NJCAT TECHNOLOGY VERIFICATION

StormTrap SurgeSettler™ Separator - Side Outlet Configuration
Coarse Sediment Removal

StormTrap LLC

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1. Introduction

Previous laboratory testing, presented in the New Jersey Corporation for Advanced Technology (NJCAT) Technology Verification Report: StormTrap SurgeSettler™ High Flow Hydrodynamic Separator – Side Outlet Configuration report (June 2026), demonstrated that the SurgeSettler Side Outlet Configuration manufactured treatment device (MTD) by StormTrap LLC, herein referred to as the SurgeSettler 90°, can achieve a weighted sediment removal rate of at least 50% in accordance with the "New Jersey Department of Environmental Protection (NJDEP) Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" (January 1, 2021, last updated April 25, 2023). The sediment specified within the NJDEP protocol has a particle size range of 1-1000 micron (µm) and a median particle size (d_{50}) of ≤75 µm. Many jurisdictions across North America are interested in stormwater MTD removal with an alternative median particle size. Since there are no widely accepted models for predicting capture of sediment of a different particle size distribution (PSD), additional testing was completed to look at capture of sediment with an alternative PSD. The goal of the testing was to determine the Maximum Treatment Flow Rate (MTFR) that would result in 80% net annual weighted sediment removal efficiency using the side outlet configuration in accordance with the NJDEP methodology while using a coarser PSD.

Testing was conducted on the identical equipment and in the same manner as the testing that was done previously for the NJCAT verification and NJDEP certification of the SurgeSettler 90° MTD, this time **using a coarse test sediment PSD**. The PSD of the test sediment used was an OK-110 equivalent, specifically Sediment B in ASTM E3317, with a median particle size (d_{50}) of 108 µm which is coarser than the NJDEP PSD. As a result of the use of coarser sediment, these results do not qualify for NJDEP certification. **Therefore, the performance testing was for NJCAT verification only.**

2. Description of Technology

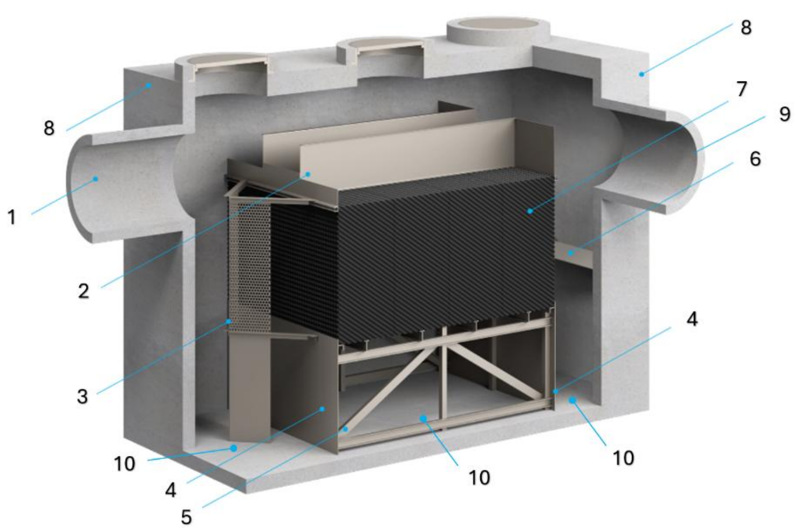
The SurgeSettler 90° is an MTD developed by StormTrap® that improves the quality of stormwater runoff before it enters receiving waterways. The SurgeSettler and SurgeSettler 90^0 are designed to remove sediment from runoff using inclined tube settling technology. Stormwater enters a vault through an inflow pipe and exits through an outflow pipe that is placed at the same elevation. The vault consists of a forebay, a settling section and an outlet bay. The forebay contains a perforated wedge structure, identified as the Flow Wedge in **Figure 1**, designed to distribute the flow to each side of the settling section while allowing a portion of the flow to pass through the center. The settling section consists of an internal structure that includes settling packs, weirs and baffles. The settling packs consist of a large number of vertical sheets formed with narrow channels which provide greatly extended settling area and reduced settling distance. The settling pack channels are at an angle to the horizontal that allows for sediment that settles on the surface to fall through the channels and into the bottom of the unit (sump). The outlet bay is an empty space that allows for the water quality treatment flow and bypass flow, if there is any, to recombine before the water exits the system.

Given the unit's rectangular geometry, the 90° outlet orientation sediment removal performance is not the same as the 180° system, so this is not an "Alternate Configuration" test, this is a new product test. In addition to the new inlet/outlet orientation, a 25-degree downward-sloped ledge was incorporated along the downstream back wall at an elevation 1’ above the bottom of the enhanced settling packs, to dissipate and redirect flow in the outlet region and minimize sediment resuspension. In all other respects the SurgeSettler 90° and SurgeSettler are the same.

The weirs and baffles in the settling section are at elevations such that floatable material is retained in the forebay at flows up to the bypass flow. The retention bays are equipped with weirs that extend above the middle bypass weir. Bypass occurs in two stages: bypass of the middle back baffle at high flows and bypass of the left and right back retention bay baffles at extremely high flows. Full internal bypass is possible at extremely high flows, above the rated scour flow.

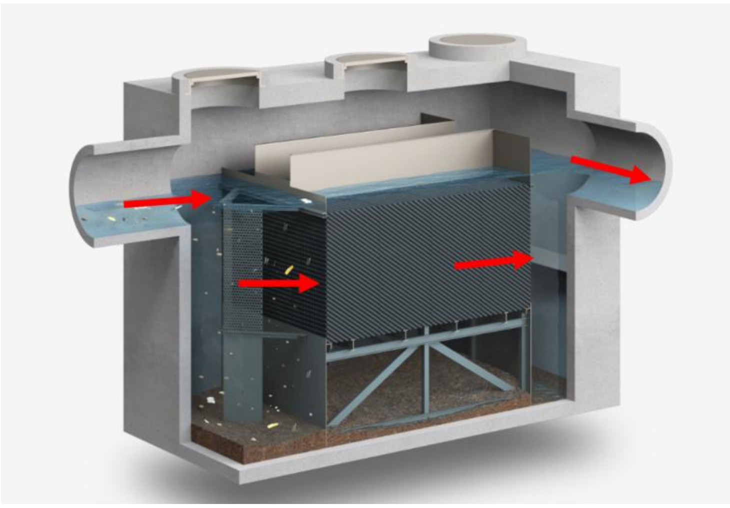
Water entering through the inlet pipe is split and distributed into the enhanced settling section by the flow wedge at the front of the unit. From there, the water moves into the enhanced settling packs, where it is further divided into many narrow pathways. Despite the angled channels in the enhanced settling pack the overall flow direction remains predominantly horizontal through the packs toward the outlet. As the flow passes through the enhanced settling packs, conditions are created that promote particle settling, allowing suspended solids to fall below the enhanced settling pack and be retained in the unit sump. The treated water then continues through the settling packs, recombines in the outlet bay, and exits the system through the outlet pipe.

Figure 1 identifies key internal components of the SurgeSettler 90° while **Figure 2** and **Figure 3** depict low and high flow operation. Red arrows indicate flow path. The internal components are typically fabricated using plastic or fiberglass parts. The internals are typically housed within a concrete vault structure. Maintenance is performed by accessing the unit in three locations including the forebay, the outlet bay, and a 2’ x 2’ maintenance access opening in the center of the enhanced settling pack.



