86.3**
2	31.5	3.30	6.58	2.88	**5.71**	**87.4**	**86.8**
3	31.5	3.41	9.98	2.97	**8.68**	**87.2**	**87.0**
4	31.5	3.34	13.33	2.90	**11.58**	**86.7**	**86.9**
5	31.5	3.37	16.69	2.92	**14.50**	**86.7**	**86.9**
6	31.5	3.24	19.93	2.82	**17.32**	**87.0**	**86.9**
7	31.5	3.42	23.36	2.94	**20.26**	**85.9**	**86.7**
8	31.5	3.59	26.95	3.12	**23.38**	**86.9**	**86.8**
9	31.5	3.38	30.33	2.95	**26.33**	**87.2**	**86.8**
10	31.5	3.24	33.57	2.84	**29.17**	**87.7**	**86.9**
11	71.0	7.41	40.98	6.33	**35.51**	**85.5**	**86.6**
12	71.0	7.26	48.25	6.24	**41.75**	**86.0**	**86.5**
13	71.0	7.79	56.03	6.60	**48.36**	**84.8**	**86.3**
14	71.0	8.00	64.04	6.79	**55.15**	**84.8**	**86.1**
15	71.0	7.68	71.72	6.54	**61.68**	**85.1**	**86.0**
16	71.0	8.08	79.80	6.79	**68.48**	**84.1**	**85.8**
17	71.0	7.49	87.28	6.14	**74.62**	**82.1**	**85.5**
18	71.0	7.56	94.84	6.33	**80.95**	**83.8**	**85.4**
19	71.0	7.40	102.24	6.11	**87.06**	**82.6**	**85.2**
20	71.0	7.79	110.04	6.55	**93.61**	**84.1**	**85.1**

Table 7 Summary of Sediment Removal Test Results

Run #	Mass/Volume Influent Concentration	Average Adjusted Effluent Concentration	Average Adjusted Drawdown Concentration	Influent Volume	Effluent Volume	Drawdown Volume	Influent Mass	Effluent Mass	Drawdown Mass
	mg/L	mg/L	mg/L	L	L	L	g	g	g
1	196	25.1	47.6	7598	6987	611	1487	175	29
2	197	23.2	43.6	7595	6989	606	1497	162	26
3	204	25.1	35.5	7590	6953	637	1545	175	23
4	200	25.4	39.5	7589	6942	646	1516	176	26
5	201	25.6	39.3	7591	6960	630	1527	178	25
6	194	24.0	36.6	7591	6958	633	1469	167	23
7	205	27.7	41.6	7592	6964	628	1553	193	26
8	215	27.0	40.9	7592	6957	635	1629	188	26
9	202	24.4	42.6	7592	6965	628	1534	170	27
10	194	23.0	33.9	7595	6995	600	1471	161	20
11	196	27.2	61.4	17114	16484	631	3361	449	39
12	193	25.8	56.3	17105	16434	670	3294	424	38
13	206	29.9	69.3	17119	16491	628	3533	494	44
14	212	30.8	62.9	17113	16400	712	3630	505	45
15	204	28.3	70.6	17112	16291	822	3485	461	58
16	214	31.3	93.5	17115	16338	778	3664	511	73
17	198	32.9	90.8	17112	16319	792	3396	537	72
18	200	30.7	72.3	17115	16376	740	3428	503	53
19	196	31.5	92.0	17111	16334	777	3358	514	71
20	207	30.2	91.0	17118	16364	754	3535	494	69

