Verification Statement

ACO Systems Ltd. StormBrixx Sediment Filtration Tunnel
Registration number: (V-2026-05-01)
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Technology type	Stormwater Filtration Device
Application	Stormwater filtration technology to remove sediments, nutrients, heavy metals, and organic contaminants from stormwater runoff
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Verified Performance Claim

The StormBrixx Sediment Filtration Tunnel (StormBrixx) demonstrated a total suspended solids (TSS) removal efficiency of at least 81% at the maximum treatment flow rate (MTFR), corresponding to a hydraulic loading rate of 3.68 gpm/ft² (149.8 L/min/m^2), under defined test conditions. The minimum removal efficiency at the lower 95% confidence level is 81%, based on ten qualifying test runs. The verified performance applies to StormBrixx systems sized and operated at or below the corresponding hydraulic loading rate under the defined test conditions. Performance outside these conditions has not been verified.

Basis of Verification - Performance verification is based on full-scale laboratory testing conducted at Verdantas Flow Labs (Massachusetts, USA) using the StormBrixx 900SD configuration as a representative test unit. Testing was performed 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, 2022 (updated 2023)* and an approved Quality Assurance Project Plan (QAPP)[1]. Data evaluation and independent verification were conducted by the Fleming Centre for Advancement of Water and Wastewater Technologies (Ontario, Canada) technical verification expert (TVE) in accordance with *ISO 14034:2016 Environmental management — Environmental technology verification (ETV)* and the VerifiGlobal Performance Verification Protocol.[2]

[1] Alden Research Laboratory, LLC, *QAPP for Verification Testing of the ACO StormBrixx Sediment Filtration Tunnel (2024)*
[2] VerifiGlobal, *Performance Verification Protocol (Applying ISO 14034:2016)*, VG-2016-002 (rev. 2017-05-04)

Technology Application

ACO Systems, Ltd. (operating as ACO Canada) is a subsidiary of the global ACO Group, a multinational company founded in 1946, which specializes in water management products for the construction and building industries. ACO Canada specializes in surface water collection, water pre-treatment and stormwater management within Canada. The company is familiar with all aspects of water resources management including flood control, subdivision and site stormwater management, watershed studies, stormwater quality studies and lake level regulation studies. The company has designed and developed technologies for the stormwater management sector, including the StormBrixx Sediment Filtration Tunnel.

StormBrixx is a unique patented plastic geocellular stormwater management system designed for surface water detention, storage and infiltration. Its versatility allows it to be used in applications across all construction environments as a standalone solution or as part of a Low Impact Development (LID). When the patented geocellular thermoplastic units are combined, they form a system that provides high void space (95-97%) stormwater storage for flood mitigation, detention, and infiltration applications. These systems can be outfitted with Sediment Filtration Tunnels to provide treatment of stormwater influent. A Sediment Filtration Tunnel consists of one or more StormBrixx half-modules that are connected to the inflow via a nearby control structure. The control structure directs the treatment flow into the Sediment Filtration Tunnel, with a weir or raised bypass allowing flows greater than the treatment flow rate to bypass the Sediment Filtration Tunnel and discharge into the larger system. StormBrixx contributes to pollutant load reduction and supports compliance with applicable regulatory requirements.

A photo of a typical ACO StormBrixx system is shown in Figure 1.

Figure 1 - Typical StormBrixx System

The Sediment Filtration Tunnel can be installed at any location within the system, corresponding with the influent connection location and is typically installed along the edge of the system.

Technology Description

The StormBrixx Sediment Filtration Tunnel consists of a series of interconnected modules encapsulated with a minimum of a single layer of non-woven geotextile fabric on the exterior sides, top, and bottom. At the interface between the Sediment Filtration Tunnel and the larger system, two layers of non-woven geotextile fabric are installed. This combination provides settling and filtration of stormwater, retains the sediment within the Sediment Filtration Tunnel and provides accessibility for inspection and maintenance. See Figure 2.