1.	Inlet
2.	Overflow Baffles
3.	Flow Wedge
4.	Divider Wall
5.	Enhanced Settling Pack Support Frame
6.	Flow Ledge
7.	Settling Pack
8.	Tank Wall
9.	Outlet
10.	Sump

Figure 1 - SurgeSettler 90° Internal Components



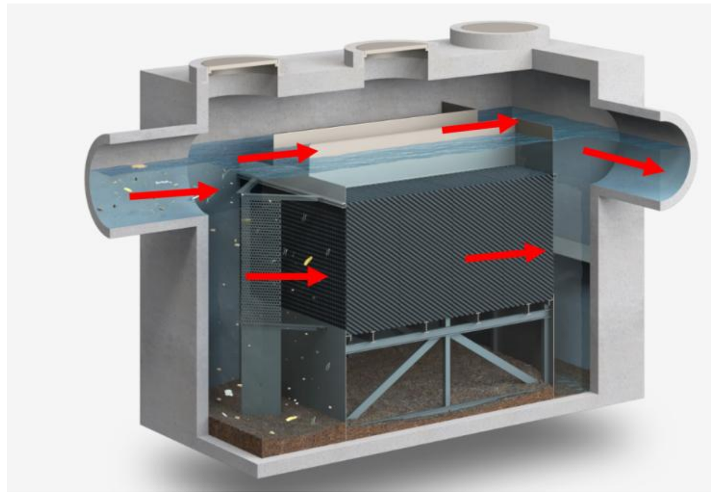


Figure 2 - SurgeSettler 90° Low Flow Operation **Figure 3 - SurgeSettler 90° High Flow Operation**

3. Laboratory Testing

The SurgeSettler 90° was previously evaluated for sediment removal efficiency and scour in the NJCAT Technology Verification Report: StormTrap SurgeSettler™ High Flow Hydrodynamic Separator – Side Outlet Configuration (June 2026). Prior to commencing the testing program, a quality assurance project plan (QAPP) was submitted to and approved by NJCAT. Since scour testing had already been conducted on the SurgeSettler unit for NJDEP certification and passed at a flow rate of 17.5 cfs, >200% of the MTFR claimed in this testing, retesting was deemed unnecessary. For reference, the original scour testing setup and results are included in this report.

Testing was conducted at the StormTrap Research and Development Laboratory Facility in Morris, Illinois under the observation of a third-party witness, Jason Wiesbrock, P.E., Vice President of Spaceco. Inc. Mr. Wiesbrock's credentials were reviewed and approved by NJCAT prior to the start of testing. Water samples collected during testing were analyzed by Gabriel Environmental Services (GES), a NELAP accredited independent laboratory located in Chicago, Illinois. Sediment particle size distribution (PSD) samples were analyzed by GeoTesting Express, an A2LA, AASHTO, and USACE accredited independent laboratory located in Acton, Massachusetts. All samples sent to independent laboratories were accompanied by chain of custody (COC) forms. The third-party witness was present and witnessed the collection of samples, sample labeling, completion of COC forms and preparation of samples for delivery to the laboratory.

3.1. Test Unit

The tested device was a commercially available SurgeSettler 90° 6'x14' unit consisting of internal components housed in a metal vault. In commercial systems, the internal components are typically housed in a concrete vault. The metal vault of the test unit is equivalent to commercial concrete vaults in all key dimensions. The use of a metal vault was proposed for testing convenience since it allows for the addition of a port that can be used for sediment removal. The test unit was equipped with a 24” diameter access port with an invert 12” above the floor to access the sump to allow for easy recovery of captured sediment. The port contains a plug to maintain a smooth inner wall. Using metal in lieu of concrete does not impact system performance.

Two test units were used during testing: one unit for sediment removal efficiency and hydraulic testing and one unit for scour testing. The SurgeSettler 90° unit used for sediment removal efficiency and hydraulic testing is hereinafter referred to as the West unit. The SurgeSettler 90^0 unit used for scour testing is hereinafter referred to as the East unit. The two units were identical except that the East unit was taller to accommodate the higher water surface elevations created by the scour flow rates. **Figure 4** is a profile view of the test unit. **Figure 5** is a plan view of the test unit. Additional dimensions are provided in **Table 1**. This unit had a total sump area of 84 ft^2 and a ***target*** MTFR of 6.91 cfs (3101 gpm).

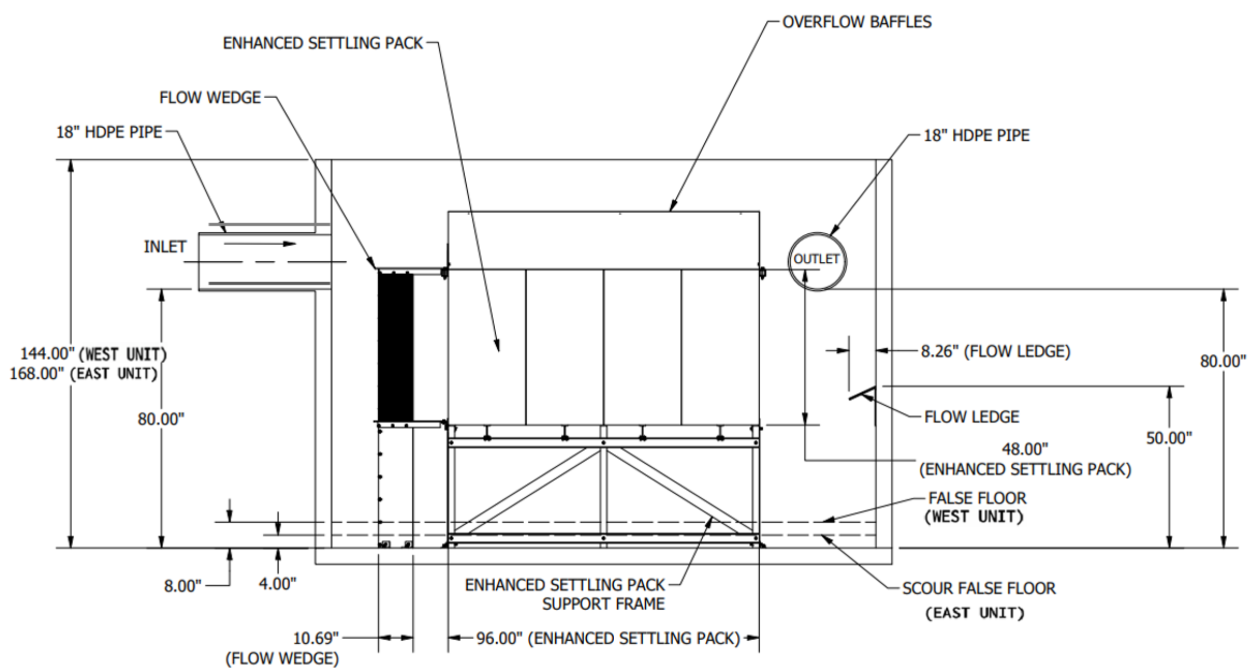


Figure 4 - SurgeSettler 90° Unit Elevations

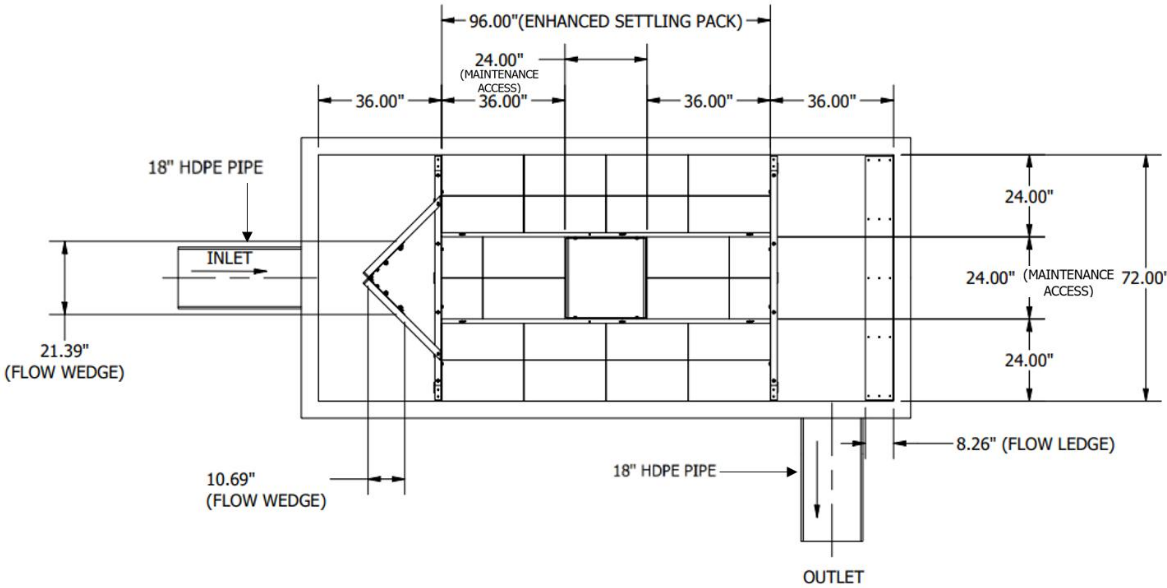


Figure 5 – SurgeSettler 90° Unit Plan View

Table 1- SurgeSettler 90^0 Dimensions

MTFR (target)		Physical Exterior Dimensions			Physical Interior Dimensions			Effective Treatment Area (ft^2)
cfs	**GPM**	**Length (ft)**	**Width (ft)**	**Depth (ft)**	**Length (ft)**	**Width (ft)**	**Depth from Invert (ft)**	
6.91	3101	15	6.83	11.17	14	6	6.67	84

