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VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

The Stormwater Management StormFilter®

Developed by CONTECH Engineered Solutions LLC
Scarborough, Maine, USA

Registration: GPS-ETV_VR2023-06-30_NJDEP

In accordance with

ISO 14034:2016

Environmental Management —
Environmental Technology Verification (ETV)

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June 30, 2023
Vancouver, BC, Canada

Verification Body
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Verification Overview

This Environmental Technology Verification (ETV) of The Stormwater Management StormFilter® (StormFilter) is the first part of a two-part verification process and entails the verification of performance claims (#1 & 2) based on laboratory testing in accordance with the New Jersey Department of Environmental Protection (NJDEP) *Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January, 2013)*. This verification complements the subsequent verification of field testing data, collected in accordance with The Washington State Department of Ecology emerging stormwater treatment technologies, in accordance with guidelines identified by Ecology (2011) in the Technology Assessment Protocol – Ecology (TAPE).

Technology description and application

The Stormwater Management StormFilter® (StormFilter) is a manufactured treatment device that is provided by Contech Engineered Solutins LLC (Contech). The StormFilter improves the quality of stormwater runoff before it enters receiving waterways through the use of its customizable filter media, which removes non-point source pollutants. As illustrated in **Figure 1,** the StormFilter is typically comprised of a vault or manhole structure that houses rechargeable, media-filled filter cartridges. Stormwater entering the system percolates through these media-filled cartridges, which trap particulates and remove pollutants. Once filtered through the media, the treated stormwater is discharged through an outlet pipe to a storm sewer system or receiving water.

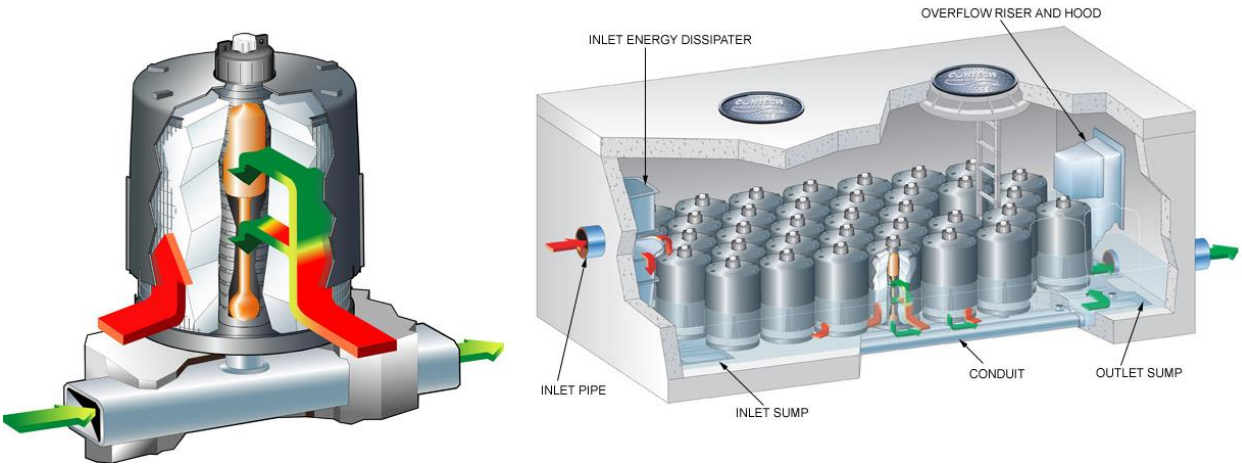

Figure 1 Individual StormFilter Cartridge (Left) and Typical Vault StormFilter Installation (Right)

Depending on the treatment requirements and expected pollutant characteristics at an individual site, the per cartridge filtration flow rate and driving head can be adjusted. The flow rate is individually controlled for each cartridge by a restrictor disc located at the connection point between the cartridge and the underdrain manifold. Driving head is managed by positioning of the inlet, outlet, and overflow elevations. The StormFilter is typically designed so that the restrictor disc passes the design treatment rate once the water surface reaches the shoulder of the cartridge which is equivalent to the cartridge height. Since the StormFilter uses a restrictor disc to restrict treatment flows below the hydraulic capacity of the media

the system typically operates under consistent driving head for the useful life of the media. Site specific head constraints are also addressed by three different cartridge heights (low drop (effective height of 12 inches), 18, and 27 inches) which operate on the same principal and surface area specific loading rates. The StormFilter requires a minimum of 1.8 ft, 2.3 ft and 3.05 ft of drop between inlet invert and outlet invert to accommodate the low drop, 18 and 27 inch cartridges, respectively, without backing up flow into the upstream piping during operation. When site conditions limit the amount of drop available across the StormFilter then flow is typically backed up into the upstream piping during operation to ensure sufficient driving head is provided. If desirable the StormFilter can be designed to operate under additional driving head.