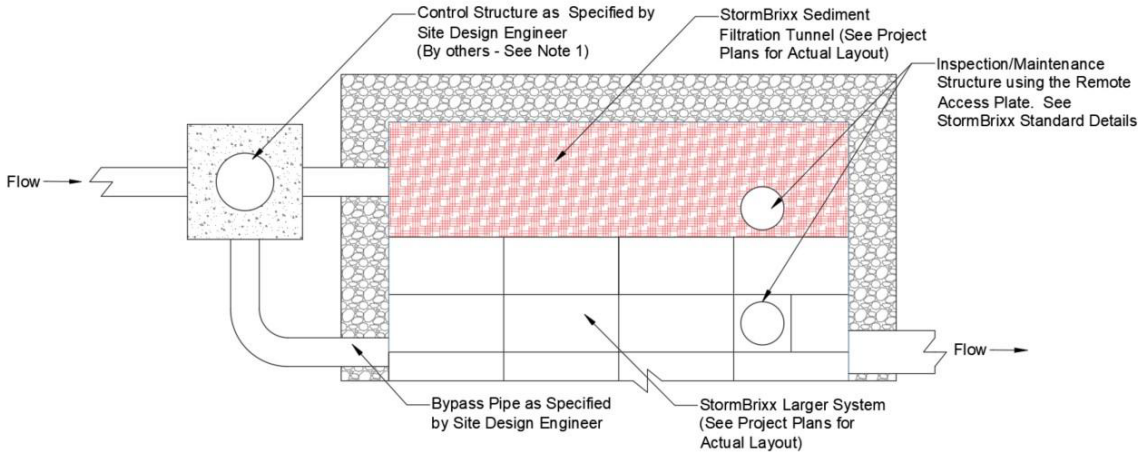


Figure 2 StormBrixx Sediment Filtration Tunnel Layout

Access points can be added in 2ft by 2ft (0.61m by 0.61m) areas within the tank using the StormBrixx Remote Access Plate or along the exterior of the tank using Remote Access Units. The Remote Access Plate is used when access is desired in the middle of tanks with footprints of at least 6ft. by 6ft. (1.83m by 1.83m). This minimum footprint allows the plates to be supported on each side. If access is desired in smaller tank sections or along the perimeter of the tank, Remote Access Units are utilized. Both components allow for inspection and cleaning of the Sediment Filtration Tunnel and the larger system. Figure 3 provides examples of both access types.

Figure 3 Accessibility for Inspection and Maintenance – Access Configurations

As an engineered component within a stormwater treatment system, the ACO StormBrixx Sediment Filtration Tunnel provides significant environmental benefits by removing pollutants, protecting groundwater quality, and enhancing the sustainable urban development. As part of the wider StormBrixx geocellular system, the StormBrixx Sediment Filtration Tunnel enables effective treatment of stormwater runoff, typically achieving over 80% removal of Total Suspended Solids (TSS).

Technology Performance Testing

The StormBrixx Sediment Filtration Tunnel is available in four module combinations (300HD, 300SD, 600HD, and 900SD). Based on the company's experience with commonly selected module/system heights for filtration applications, the one-layer 900SD module with a system height of approximately 36 inches (0.91 m) was selected for suspended removal performance testing at Verdantas Flow Labs.

Test Configuration

The test setup included an inlet Sediment Filtration Tunnel of 3 modules and an adjacent Outlet Tank of 3 modules (6 total). Each module measured 4ft. L x 2ft. W x 3ft. H (1.22m L × 0.61m W × 0.91m H) nominally. The modules sat on a 6-inch (0.152 m) base of AASHTO #57 3/4-1.5-inch (1.9-3.8 cm) double-washed angular granite. Each row was wrapped in non-woven geotextile fabric. The perimeter volume and top of the modules were backfilled with the same stone as the base. A 12 inch (0.305 m) influent pipe, set at a 1% slope, was located at the center of the inlet row. The invert of the pipe was located 4 inches (0.102 m) above the base stone. A 12-inch (0.305 m) outlet pipe was located at the center of the outlet row, with the invert located 2 inches (0.051m) above the base stone. Custom fabric boots were used to seal the influent and effluent pipes to the modules. An external bypass was set at 39 inches (0.99 m) above the bottom of the modules.