3.2.Test Set Up

Test Loop 1, illustrated in **Figure 6**, operated as a recirculating closed looped system, comprised of a test pool (approximate 95,000-gallon capacity), pumps, sediment filter, flow meter, auger feeder, and the West test unit. The test loop used was capable of moving water at a rate of approximately 4670 gpm (10.4 cfs). Test Loop 1 was used for sediment removal efficiency tests and hydraulic testing from 10% MTFR to 125% MTFR.

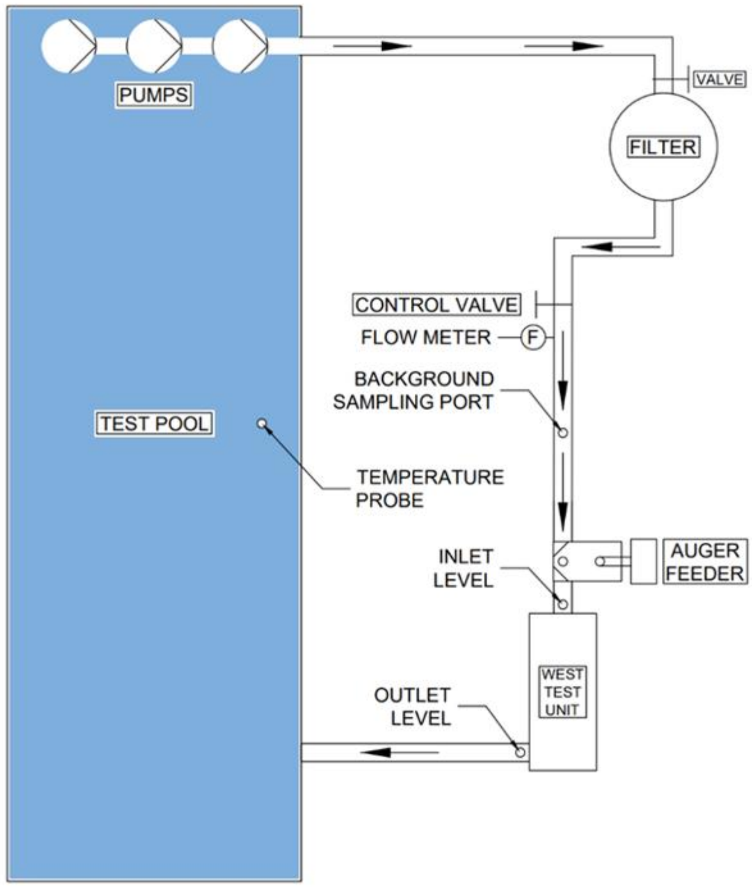


Figure 6 - Test Loop 1 "Low Flow" Laboratory Set Up

Shown in **Figure 7** through **Figure 10** are the sediment addition port (Test Loop 1, Test Loop 2 and Test Loop 3), background sampling port (Test Loop 1), the SurgeSettler 90° access port (Test Loop 1) and the outlet pipe (Test Loop 1, Test Loop 2, and Test Loop 3) respectively.

Figure 7 - Sediment Addition Port Test Loop 1, Test Loop 2 and Test Loop 3

Figure 8 - Background Sampling Port Test Loop 1

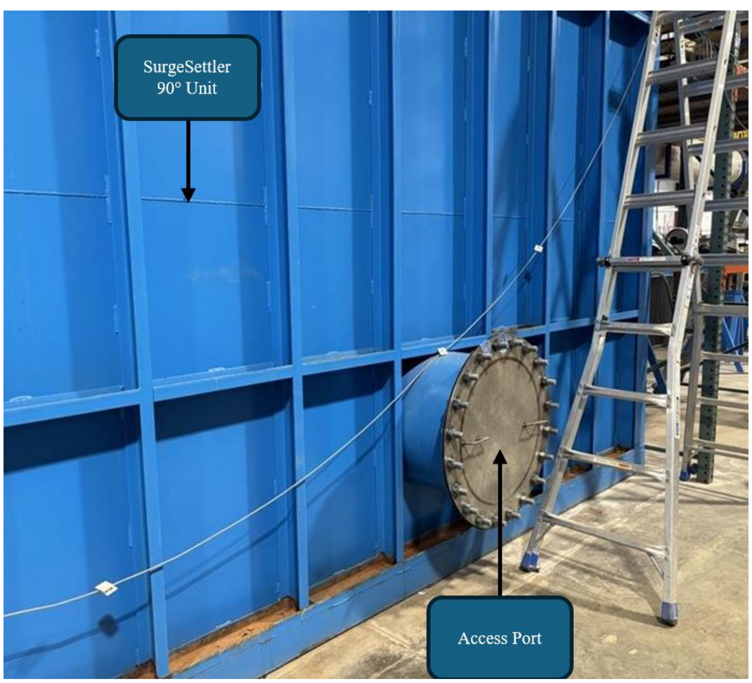


Figure 9 - SurgeSettler 90° Unit and Access Port Test Loop 1

Figure 10 - Outlet Pipe Test Loop 1, Test Loop 2 and Test Loop 3

When testing with Test Loop 1, all equipment was calibrated and connected via wired or wireless transmission to the Prosoft data acquisition system which collected and recorded outputs from each instrument. Data collection intervals for each device were input as required by the NJDEP protocol. The system was synced with a NIST timekeeping device to ensure all data points were accurately timestamped and synchronized into a centralized comma-separated values (CSV) file.

When configured in Test Loop 1, water was pumped from the test pool using a single or a series of the following pumps to achieve the desired flow rate: Tsurumi Model KTV2-15 2HP Semi-Vortex Dewatering Pump, Tsurumi Model KTV2-55 7.5 HP Semi-Vortex Dewatering Pump, Tsurumi Model KRS822L-61 30HP High Volume Dewatering Pump, and Tsurumi Model GSZ2-75-4L 100HP High Volume Dewatering Pump. Water from the test pool was pumped through a 12" PVC pipe into a Fil-Trek Model ELP50-3012-12F-A-15 filter housing containing bag filters with a rating of 1 µm for flows below 3000 gpm or 25 µm or 50 µm bag filters for flows above 3000 gpm. From the filter housing, the water flowed through a straight horizontal run of 12" diameter PVC pipe.

Flow measurements for Test Loop 1 were taken using a calibrated Krohne Enviromag 2300 C Optiflux KC 2000F electromagnetic flow meter with a measurement accuracy of ± 0.1%. The flow meter was installed away from flow disturbances on the horizontal run of 12" diameter PVC pipe downstream of the filter vessel, where full flow was achieved. The flow meter was installed in accordance with the manufacturer's instructions. The flow meter was set to collect data every 30 seconds via the Prosoft data acquisition system.

Background samples were taken from a sampling port in a section of 12" PVC vertical pipe downstream of the flow meter and upstream of the sediment addition point. The background sampling port was fashioned from a ¾" copper pipe with a 90° fitting placed in the centerline of the vertical pipe with a ball valve to open and close the port. The 18" diameter PVC inlet pipe was connected to the vertical pipe section and was 205" long and installed with a 1.6% slope. The 18" PVC outlet pipe was 60" long and installed with a 1.1% slope. The outlet pipe was terminated with a free-fall directly back into the test pool.