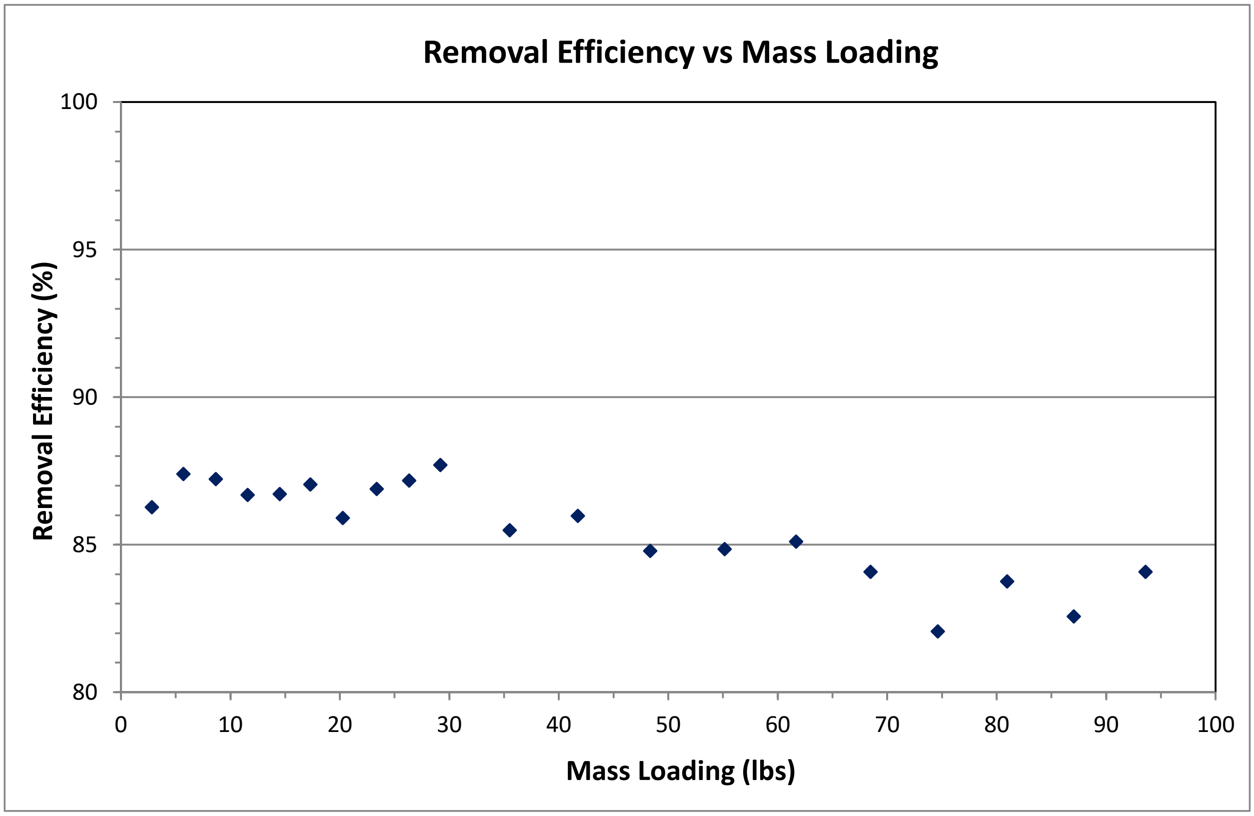

Figure 11 FocalPoint HC Removal Efficiency vs Mass Loading

5. Design Limitations

Convergent and its network of value-added resellers typically work with the civil site designers, engineers, landscape architects and land planners to ensure all potential constraints are addressed during the specification process and that the system will function as intended. Each installation will have unique limitations or requirements, and the following limitations should be considered general and not all inclusive.

Required Soil Characteristics

The FocalPoint HC is suitable for installation in all types of soils.

Infiltration Regulatory Requirements

The state of New Jersey requires that any green infrastructure (GI) device must treat the Water Quality Design Storm (WQDS) through soil and/or vegetation, infiltration, or storage for reuse. Any configuration that uses a biofiltration media and can be configured "at grade" and incorporated into a soft shell, planter box, or vegetated area would meet the GI definition. MTDs with biofiltration media that would be placed "below ground" as a vault without vegetation can be considered GI only if the device infiltrates the entire water quality design storm into the subsoil. A below ground device (vault) would need to meet the NJDEP Stormwater BMP Manual conditions of having the soil below the MTD meet the minimum tested infiltration rate of one inch per hour, have at least two feet of separation from the seasonal high-water table, and infiltrate into the subsoil.