Test Sediment and Particle Size Distribution

Testing was conducted using a standardized silica-based sediment (1–1000 µm, specific gravity 2.65) uniformly mixed to meet the required particle size distribution (PSD). The PSD was verified in accordance with NJDEP Filtration MTD Protocol requirements, with all measured values within allowable tolerances and a median particle size (D_{50}) of 68 µm. The target PSD is shown in Table 1. A comparison of the measured PSD to the NJDEP specified distribution is provided in Figure 3.

Test Implementation

Testing was performed under controlled laboratory conditions using a target influent total sediment concentration of 200 mg/L (+/-20 mg/L) and a particle size distribution of 1–1000 µm (D_{50} = 68 µm). The maximum treatment flow rate (MTFR) was 216 gpm (817.7 L/min), corresponding to a hydraulic loading rate of 3.68 gpm/ft² (149.8 L/min/m^2). The temperature of the supply water was below 26.7°C (80°F).

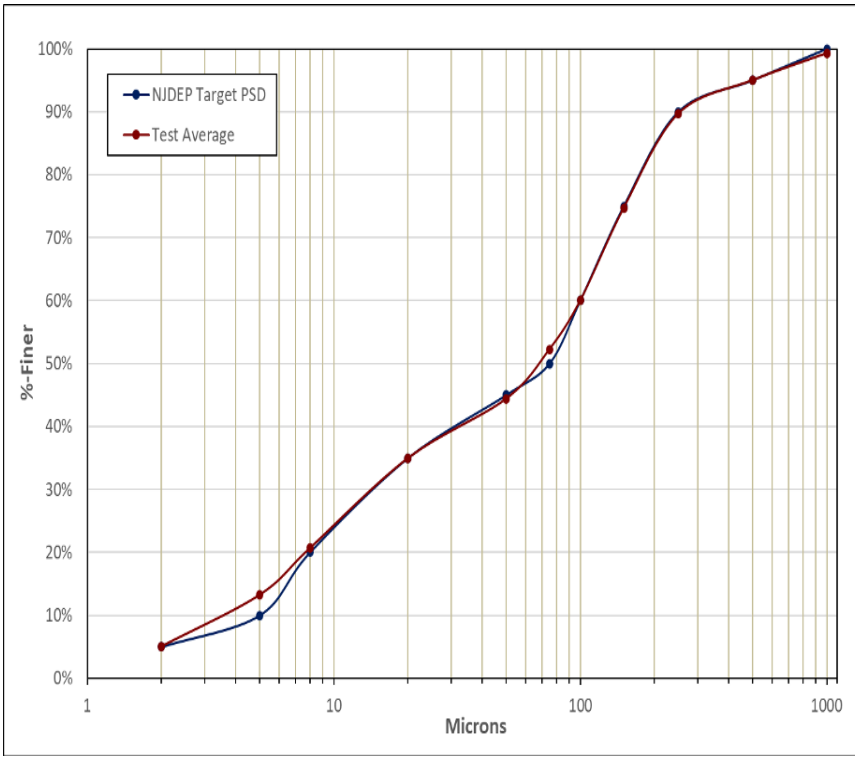
Effluent sampling was conducted throughout each test run using time-based and volume-based collection methods. Six (6) time-weighted effluent samples and three (3) background samples of the supply water were collected during each run, with additional samples obtained during the drawdown period.
The allowed Coefficient of Variance (COV) for the measured samples was 0.10.

Flow rates were controlled and monitored using calibrated instrumentation, and water elevations within the system were measured throughout testing to confirm hydraulic conditions. Measured flows were consistent with target conditions. Water elevations were monitored throughout testing to confirm hydraulic conditions, with a maximum measured driving head of approximately 2.6 ft. (0.79 m) observed during peak conditions. All sampling and measurement systems met applicable calibration and accuracy requirements.