To meet the flow requirements for the 150% MTFR sediment removal efficiency run, additional hydraulic testing, and scour testing, supplemental external pumps, pipes and filter housings were integrated, and the loop configuration was revised as shown in **Figure 11** and **Figure 12**. Test Loop 2 was configured for use with the West unit and Test Loop 3 was configured for use with the East unit. Both Test Loop 2 and Test Loop 3 also operated as a recirculating closed looped system comprised of the test pool, pumps, sediment filters, flow meter, and auger feeder. Test Loop 2 and Test Loop 3 had a maximum flow rate of approximately 8,000 gpm (17.8 cfs). Shown in **Figure 13** and **Figure 14** are the background sampling port (Test Loop 2 and Test Loop 3) and the SurgeSettler access port and test unit (Test Loop 2 and Test Loop 3) respectively.

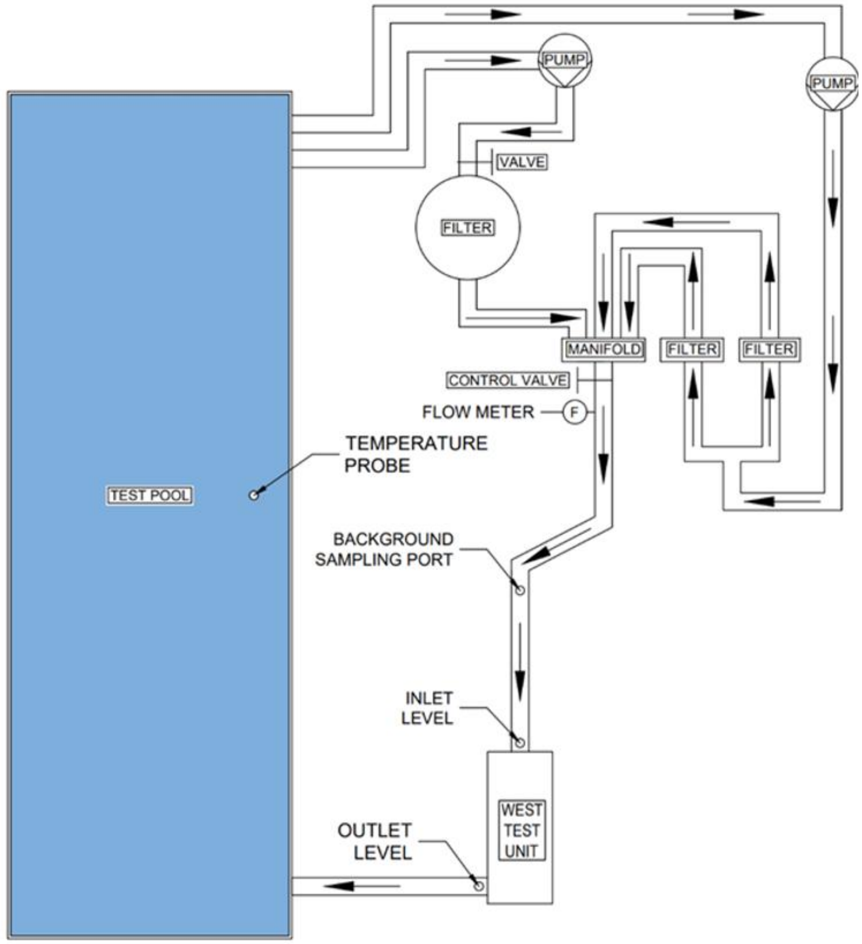


Figure 11 - Test Loop 2 "High Flow" Laboratory Set Up

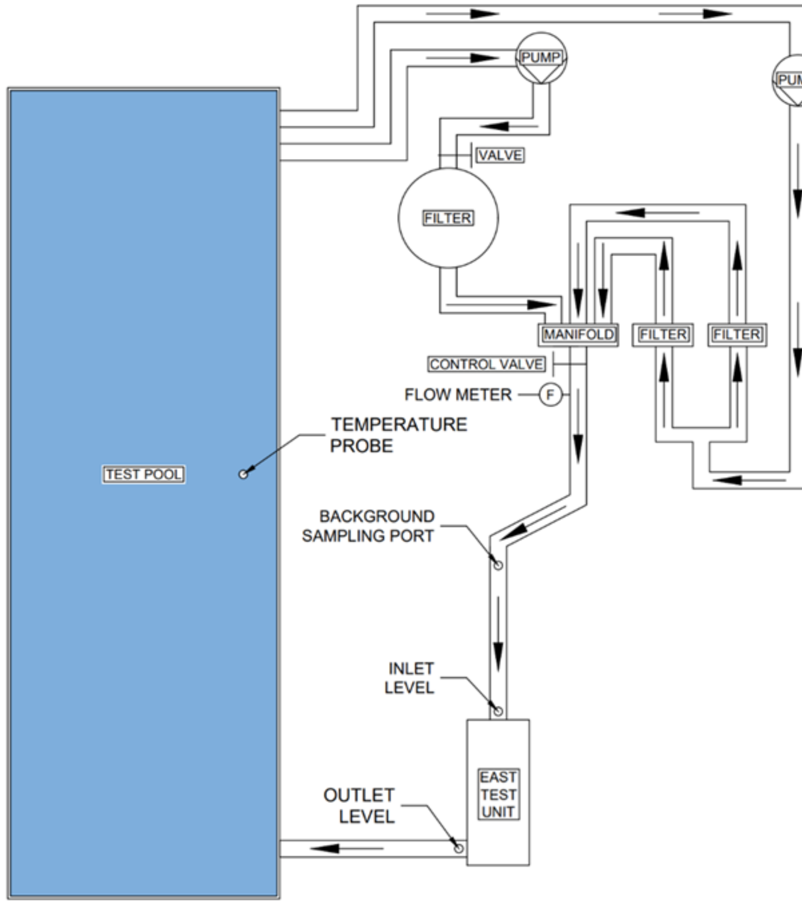


Figure 12 - Test Loop 3 “High Flow” Laboratory Set Up

Figure 13 - Background Sampling Port Test Loop 2 and 3

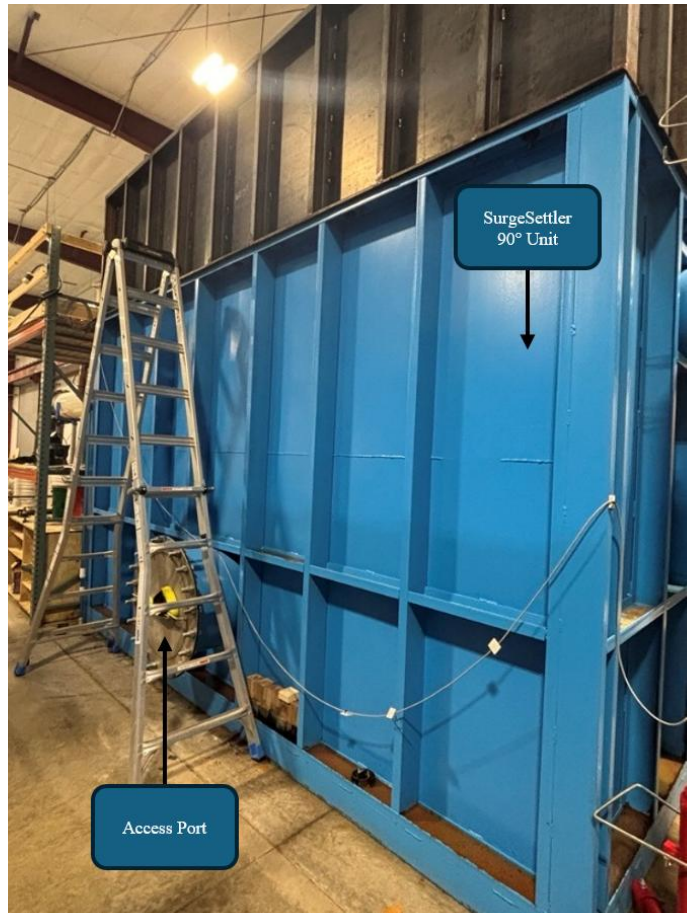


Figure 14 – SurgeSettler 90° Unit and Access Port Test Loop 2 and 3

When configured in Test Loop 2 and Test Loop 3, water was pumped from the test pool using two Rain for Rent BBA Pumps Model BA350E D370 with John Deere Engine Model 6068CI550. One 12" HDPE pipe was used to pump water from the test pool through a Fil-Trek Model ELP50-3012-12F-A-15 filter housing containing bag filters with a rating of 25 µm or 50 µm. From the filter housing, a 12" diameter polypropylene flex pipe with non-corrugated interior walls was connected to a valve manifold.