Slope

The FocalPoint HC is typically installed flat (i.e., no slope) to ensure consistent operation. Because the system requires a relatively small footprint it is rare that slope becomes an issue for installation. If the system is to be installed on a site with steep slope, we recommend the design be reviewed by Convergent.

Maximum Flow Rate

The maximum flow rate of the FocalPoint HC is 4.0 gpm/ft^2 of effective filtration treatment area.

Allowable Head Loss

There is no operational head loss associated with the FocalPoint HC device. Head loss will increase over time due to sediment loading. Typical ponding depth for the system is 6 inches above the top of the mulch surface and specific site conditions should be evaluated to ensure sufficient head for the system is provided for long-term function.

Maintenance Requirements

Maintenance frequency and requirements are dependent on site specific conditions. In general, it is recommended that inspections and/or maintenance be conducted on a regularly occurring basis or after an extreme rainfall event or chemical spill.

Installation Limitations

The FocalPoint HC has few installation limitations and is typically delivered to the site in a kit with all components properly labeled, bagged, boxed, wrapped and palletized for shipping. The contractor is responsible for off-loading materials, staging/storing and protecting material at the jobsite, preparing the excavation, connecting the outlet piping and following the installation guide and construction plans for placement of the system. The system should be protected from construction runoff until the site is permanently stabilized. Note that plants should be installed at the time of activation or when site landscaping activities commence, provided the runoff area is completely stabilized.

Configurations

FocalPoint HC is typically designed at grade (same as a rain garden or bioretention practice) and accepts sheet, curb and gutter flow, open channel flow or piped flow if site grading allows (e.g., roof downspouts or area drains). FocalPoint HC is primarily configured in a boxless or soft-shell configuration for better aesthetics and simplifies the connection between the filtration layer and the infiltration zone (native soils) because it requires less infrastructure to do so. FocalPoint HC can also be installed above grade (e.g., raised planter boxes), or below grade (e.g., in a variety of precast vault sizes or sunken planter boxes).

Structural Load Limitations

FocalPoint HC units are typically placed in landscaped or green space areas (traffic islands, behind curbing, etc.) and are not expected to receive vehicular loading, similar to a rain garden or bioretention practice. If placed in a precast vault or other structural container and required to handle traffic loads (e.g., HS-20), the system would be designed and manufactured to meet those requirements.

Pre-treatment Requirements

There are no pre-treatment requirements for the FocalPoint HC system based on the configuration that was tested; however, pretreatment will extend the lifespan of the mulch and media layers and reduce maintenance frequency.

Limitations in Tailwater

Tailwater conditions should be evaluated for each application. Generally, it is best to design under free discharge conditions, however given the system has a 95 percent void space modular underdrain system, it is possible to design for a permanent or intermittent tailwater condition so long as the media is not permanently wet. As always, designers can contact Convergent for technical assistance when trying to meet site-specific requirements.

Depth to Seasonal High Water Table

FocalPoint HC operation is typically not impacted by seasonal high-water table; however, if lined or contained in a concrete box, it may be impacted by buoyancy. Designers should contact Convergent for technical assistance when trying to meet site-specific requirements.

6. Maintenance

Maintenance frequency for the FocalPoint HC will ultimately be determined by site-specific pollutant loading conditions. Inspections of the pretreatment area, plants, mulch layer and filtration media can be accomplished from the surface without special tools. Periodic inspections within the first year after installation are recommended to determine a site-specific maintenance cycle of the system.

More information can be found in Convergent's operation and maintenance guide: https://convergentwater.com/the-innovations/focalpoint-biofiltration-system/#1745418683649-848eafcc-6635

Maintenance Visit Procedure

Each maintenance visit consists of the following tasks.

- *Inspect FocalPoint HC and Surrounding Area* – Document with photographs and record on maintenance report (example document provided).