The StormFilter is offered in multiple configurations including plastic, steel, and concrete catch basins; and precast concrete manholes, and vaults. Other configurations include panel vaults, CON/SPAN®, box culverts, and curb inlets. The filter cartridges operate consistently and act independently regardless of housing which enables linear scaling.

The StormFilter cartridge can house different types of media including perlite, zeolite, granular activated carbon (GAC), CSF® leaf media, MetalRx™, PhosphoSorb® or various media blends such as ZPG™ (perlite, zeolite and GAC). All of the media use processes associated with depth filtration to remove solids. Some media configurations also provide additional treatment mechanisms such as cation exchange, and/or adsorption, chelation, and precipitation. This verification is specific to a laboratory evaluation of the StormFilter using perlite media.

Performance conditions

The data and results published in this Verification Statement were obtained from the laboratory testing conducted on The Stormwater Management StormFilter® device, in accordance with the New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January, 2013) (NJDEP Filtration Protocol). 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).

Performance claim(s)

Performance Claim 1 (NJCAT)

The Stormwater Management StormFilter®, with perlite media, demonstrated at least 80% removal of total suspended solids at a design hydraulic loading rate of 1.44 l/s/m^2 (2.12 gpm/ft^2) of media surface area and at a constant influent test sediment concentration of 200 mg/L in laboratory testing conducted under the 2013 NJDEP Protocol (removal efficiency test). This performance claim was verified at a 95% level of confidence.

Performance Claim 2 (NJCAT)

During the load testing (mass sediment load capacity) conducted under the 2013 NJDEP Protocol, The Stormwater Management StormFilter®, with perlite media, maintained at least 80% removal of total suspended solids at a design hydraulic loading rate of 1.44 l/s/m^2 (2.12 gpm/ft^2) of media surface area to a cumulative mass sediment load of 54.3 lbs by a single 45.72 cm tall and 18in cartridge. This performance claim was verified statistically at a 95% level of confidence.

Performance results

Performance Claim 1 (NJCAT):
Raw data summarizing the percent removal of influent total suspended solids (TSS) by The Stormwater Management StormFilter®, at a concentration of 200 mg/L and a loading rate of 2.12 gpm/sq. ft. of media surface area.

Run #	Average Influent TSS Concentration (mg/L)	Background (mg/L)	Adjusted Effluent (mg/L)	TSS Removed (%)
1	203	2.11	37.7	81.8
2	210	1.83	35.4	83.7
3	207	2.84	40.5	81.2
4	213	2.04	36.8	83.3
5	212	2.17	35.8	83.7
6	208	2.34	38.0	82.3
7	212	2.08	38.4	82.5
8	203	2.42	35.8	83.0
9	206	2.86	35.2	83.5
10	207	3.16	35.6	83.3

Sum	823
N (COUNT)	10
Mean (AVG)	82.3
STDEV.s	0.871
VAR.s	0.758
Z (alpha)	1.65
Z (beta)	1.29
Hypothesized mean	80.0

Performance Claim 2 (NJCAT):

Raw data summarizing the percent removal of influent total suspended solids (TSS) and its capture by The Stormwater Management StormFilter®, at 200 mg/L (Run 1-45) and 400mg/L (Run 46-66).