An additional 12" diameter HDPE pipe was installed to convey water from the test pool to a tee connection, which distributed the flow into two 12" diameter polypropylene flexible pipes with a non-corrugated interior. The flex pipes directed water through the following two Rain for Rent Model BF2000 filter housings both installed with 25 µm or 50 µm bag filters. From each filter housing, a 12" diameter polypropylene flex pipe with a non-corrugated interior was connected to the valve manifold. From the valve manifold, water was directed through a single straight horizontal run of 18" diameter HDPE pipe.

Flow measurements for both Test Loop 2 and Test Loop 3 were taken using a calibrated Greyline Transit Time Flow Meter (TTFM) 1.0 with a measurement accuracy of ±1% configured to take readings every 30 seconds. The TTFM 1.0 was not configured for data output to the Prosoft data acquisition system thus data was retrieved directly from the unit's internal datalogger. The TTFM 1.0 was installed on the section of straight 18" HDPE pipe where full flow was achieved to ensure the location complied with the manufacturer's specifications.

For Test Loop 2, the horizontal run of pipe from the valve manifold was connected to another straight run of 18" HDPE pipe then up to a vertical section of 18" diameter HDPE pipe downstream of the flow meter and upstream of the West unit containing the background sampling port. The inlet pipe was connected to the vertical pipe section. The inlet pipe to the unit was PVC, 18" in diameter, 205" long, and installed with a 1.6% slope. The outlet pipe was 18" in diameter, 60" long and installed with a 1.1% slope. The outlet pipe was terminated with a free-fall directly back to the test pool.

For Test Loop 3, the horizontal run of pipe was connected to a vertical section of 18" diameter HDPE pipe downstream of the flow meter and upstream of the East unit containing the background sampling port. The inlet pipe was connected to the vertical pipe section. The inlet pipe was PVC, 18" in diameter, 205" long, and installed with a 1.6% slope. The outlet pipe was 18" in diameter, 60" long and installed with a 1.1% slope. The outlet pipe was terminated with a free-fall directly back to the test pool.

Sediment Addition and Collection

For Test Loops 1 and 2 sediment addition was accomplished through a funneled port on the crown of the influent pipe 23" upstream of the SurgeSettler 90° unit. The sediment feeder was an Acrison volumetric screw feeder. Sediment feed samples were collected in clean 1-L wide-mouth bottles at the screw feeder outlet (Figure 7).

Sample Collection

Background samples were collected from the sample ports described above for each test loop. Wide-mouth, 0.5-gallon jars were used for background sample collection. The background sampling port was opened for a minimum of three seconds prior to the start of sample collection to flush the sampling port of any accumulated sediment.

For the scour test, effluent samples were taken by hand via grab sampling using a 0.5-gallon wide-mouth jar at the pipe exit. Removal efficiency was determined by mass recovery which eliminated the need for effluent sampling.

Duplicate samples were collected for background and effluent samples. The primary set was analyzed and reported while the second set was held under refrigerated conditions at the third-party analytical laboratory in case there was a need for analytical investigation of any aberrant results.

Water Temperature

Water temperature measurements for all tests were obtained using a temperature probe calibrated against a calibrated Madgetech Microtemp datalogger. Temperature readings were collected every 30 seconds via the Prosoft data acquisition system to ensure the water temperature did not exceed 80.0°F. A Pentair Model ETi 400 heater was used to regulate the test pool temperature. Throughout the duration of all tests completed, the water temperature remained under 80.0°F.

Head loss

The Prosoft data acquisition system was configured to record upstream, downstream and differential water surface elevation measurements every 30 seconds during hydraulics testing. Water surface elevation levels were measured in the influent and effluent pipes to determine head loss across the unit. Piezometer taps were placed on the invert of the influent and effluent pipe one pipe-diameter upstream and downstream of the test unit, respectively. Each piezometer tap was connected to a 6" diameter clear PVC tube with a calibrated Vega VEGAPULS 31 radar level sensor installed to the top of the tube per the manufacturer's specifications. The Vega VEGAPULS 31 radar level sensors measured water surface elevation to a precision of ± 2mm.

Additional Instrumentation and Measurement

Run and sampling times were measured using a NIST timekeeping device connected to the Prosoft data acquisition system in addition to NIST traceable calibrated stopwatches.

Sediment feed samples, non-ferrous pans, filter bags and calibration sampling jar tare weights were weighed on an Ohaus Ranger 3000 Model R31P3 scale with a precision of 0.1 g. Sediment that was added to the auger feeder and the sediment recorded following each run was weighed on a Cole Parmer IPS-300-400 balance with a precision of 0.02 lbs. Scales were verified each day prior to use using calibrated NIST traceable verification weights.

3.3. Test Sediment

Removal Efficiency Test Sediment

Historically, US Silica's OK-110 PSD, having a reported d_{50} of 110 µm, was used for testing the coarse particle removal performance of hydrodynamic separators (HDS). That gradation has not been commercially available for several years, so an equivalent blend was created for this testing program. Given that there is no NJDEP protocol for this PSD, test sediment used for removal efficiency testing was comprised of high purity silica blended to have a PSD that meets the required tolerances of Sediment B specified in ASTM E3317 "Standard Specification for Silica-Based Sediments for the Evaluation of Stormwater Treatment Devices". The test sediment was blended at the StormTrap Research and Development laboratory facility. Internal sediment blend lot number used for testing was Lot 25D-02. Upon completion of blending, three random samples were taken in accordance with ASTM E3317-22 under third-party observation. The final blended sediment lot was stored in 5-gallon buckets and security sealed under third-party observation until needed.

The sediment samples were analyzed for PSD by a qualified third-party analytical laboratory, GeoTesting in Acton, Massachusetts (A2LA, AASHTO, and USACE accredited) in a manner consistent with ASTM D6913-17, "Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis" and ASTM D7928-21 "Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis". A COC form accompanied all samples analyzed. The test results for the sediment lot are summarized in **Table 2** below and shown graphically in **Figure 15**. Where required, particle size data had been interpolated to allow for comparison to the required particle size. Per ASTM E3317-22, a measured value may be lower than a target minimum percent less than value by up to two percentage points, provided that the measured d_{50} value does not exceed 110 µm.

Table 2 - Particle Size Distribution of Test Sediment Lot 25D-02

Particle Size (µm)	Test Sediment Particle Size (% Passing)				ASTM Specification (Minimum % Passing)
	Sample 1	Sample 2	Sample 3	Average	
1000	100	100	100	100	100
500	100	100	100	100	100
250	100	100	100	100	100
150	100	100	100	100	98
125	90	85	90	88	79
106	43	33	44	40	42
90	24	19	23	22	21
75	9	8	9	9	1
53	2	2	2	2	0
50	2	2	2	2	0
20	0	0	0	0	0
8	0	0	0	0	0
5	0	0	0	0	0
2	0	0	0	0	0
d_{50} µm	106 µm	111 µm	106 µm	108 µm	-

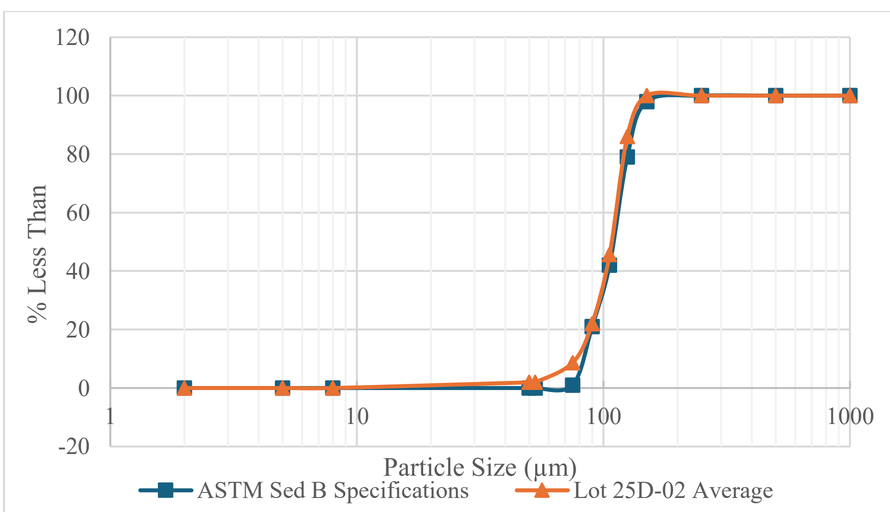


Figure 15 - ASTM E3317-22 Sediment B Particle Size Distribution of Test Sediment Lot 25D-02

The moisture content of the test sediments was also tested at GeoTesting in accordance with ASTM Method D2216-19, "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass". The moisture content for all sample lots was ≤0.3%. This amount of moisture was considered insignificant and therefore no correction for moisture was made for the sediment mass. The median (d_{50}) particle size of Lot 25D-02 was 108 µm and consistent with the sediment gradation of Sediment B of ASTM E3317.