- *Remove Silt/Sediment/Clay* – Dig out silt (if any) and mulch and remove trash and foreign items. After removal of mulch and debris, measure distance from the top of the FocalPoint HC engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this is greater than that specified on the plans add FocalPoint HC media (not topsoil or other) to recharge to the distance specified.

- *Mulch Replacement* – Bags of clean, double shredded hardwood mulch are typically used for smaller biofiltration beds; however, larger systems may require truckloads of mulch.

- *Plant Health Evaluation and Pruning or Replacement as Necessary* – Examine the plants' health and replace if dying. Prune as necessary to encourage growth in the correct directions.

- *Clean Surrounding Area* – Clean area around the unit and remove all refuse to be disposed of appropriately.

- *Complete Paperwork* – Including date stamped photos of the tasks listed above. Submit maintenance reports to local jurisdictions in accordance with approvals.

7. Statements

The following signed statements from the manufacturer (Convergent), independent testing laboratory (Verdantas Flow Labs) and NJCAT are required to complete the NJCAT verification process.

In addition, it should be noted that this report has been subjected to public review (e.g., stormwater industry) and all comments and concerns have been satisfactorily addressed.

Convergent Water Technologies
13100 Wortham Center Dr
Third Floor, Suite 3134
Houston, TX 77065

August 7, 2025

Richard Magee, Sc.D., P.E., BCEE
Executive Director – NJCAT c/o
Center for Environmental Systems Stevens Institute of Technology
One Castle Point on Hudson
Hoboken, NJ 07030

SUBJECT: Statement of Compliance
FocalPoint HC Biofilter

Dear Dr. Magee:

Convergent Water Technologies (Convergent) has completed its verification testing for the FocalPoint HC Biofilter, a green infrastructure manufactured treatment device, in accordance with the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology". As required, manufacturers shall submit a signed statement confirming that all the procedures and requirements identified in the aforementioned process document and the "New Jersey Department of Environmental Protection (NJDEP) Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device", dated January 14, 2022, updated April 25, 2023. This letter serves as Convergent's statement that testing executed by Verdantas in the summer of 2025, under the direct supervision of Mr. James Mailloux - Principal Engineer, was conducted in full compliance with all applicable protocol and process documents.

Please feel free to contact me with additional questions or comments.

Kindest Regards,

Sincerely,

W. Scott Gorneau, P.E.
Senior Vice President
Convergent Water Technologies

verdantas

August 8, 2025

Dr. Richard Magee, P.E., BCEE
Executive Director
New Jersey Corporation for Advanced Technology
Center for Environmental Systems
Stevens Institute of Technology
One Castle Point
Hoboken, NJ 07030

Conflict of Interest Statement

Verdantas Flow Labs, LLC is a non-biased independent testing entity which receives compensation for testing services rendered. Verdantas does not have any vested interest in the products it tests or their affiliated companies. There is no financial, personal, or professional conflict of interest between Verdantas and Convergent Water Technologies.

Protocol Compliance Statement

Verdantas Flow Labs conducted verification testing on the Convergent Water Technologies FocalPoint HC Biofilter treatment system. The Technical Report and all required supporting data documentation has been submitted to NJCAT as required by the protocol.

Testing performed by Verdantas on the CWT FocalPoint HC Biofilter met or exceeded the requirements as stated in the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device", January 14, 2022, (Updated April 25, 2023).