Table 1 – Test Sediment Particle Size Distribution

Particle Size (Microns)	Target Minimum % Less Than*
1,000	100
500	95
250	90
150	75
100	60
75	50
50	45
20	35
8	20
5	10
2	5

Figure 3 – Average PSD of the 1-1000 micron test sediment used for the sediment removal test compared to the NJDEP specified PSD



* Note: 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 d_{50} value does not exceed 75 microns.

Analytical Methods

Influent sediment concentration for each test run was calculated based on the sediment mass feed rate and measured flow rate. Measured effluent concentrations, together with calculated influent concentrations, were used to determine concentration-based removal efficiency.

Suspended solids concentrations were determined using ASTM D3977 by an ISO/IEC 17025[3] accredited laboratory. All samples were analyzed for suspended solids concentration (SSC) in accordance with ASTM D3977, which was used as the basis for total suspended solids (TSS) removal. Particle size distribution (PSD) of the test sediment was determined using sieve and hydrometer analyses in accordance with ASTM D6913/D6913M and ASTM D7928. Moisture content was measured in accordance with ASTM D2216 to support sediment preparation and concentration calculations.

[3] *ISO/IEC 17025:2017 - General requirements for the competence of testing and calibration laboratories*

Quality Assurance

Quality assurance (QA) and quality control (QC) procedures were implemented to ensure consistency, accuracy, and reproducibility of test results. These procedures included the use of ISO 17025 accredited laboratories, standardized analytical methods, calibrated instrumentation, and defined acceptance criteria for key test parameters. The TVE reviewed and validated that QA/QC requirements were met, including confirmation of particle size distribution, influent concentration control, flow and head measurement accuracy, and analytical methods used for suspended solids concentration. Table 2 summarizes the QA/QC parameters and acceptance criteria applied during testing.

Table 2 – Validation of Performance Testing QA/QC Procedures

QC Parameter	Acceptance Criteria
Particle Size Distribution	Analyzed by an ISO 17025 accredited laboratory in accordance with ASTM D6913 and D7928. Test sediment met the required PSD specification with ≤2% variation at each size fraction and D_{50} < 75 µm.
Background Suspended Solids	Background suspended solids concentration < 20 mg/L. Samples analyzed in accordance with ASTM D3977.
Water temperature	Maintained below 26.7 °C (80 °F) during testing.
Flow measurement equipment	Flow meters calibrated to ±1% accuracy. Flow recorded at regular intervals and maintained within ±10% of target with COV ≤ 0.03.
Head measurement equipment	Water levels measured using calibrated instrumentation with minimum accuracy of ±0.125 inches (0.32 cm). Measurements recorded at regular intervals throughout testing.
Sediment feed	Target influent concentration of 200 mg/L ± 20 mg/L. Variability controlled with COV ≤ 0.10
Sediment moisture content	Determined in accordance with ASTM D2216 to support accurate sediment dosing.
Sample analysis	Conducted by ISO 17025 accredited laboratories using established analytical methods.

Summary of Removal Efficiency Test Results

The results of sediment removal efficiency testing for the StormBrixx module are summarized in Table 3. Removal efficiency was calculated based on influent, effluent and drawdown measurements.