Scour Test Sediment

The sediment used for scour testing was also comprised of high purity silica blended to have a PSD that meets the required tolerances specified in Section 4.A. of the test protocol for "TSS Removal Efficiency". The test sediment was blended at the StormTrap Research and Development laboratory facility. Internal lot number 25B-04 was used. Upon completion of blending, three random samples of the sediment blend were taken in accordance with ASTM E3317-22 under third-party observation. The final blend sediment was stored in 5-gallon buckets sealed under third-party observation until needed.

The samples were also analyzed by GeoTesting in a manner consistent with ASTM D6913-17 and ASTM D7928-21. The test results for the scour blend are summarized in **Table 3** below and shown graphically in **Figure 16**. Where required, particle size data had been interpolated to allow for comparison to the required particle size. Per ASTM E3317-22, a measured value may be lower than a target minimum percent less than value by up to two percentage points, provided that the measured d_{50} value does not exceed 230 µm.

Table 3 - Particle-Size Distribution of Scour Test Sediment Lot 25B-04

Particle Size (µm)	Test Sediment Particle Size (% Passing)				NJDEP Specification (Minimum % Passing)
	Sample 1	Sample 2	Sample 3	Average	
1000	100	100	100	100	100
500	95	95	96	95	90
250	60	60	61	60	55
150	43	44	43	43	40
100	24	25	23	24	25
75	15	17	15	16	10
50	9	10	9	9	0
20	2	4	4	3	0
8	1	1	1	1	0
5	1	1	1	1	0
2	1	1	1	1	0
d_{50} µm	185 µm	181 µm	182 µm	183 µm	-

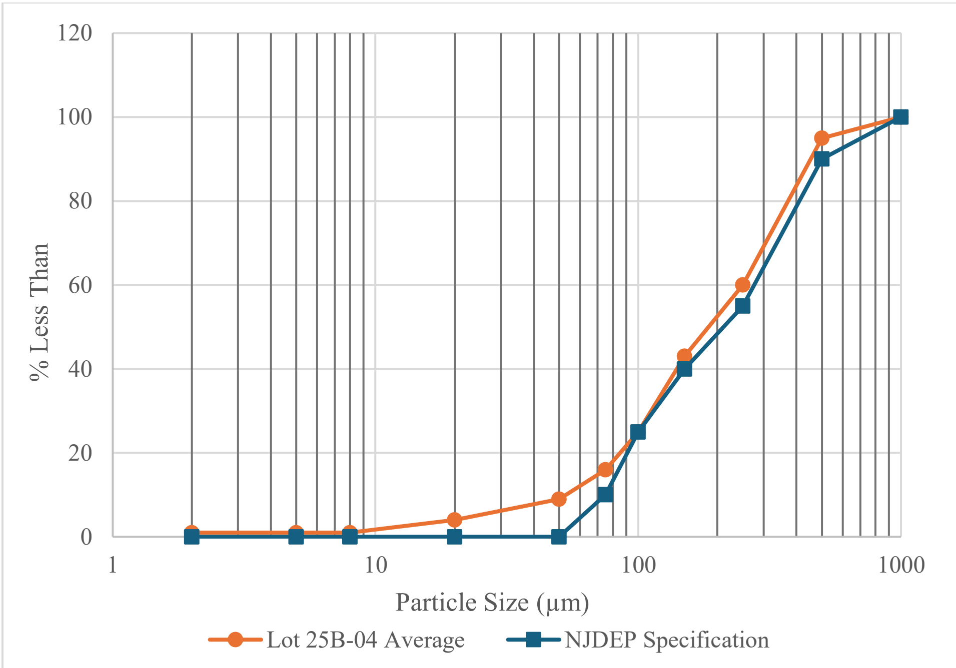


Figure 16 - Particle-Size Distribution of Scour Test Sediment

The median (d_{50}) was 183 µm, finer than the Sediment C specification in ASTM E3317-22. The scour was found to meet the NJDEP and ASTM E3317-22 particle size specification and was deemed acceptable for use.

3.4. Laboratory Proficiency Testing

Background and effluent samples were analyzed for suspended sediment concentration (SSC) in a manner consistent with ASTM D3977-97 “Standard Test Methods for Determining Sediment Concentration in Water”. All samples were labeled and submitted with a chain of custody (COC) form. Samples were analyzed by Gabriel Environmental Services (GES) in Chicago, Illinois (NELAP accredited).

As GES is not accredited specifically for ASTM D3977-97, a proficiency test was conducted in accordance with Section 3.B Laboratory Proficiency of the NJDEP protocol. Spiked samples were created at the StormTrap Research and Development laboratory facility at a concentration of 20.0 ± 5.0 mg/L and 50.0 ± 5.0 mg/L under observation of the third-party observer. Samples at each known concentration were prepared in triplicate. Results for the six spiked samples are provided below in **Table 4**.

Table 4 - SSC Proficiency Sample Results

Sample Number	Known Sample Concentration (mg/L)	Laboratory Reported Sample Concentration (mg/L)	Percent Recovery	Average Recovery (%)	COV
1	20.4	17.7	86.8	92.5	0.06
2	20.0	20.0	100.0		
3	20.7	18.8	90.8		
4	49.3	47.9	97.2	97.5	0.01
5	50.1	48.9	97.6		
6	50.7	49.5	97.6		

The average SSC recovery results were within the ± 15% of the two known concentrations and the COV at the two concentration levels was ≤ 0.2; therefore, GES passed the Laboratory Proficiency Testing for SSC analysis per ASTM D3977-97.

3.5.Hydraulic Testing

Hydraulic testing of the SurgeSettler 90° was conducted on a clean unit, free of sediment, with a false floor installed at 8" above the base of the unit which corresponds to the 50% level of the maximum sediment storage depth. Water flow and corresponding water surface elevation levels were measured in the influent and effluent pipes to determine head loss across the unit. Piezometer taps were placed on the invert of the influent and effluent pipes and one pipe-diameter upstream and downstream of the test unit, respectively. Each piezometer tap was connected to a 6" diameter clear PVC tube 40" in length with a calibrated Vega VEGAPULS 31 radar level sensor installed to the top of the tube per the manufacturer's specifications. Head loss measurements were taken spanning flows from 10 to 200% of the target MTFR.

3.6. Sediment Removal Efficiency Testing

A total of seven removal efficiency tests were completed in accordance with the NJDEP protocol. Sediment removal efficiency testing was conducted at 10%, 25%, 50%, 75%, 100%, 125% and 150% of the ***target*** maximum treatment flow rate (MTFR) of 6.91 cfs. A false floor was installed at 8" above the base of the unit to simulate a 50% sump full condition for all removal efficiency test runs. The flow rates were held within ± 10% of the target value with a COV ≤ 0.03. Flow rates were recorded once every 30 seconds. Flow continued for one detention time after sediment feed was stopped to allow sediment to pass through the unit that may not normally be captured. Water temperature was recorded every 30 seconds and did not exceed 80.0°F during any test run.