Run #	Average Influent TSS Concentration (mg/L)	Background (mg/L)	Adjusted Effluent (mg/L)	Mass Captured (lbs)	TSS Removed (%)
1	203	2.11	37.7	0.640	81.8
2	210	1.83	35.4	1.32	83.7
3	207	2.84	40.5	1.96	81.2
4	213	2.04	36.8	2.65	83.3
5	212	2.17	35.8	3.33	83.7
6	208	2.34	38.0	3.99	82.3
7	212	2.08	38.4	4.67	82.5
8	203	2.42	35.8	5.32	83.0
9	206	2.86	35.2	5.98	83.5
10	207	3.16	35.6	6.65	83.3
11	200	1.78	37.4	7.29	81.8
12	209	1.55	36.0	7.96	83.4
13	211	2.29	40.9	8.62	81.3
14	206	1.96	37.7	9.21	*excluded*
15	209	2.32	36.2	9.87	83.2
16	202	2.07	36.5	10.5	82.6
17	206	1.97	39.9	11.2	81.3
18	203	3.13	35.1	11.8	83.2
19	204	2.57	37.2	12.5	82.4
20	210	2.64	35.6	13.1	83.6
21	199	3.17	39.8	13.8	80.7
22	206	3.07	40.5	14.4	80.9
23	203	3.32	37.1	15.1	82.3
24	206	2.91	38.5	15.7	81.8
25	203	3.44	37.4	16.3	82.1
26	204	2.77	40.4	17.0	80.8
27	208	2.85	29.4	17.6	*excluded*
28	199	2.46	37.7	18.2	81.5
29	199	3.72	37.6	18.8	81.6
30	202	3.66	37.6	19.5	82.0
31	200	3.41	42.4	20.1	79.3
32	202	3.17	43.4	20.7	79.1
33	204	4.52	42.5	21.3	79.8
34	200	5.11	40.0	22.0	80.6
35	198	4.11	44.4	22.5	78.1
36	204	3.90	43.1	23.2	79.5
37	203	4.55	43.1	23.8	79.4
38	202	4.84	41.4	24.4	80.0
39	203	5.55	34.8	25.1	83.3
40	203	6.34	39.9	25.7	80.9
41	199	3.53	43.3	26.3	78.7
42	199	3.21	45.1	26.9	77.9
43	200	3.21	40.9	27.5	80.1

44	203	3.41	40.0	28.2	80.9
45	202	3.61	46.6	28.8	77.4
46	401	1.78	79.2	30.0	80.8
47	402	1.91	81.6	31.3	80.2
48	401	2.38	85.6	32.5	79.2
49	396	2.83	87.0	33.7	78.5
50	412	1.62	85.5	35.0	79.6
51	396	3.66	87.6	36.2	78.3
52	396	4.12	90.1	37.3	77.6
53	403	4.05	92.4	38.5	77.4
54	403	4.85	89.9	39.8	78.1
55	400	3.59	86.3	41.0	78.8
56	400	1.85	89.0	42.2	78.2
57	403	2.33	88.7	43.4	78.5
58	407	3.25	89.6	44.6	78.2
59	395	3.22	92.5	45.8	76.9
60	404	3.01	88.2	47.0	78.5
61	410	1.82	90.7	48.2	*excluded*
62	398	2.15	86.6	49.4	78.6
63	401	2.60	88.1	50.6	78.3
64	402	2.75	91.5	51.9	77.6
65	403	4.10	89.1	53.1	78.2
66	402	3.65	89.5	54.3	77.8
Sum	5069				
N (COUNT)	63				
Median	80.7				
STDEV.s	2.03				
VAR.s	4.12				
Z (alpha)	1.65				
Z (beta)	1.29				
Hypothesized median	80.0				

Performance Claims were statistically analyzed and verified using the *mean* percent removal values for Claim #1, which utilized normally distributed data. The data set for Claims #2 was not normally distributed, which required the use of the *median* of the data as a surrogate for the mean, in order to be verified statistically at a 95% level of confidence.

Verification

This verification was first completed in June 2020 by the Verification Expert, the Centre for Advancement of Water and Wastewater Technologies ("CAWT"), contracted by GLOBE Performance Solutions, applying the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Contech Engineered Solutions LLC to support the performance claim included the following:

- Performance test report "NJCAT TECHNOLOGY VERIFICATION, Stormwater Management StormFilter® (StormFilter) With Perlite Media" prepared by Contech Engineered Solutions, November 2016. This report is based on a test program was conducted at Contech's Portland, Oregon laboratory under the direct supervision of *Scott A. Wells, Ph.D. and Associates* in accordance with the New Jersey Department of Environmental Protection (NJDEP) *Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January, 2013)* and in compliance with the requirements of ISO/IEC 17025.

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV) and was developed and published by the International Organization for Standardization (ISO). The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

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