Table 3 –Summary of StormBrixx Sediment Removal Efficiency

Run #	Mass/Volume Influent Concentration	Average Adjusted Effluent Concentration	Average Adjusted Drawdown Concentration	Influent Volume	Effluent Volume	Drawdown Volume	Removal Efficiency	Cumulative Average
	mg/L	mg/L	mg/L	L	L	L	%	%
1	196	46.4	28.1	28208	26431	1777	**77.0**	**77.0**
2	200	13.5	18.3	28265	26072	2193	**93.0**	**85.0**
3	198	31.3	20.6	28134	25498	2636	**84.7**	**84.9**
4	202	38.7	18.3	28222	25370	2851	**81.9**	**84.1**
5	206	34.5	18.5	28156	25274	2882	**84.0**	**84.1**
6	193	33.2	18.6	28154	25128	3026	**83.6**	**84.0**
7	203	34.7	22.9	28163	25108	3055	**83.5**	**84.0**
8	191	33.3	19.7	28221	24984	3237	**83.4**	**83.9**
9	199	32.1	28.4	28164	24807	3357	**84.1**	**83.9**
10	208	38.6	28.2	28159	24775	3384	**82.0**	**83.7**
11	198	36.9	24.0	28181	24852	3328	**82.1**	**83.6**
12	202	36.3	21.5	28205	25008	3198	**82.8**	**83.5**
13	197	32.9	21.0	28171	24910	3261	**84.0**	**83.5**
14	195	36.1	24.4	28225	24729	3497	**82.3**	**83.5**
15	197	37.6	22.4	28237	24596	3641	**82.0**	**83.4**
16	201	37.9	24.7	28181	24555	3626	**82.0**	**83.3**
17	194	37.0	29.7	69112	65411	3701	**81.1**	**83.0**
18	195	38.1	33.8	69172	65275	3896	**80.6**	**82.7**

Verification Results

Verification of the StormBrixx test results was conducted in accordance with ISO 14034:2016 and the VerifiGlobal Performance Verification Protocol. The process included review of the test procedure, supporting documentation, and validation of test data against the requirements of an established lab testing protocol.

The test results were used to establish the performance claim summarized in Table 4. The claim is based on the “Cumulative Average Removal Efficiency” data that were statistically evaluated using a non-parametric Wilcoxon Signed-Ranks test. Ten qualifying runs were used for statistical evaluation to support the reported performance.

At a 95% confidence level, there is sufficient evidence to conclude that the median cumulative TSS removal efficiency of the StormBrixx Sediment Filtration Tunnel is at least 81.0%.

The verified performance claim for the StormBrixx technology is based on full-scale laboratory testing conducted using the StormBrixx one-layer 900SD module configuration as a representative test unit. The verified performance applies to StormBrixx systems sized and operated at or below the corresponding hydraulic loading rate under the defined test conditions.

Table 4 – Summary of Verified Performance Claim for StormBrixx Sediment Filtration Tunnel

Parameter	Verified Claim	Accuracy
Sediment Removal Efficiency	During sediment removal efficiency testing conducted under controlled laboratory conditions, the StormBrixx Sediment Filtration Tunnel demonstrated a minimum total suspended solids (TSS) removal efficiency of 81% at the lower 95% confidence level, based on 10 qualifying test runs. Testing was performed using an inlet sediment concentration of approximately 200 mg/L, a particle size distribution of 1–1000 µm (D_{50} = 68 µm), and an average flow rate of 216 gpm (817.7 L/min), corresponding to a hydraulic loading rate of 3.68 gpm/ft² (149.8 L/min/m^2).	Sediment removal characteristics were quantified at the maximum treatment flow rate (MTFR) of 216 gpm (817.7 L/min), with a particle size distribution (PSD) gradation of 1-1000 microns fractions (D_{50} = 68 µm). The target influent total sediment concentration was 200 mg/L (+/-20 mg/L) for all tests. The allowed Coefficient of Variance (COV) for the measured samples was 0.10. The temperature of the supply water was below 26.7 °C (80 °F).

Other Performance Parameters

The verified performance of the StormBrixx Sediment Filtration Tunnel is presented in Table 4 and on the front page of this Verification Statement. In addition to total suspended solids (TSS) removal efficiency, other performance parameters were measured during testing to characterize system hydraulics, treatment capacity, and operational conditions under the defined test conditions. These parameters are not independent performance claims but provide supporting information for interpreting the verified performance and understanding system behavior under the tested conditions. Key parameters measured during testing are summarized in Table 5.