A minimum of 25 lbs. of sediment was fed into the unit in each run at a target concentration of 200 mg/L (180 - 220 mg/L). The sediment added during a run was determined by weighing the amount of sediment put into the hopper before and after each run and correcting for the sediment feed calibration samples taken. Both the pre-run and post-run sediment weights were measured to the nearest 0.02 lbs. No sediment was pre-loaded into the test unit for the sediment removal efficiency test runs. Six sediment feed calibration samples were collected and weighed to the nearest 0.1 g at evenly spaced intervals during each run to ensure the feed rate was stable and within the COV limit of ≤ 0.10 per the NJDEP protocol. All feed samples taken were above 20.0 g and collection times did not exceed one minute.

A total of 16 background samples (8 samples taken in duplicate) were collected at evenly spaced intervals during each run. All background samples collected surpassed the 500 mL minimum volume per the NJDEP HDS protocol. All background samples were security sealed immediately after collection under third party observation. All background samples collected were sent with a COC form to Gabriel Environmental Services for analysis in accordance with ASTM D3977-97.

Following the end of each test run, the unit was decanted and then filtered via a pre-weighed 1.0 µm single bag filter. Filtered water was then returned into the test pool. The mass collected within the filter bag was counted towards the total mass collected in the MTD.

For all sediment removal efficiency test runs, the unit was cleaned the following business day under third-party observation. Due to this, access points of the unit and filtration equipment were security sealed under third-party observation ensuring that the unit was not tampered with after the test run and prior to cleaning of the unit (**Figure 17**).

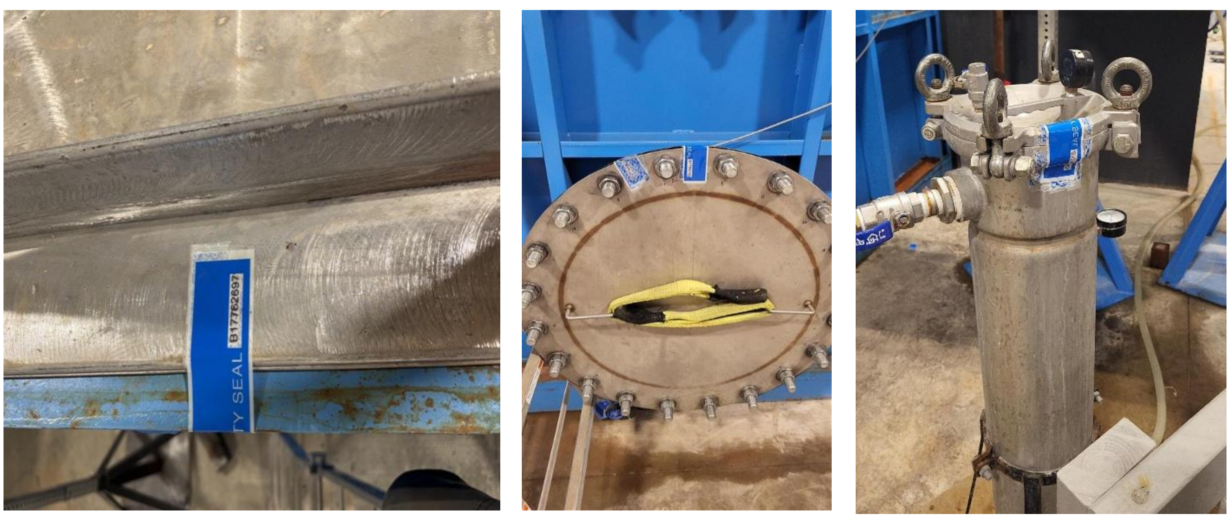


Figure 17 – Unit Security Seals

When cleaning, the decanted unit was opened and any sediment/slurry remaining in the test unit was removed and transferred to pre-weighed nonferrous trays for drying. The filter bag was also removed from the housing and transferred to a pre-weighed nonferrous tray for drying. Any sediment remaining in the influent pipe was also collected, weighed and dried separately from the sediment collected in the sump.

The sediment and filter bag were dried in a vented oven not exceeding 212°F until constant weight was obtained when cooled to room temperature, as determined by two successive measurements taken no less than two hours apart. When the oven was in use and unattended, the oven was tagged with a security seal in the presence of the third-party observer. All consecutive weight measurements showed no more than a 0.1% difference in measured mass weighed to a precision of 0.02 lbs.

Removal efficiency was calculated for each %MTFR using the following equation:

$$Removal\ Efficiency\ (\%) = \frac{Total\ Mass\ Collected\ in\ MTD}{Total\ Mass\ Added - \ Mass\ collected\ in\ Inlet\ Pipe} \times 100$$

All calculations were performed using unrounded intermediate values in accordance with ASTM E29-22 “Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications”. Both observed and calculated values presented in this report are rounded and reported to the nearest unit used in expressing the specification limit according to the NJDEP protocol and ASTM E29-22 guidance.

3.7. Scour Testing

Prior to the start of testing, the false floor was set 4” above the bottom of the unit. Four inches of scour test sediment was loaded on the false floor of the unit and leveled, putting the top of the sediment 8” above the bottom of the floor. The final height of the sediment was at an elevation equivalent to 50% of the maximum sediment storage capacity of the unit. After the sediment was loaded, the unit was filled with clear water up to the invert of the effluent pipe in a manner to minimize disturbance to the sediment. The unit then sat for 95 hours prior to starting the scour test.

The scour test was performed at 17.5 cfs (7862 gpm), over 200% of the target MTFR. During the scour test, the water flow rate and temperature were recorded once every 30 seconds. Testing was commenced by increasing the flow into the system until the target flow rate was achieved within three minutes of starting the test. Background and effluent sampling began one minute after starting flow. An effluent grab sample was taken once every two minutes, until a total of 15 effluent samples (plus 15 duplicate samples) were collected. A total of eight background samples (plus eight duplicate samples) were taken with every odd-numbered effluent sample.

4. Performance Claims

Per the NJDEP verification procedure, the following are the performance claims made by StormTrap LLC and/or established via the laboratory testing conducted for the SurgeSettler 90° Hydrodynamic Separator.

Total Suspended Solids (TSS) Removal Rate

The TSS removal rate of the SurgeSettler 90^0 was calculated using the annualized weighted method required by the NJDEP mass capture HDS MTD protocol. Based on an MTFR of 3.94 cfs (1768 gpm), the SurgeSettler 90° achieved an annualized weighted TSS removal of 80.0%.

Maximum Treatment Flow Rate (MTFR)

The tested SurgeSettler 90^0 unit had a surface area of 84 ft^2 and a MTFR of 3.94 cfs (1768 gpm). This equates to a hydraulic loading rate of 21.05 gpm/ft^2.

Maximum Sediment Storage Depth and Volume

The maximum storage depth for the SurgeSettler 90^0 6'x14' unit is 16" which equates to 112 ft^3 of sediment storage volume. The 50% storage depth is 8 inches which equates to 56 ft^3 of sediment storage volume.

Effective Treatment/Sedimentation Area

The effective treatment area and effective sedimentation area of the unit tested is 84 ft^2.

Detention Time and Wet Volume

The detention time of the SurgeSettler 90^0 is dependent on flow rate and model size. For the tested SurgeSettler 6'x14' unit at the MTFR of 3.94 cfs, the detention time is 142 seconds. The wet volume of the tested SurgeSettler 90^0 6'x14' unit was 560.3 ft^3.

Online Installation

Based on the laboratory scour testing, the SurgeSettler 90^0 qualifies for online installation.

5. Supporting Documentation

The NJDEP Procedure 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 to NJCAT upon request that it would not be prudent or necessary to include all this information in this verification report. All supporting documentation will be retained securely by StormTrap to be provided to NJCAT or NJDEP upon request.