James T. Mailloux

James T. Mailloux

Senior Consultant
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Center for Environmental Systems
Stevens Institute of Technology
One Castle Point
Hoboken, NJ 07030-0000

November 11, 2025

Gabriel Mahon, Chief
NJDEP
Bureau of Non-Point Pollution Control
Division of Water Quality
401 E. State Street
Mail Code 401-02B, PO Box 420
Trenton, NJ 08625-0420

Dear Mr. Mahon,

Based on my review, evaluation and assessment of the testing conducted on the Convergent Water Technologies FocalPoint High Capacity Modular Biofiltration System (FocalPoint HC) at the Verdantas Flow Labs,. Alden Campus (Verdantas. LLC), Holden, Massachusetts, under the direct supervision of Verdantas senior stormwater engineer, James Mailloux, the test protocol requirements contained in the *"New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device,* 2022, Updated April 25, 2023*"* (NJDEP Filtration Protocol) were met or exceeded. Specifically

Test Sediment Feed

The sediment particle size distribution (PSD) used for removal efficiency testing was comprised of 1-1000 micron silica particles. The Specific Gravity (SG) of the sediment mixes was 2.65. Commercially-available silica products were provided by AGSCO Corp., a QAS International ISO-9001 certified company, and blended by Verdantas as required. Test batches were prepared in individual 5-gallon buckets, which were arbitrarily selected for the removal testing. A well-mixed sample was collected from three buckets and analyzed for PSD in accordance with ASTM D6913 /D6913M-17 (2017) and ASTM D7928-21e1 (2021) by GeoTesting Express. an ISO/IEC 17025 accredited independent laboratory. The average of the samples was used for compliance to the protocol specifications. The median D_{50} of the samples was 68 microns, well below the 75 micron protocol requirement.

Removal Efficiency Testing

Twenty (20) removal efficiency testing runs were completed in accordance with the NJDEP filter protocol. Ten (10) of the 20 test runs were conducted during removal efficiency testing and 10 during mass loading capacity testing. The target flow rate and influent sediment concentration were 63.7 gpm and 200 mg/L for the removal efficiency testing and mass loading capacity testing. The FocalPoint HC demonstrated a cumulative sediment removal efficiency of 86.9% after the initial 10 removal efficiency test runs and 85.1% at the completion of the additional 10 mass load capacity tests.

Sediment Mass Loading Capacity

Mass loading capacity testing was conducted as a continuation of removal efficiency testing. Mass loading test runs were conducted using identical testing procedures. The FocalPoint HC demonstrated a mass loading capture capacity of 93.61 lbs (5.88 lbs/ft^2 of filter area).

Scour

Scour testing was not assessed for the FocalPoint HC system since it is intended for off-line installation

Sincerely,

Richard S Magee

Richard S. Magee, Sc.D., P.E., BCEE
Executive Director

8. References

ASME (1971). *"Fluid Meters Their Theory and Application- Sixth Edition".*

ASTM (2016). *"Standard Test Methods for Determination of Water (Moisture) Content of Soil by Direct Heating"*, Annual Book of ASTM Standards, D4959-07, Vol. 04.08.

ASTM (2007). *"Standard Test Method for Particle Size Analysis of Soils"*, Annual Book of ASTM Standards, D422-63, Vol. 04.08.

ASTM (2017). *"Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis",* Annual Book of ASTM Standards, D6913 / D6913M-17, Vol. 04.08

ASTM (2019). *"Standard Test Methods for Determining Sediment Concentration in Water Samples",* Annual Book of ASTM Standards, D3977-97, Vol. 11.02.

ASTM (2021). *"Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grain Soils Using the Sedimentation (Hydrometer) Analysis"*, Annual Book of ASTM Standards, D7928-21e1, Vol. 04.08

NJDEP (2021) *New Jersey Department of Environmental Protection Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology.*

NJDEP (2023) *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device.*

U.S. Department of the Interior, Bureau of Reclamation (2001) "*Water Measurement Manual*", 3rd edition.