Table 5 – Supporting Test Parameters and Measured Values (Non-Verified Metrics)

Performance Parameter	Measured Value Under Test Conditions
Maximum Treatment Flow Rate - MTFR	The StormBrixx® Sediment Filtration Tunnel system has an MTFR of 216 gpm (817.7 L/min), and a loading rate of 3.68 gpm/ft^2 (149.8 L/min/m^2). Flow rates from calibrated flow instruments were recorded every 5 seconds over the duration of the test.
Detention Time and Wetted Volume	The StormBrixx® Sediment Filtration Tunnel system maximum wet volume is 62.4 ft^3 (1.77 m^3) at 1.3 ft (0.40m) water level, and the detention time was on average 2.2 minutes over the course of the testing at the average test flow rate of 216 gpm (817.7 L/min).
Hydraulic Losses	The measured water elevation of 2.6 ft (0.79 m) did not reach the target driving head of 3.0 ft (0.91 m) at the end of the 18th run. Accuracy of the readings was 0.3 mm.
Effective Filtration Treatment Area (EFTA)	The EFTA for the test system is 58.7 ft^2 (5.45 m^2)

Effective Sedimentation Treatment Area -ESTA	EFTA and ESTA are equivalent for filtration systems with no distinct pre-filtration settling zone.
Sediment Mass Load Capacity	The maximum sediment mass loading capacity is 257.2 lbs (116.66 kg), determined using the relationship between measured sediment removal efficiency and the cumulative injected mass
Sediment Mass Capture Capacity	Sediment mass capture capacity is 212.7 lbs (96.48 kg) or 3.62 lbs/ft^2 (17.67 kg/m^2) of filter area)
Maximum Allowable Inflow Drainage Area	Maximum inflow drainage area is 0.355 acres (0.144 ha). Per the NJDEP protocol, to calculate the maximum inflow drainage area, the total sediment mass captured during the test is divided by 600 lbs/acre (672.8 kg/ha). In this case the total captured sediment mass was 212.7 lbs (96.48 kg).

Design and Operational Considerations

The verified performance of the StormBrixx Sediment Filtration Tunnel applies to systems designed, sized, and operated within the hydraulic loading conditions established during testing. System performance is dependent on available driving head and hydraulic conditions. As sediment accumulates within the system, head loss will increase, which may reduce treatment flow capacity and increase the potential for bypass if not addressed through maintenance.

Design of the StormBrixx system must consider site-specific factors including available footprint, storage requirements, pipe configuration, and allowable head conditions to ensure that treatment flow rates and hydraulic performance remain within the verified range and is suitable for installation under typical earth and traffic loading conditions when installed in accordance with manufacturer requirements.

The StormBrixx may be applied across a range of site conditions. In areas with high groundwater or sensitive receiving environments, additional design measures such as liners may be required in accordance with local regulations. While additional pretreatment is not required for verified performance, upstream sediment control measures may be considered for sites with elevated pollutant loading to support long-term operation.

Routine inspection and maintenance are required to sustain hydraulic and treatment performance over time. Performance outside these conditions has not been verified.

What is ISO 14034?

The purpose of environmental technology verification is to provide a credible and impartial account of the performance of environmental technologies. Environmental technology verification is based on a number of principles to ensure that verifications are performed and reported accurately, clearly, unambiguously and objectively. The International Organization for Standardization (ISO) standard for environmental technology verification (ETV) is ISO 14034, which was published in November 2016.

Benefits of ETV

ETV contributes to protection and conservation of the environment by promoting and facilitating market uptake of innovative environmental technologies, especially those that perform better than relevant alternatives. ETV is particularly applicable to those environmental technologies whose innovative features or performance cannot be fully assessed using existing standards. Through the provision of objective evidence, ETV provides an independent and impartial confirmation of the performance of an environmental technology based on reliable test data. ETV aims to strengthen the credibility of new, innovative technologies by supporting informed decision-making among interested parties.

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