VERIFICATION APPENDIX

Introduction

- Manufacturer – Convergent Water Technologies, 13100 Wortham Center Drive, Third Floor, Houston, TX 77065. www.convergentwater.com (800)-711-5428.
- Convergent Water Technologies FocalPoint HC verified models are shown in **Table A-1**.
- TSS Removal Rate – 80%
- Off-line installation

Detailed Specification

- FocalPoint HC models, MTFR, and maximum drainage area per NJDEP sizing requirements are attached (**Table A-1**).
- Maximum inflow drainage area
  - The maximum inflow drainage area is governed by the maximum treatment flow rate or sediment loading on the filter for each filter arrangement as presented in **Table A-1.**
- The FocalPoint HC O&M manual can be accessed at: https://convergentwater.com/the-innovations/focalpoint-biofiltration-system/#1745418683649-848eafcc-6635
- This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

TABLE A-1 FOCALPOINT HC TYPICAL MODEL SIZES and NEW JERSEY DESIGN SPECIFICATIONS

FocalPoint HC Biofilter Model Designation[1]	Overall System (FT)	Pretreatment Cell - (FT)	Filter Bed - (FT)	Effective Filtration Treatment Area (EFTA) - (SF)	Effective Sedimentation Treatment Area (ESTA) - (SF)	ESTA/EFTA	MTFR (CFS)[2]	Mass Capture Capacity (LBS)	Drainage Area (ACRES)[3]
FPHC-16	4X5	4X1	4X4	16	4	0.25	0.14	94	0.16
FPHC-20	4X6.25	4X1.25	4X5	20	5	0.25	0.18	117	0.20
FPHC-24	4X7.5	4X1.5	4X6	24	6	0.25	0.21	141	0.23
FPHC-25	5X6.25	5X1.25	5X5	25	6.25	0.25	0.22	147	0.24
FPHC-30	5X7.5	5X1.5	5X6	30	7.50	0.25	0.27	176	0.29
FPHC-32	4X10	4X2	4X8	32	8	0.25	0.29	188	0.31
FPHC-35	5X8.75	5X1.75	5X7	35	8.75	0.25	0.31	205	0.34
FPHC-36	6X7.5	6X1.5	6X6	36	9	0.25	0.32	211	0.35
FPHC-40	4X12.5	4X2.5	4X10	40	10	0.25	0.36	235	0.39
FPHC-48-4W	4X15	4X3	4X12	48	12	0.25	0.43	282	0.47
FPHC-48-6W	6X10	6X2	6X8	48	12	0.25	0.43	282	0.47
FPHC-60	6X12.5	6X2.5	6X10	60	15	0.25	0.53	352	0.59
FPHC-64-4W	4X20	4X4	4X16	64	16	0.25	0.57	376	0.63
FPHC-64-8W	8X10	8X2	8X8	64	16	0.25	0.57	376	0.63
FPHC-72	6X15	6X3	6X12	72	18	0.25	0.64	423	0.70
FPHC-80	8X12.5	8X2.5	8X10	80	20	0.25	0.71	470	0.78
FPHC-90-4W	4X25	4X5	4X20	80	20	0.25	0.71	470	0.78
FPHC-90-5W	5X22.5	5X4.5	5X18	90	22.50	0.25	0.80	528	0.88
FPHC-90-6W	6X18.75	6X3.75	6X15	90	22.50	0.25	0.80	528	0.88
FPHC-90-9W	9X12.5	9X2.5	9X10	90	22.50	0.25	0.80	528	0.88
FPHC-100	10X12.5	10X2.5	10X10	100	25	0.25	0.89	587	0.98
FPHC-120	10X15	10X3	10X12	120	30	0.25	1.07	704	1.17
FPHC-128	8X20	8X4	8X16	128	32	0.25	1.14	751	1.25
FPHC-160	8X25	8X5	8X20	160	40	0.25	1.43	939	1.57

1. FocalPoint HC model sizes are not fixed to a width or length dimension and are expressed as a filter bed area that can be dimensioned based on site specific conditions. To facilitate ease of layout recommended WXL dimensions are included herein, please see manufacturer's details and design guidelines for custom layouts.
2. Based on 4 gpm/ft^2 of effective treatment area.
3. Drainage Area is based on mass capture capacity of 5.87 lbs/ft^2 of filtration area and the equation in the NJDEP Filter Protocol wherein drainage area is calculated by dividing the pounds of mass captures by 600 lbs/acre.