5.1. Removal Efficiency Testing

The results from all seven runs were used to calculate the overall removal efficiency of the SurgeSettler. Sediment removal efficiencies were plotted vs. flow rate to generate a removal efficiency curve from which the MTFR was determined, and an annual weighted removal efficiency calculated. The total water volume and average flow rate per run were calculated from the data collected from the flow meters. The average influent sediment concentration for each test flow was determined by mass recovery. The amount of sediment fed into the auger feeder hopper during dosing, and the amount remaining at the end of a run, was used to determine the amount of sediment fed during a run. The sediment mass was corrected for the mass of the six feed rate samples taken during the run. The mass of the sediment fed was divided by the volume of water that flowed through the MTFR during dosing to determine the average influent sediment concentration for each run. A summary of the seven test run results is shown in **Table 5** below.

Table 5 - Sediment Removal Efficiency Based on Captured Sediment

% MTFR	10	25	50	75	100	125	150
Total Mass Added (lbs)	39.72	38.08	38.54	43.32	42.70	41.30	43.74
Total Sediment Feed Calibration Samples Mass (lbs)	3.33	7.81	8.00	7.73	7.82	6.45	7.59
Sediment Retained in Inlet Pipe (lbs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sediment Delivered to MTD (lbs)	36.39	30.27	30.54	35.59	34.88	34.85	36.15
Sediment Captured in MTD (lbs)	34.43	25.59	22.11	21.70	17.01	13.23	12.55
Removal Efficiency (%)	94.61	84.57	72.41	60.95	48.77	37.96	34.72
Percent of Retained Sediment in Inlet Pipe (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The data collected for each removal efficiency run are tabulated below to include sampling schedule, water flow and temperature, sediment feed rate summary, and background SSC results.

10% MTFR Data (Table 6 through Table 9 and Figure 18)

Table 6 - 10% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
10.2		2
14.3	2	
20.4		3
28.6	3	
30.6		4
40.8		5
42.9	4	
51.1		6
57.2	5	
61.3		7
71.5	6	8
85.0	End of Testing	
MTD Detention Time = 13.5 minutes Sediment Sampling Time = 1 minute Dosing time = 66.5 minutes		

Table 7 - 10% MTFR Water Flow and Temperature

	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
Run Parameters	310	312.8	0.9%	0.01	77.3
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

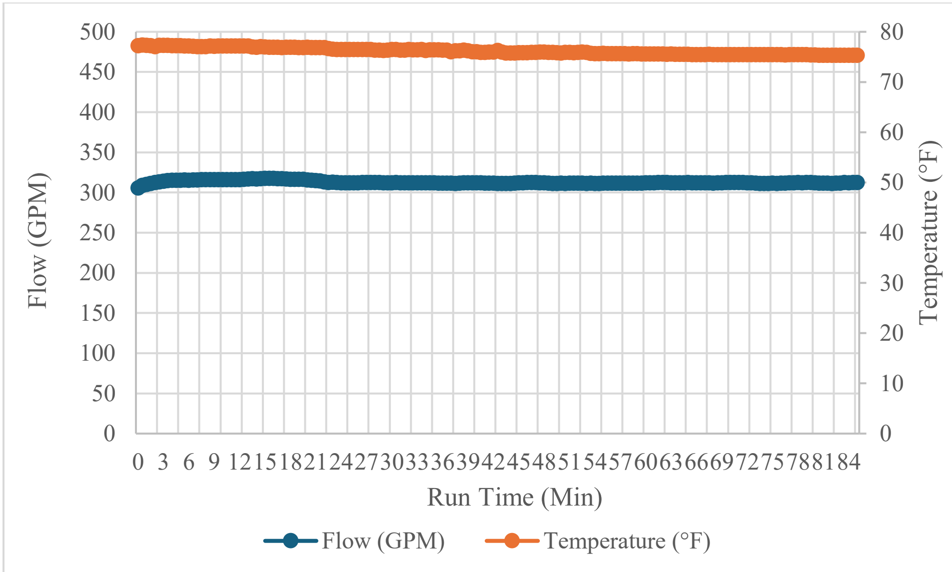


Figure 18 - 10% MTFR Water Flow and Temperature Graph

Table 8 - 10% MTFR Sediment Feed Rate Summary

Sediment Feed Rate (g/min)		Sediment Mass Balance	
1	254.9	Starting Weight of Sediment (lbs)	126.14
2	262.1		
3	244.9	Recovered Weight of Sediment (lbs)	86.42
4	235.1		
5	252.4	Mass of Sediment Used (lbs) *	36.39
6	259.1	Volume of Water Through MTD During Dosing (gal)	20,802
Average	251.4		
COV	0.04	Average Influent Sediment Concentration (mg/L)	210
QA/QC Limit	≤ 0.10 PASS	QA/QC Limit	180 - 220 mg/L PASS

*Adjusted for feed rate calibration samples

Table 9 - 10% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2 mg/L reported as half the detection limit

25% MTFR Data (Table 10 through Table 13 and Figure 199)

Table 10 - 25% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
4.1		2
5.7	2	
8.2		3
11.4	3	
12.3		4
16.3		5
17.2	4	
20.4		6
22.9	5	
24.5		7
28.6	6	8
34.0	End of Testing	
MTD Detention Time = 5.4 minutes Sediment Sampling Time = 1 minute Dosing time = 23.6 minutes		

Table 11 - 25% MTFR Water Flow and Temperature

Run Parameters	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
	775	780.9	0.8%	0.002	73.5
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

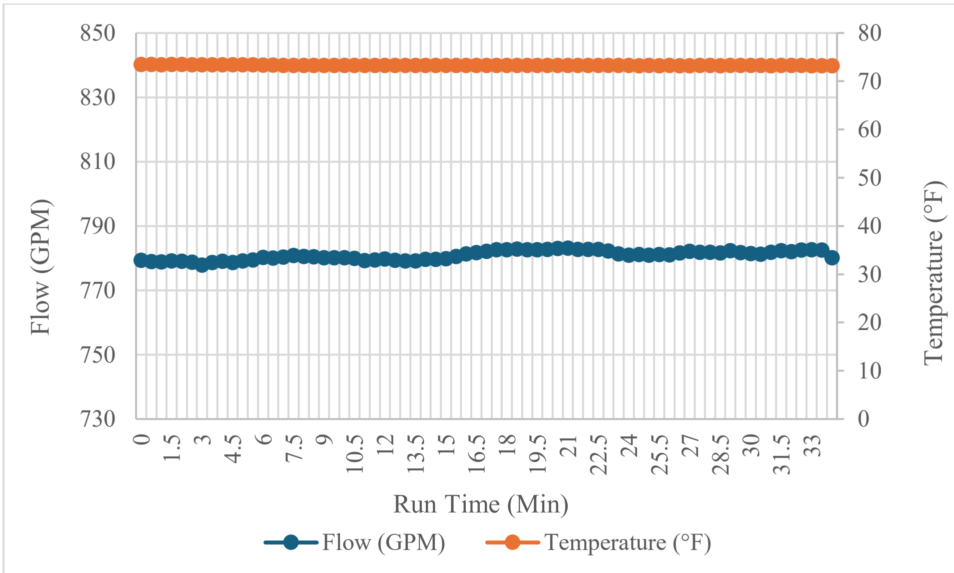


Figure 19 - 25% MTFR Water Flow and Temperature Graph

Table 12 - 25% MTFR Sediment Feed Rate Summary

Sediment Feed Rate (g/min)		**Sediment Mass Balance**	
1	590.4	Starting Weight of Sediment (lbs)	89.72
2	574.5		
3	599.7	Recovered Weight of Sediment (lbs)	51.64
4	596.4		
5	595.4	Mass of Sediment Used (lbs) *	30.27
6	588.1	Volume of Water Through MTD During Dosing (gal)	18,428
Average	590.8		
COV	0.015	Average Influent Sediment Concentration (mg/L)	197
QA/QC Limit	≤ 0.10 PASS	QA/QC Limit	180 - 220 mg/L PASS

*Adjusted for feed rate calibration samples

Table 13 - 25% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2 mg/L reported as half the detection limit

50% MTFR Data (Table 14 through Table 17 and Figure 200)

Table 14 - 50% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
2.0		2
2.9	2	
4.1		3
5.7	3	
6.1		4
8.2		5
8.6	4	
10.2		6
11.4	5	
12.3		7
14.3	6	8
17.0	End of Testing	
MTD Detention Time = 2.7 minutes Sediment Sampling Time = 30 seconds Dosing Time = 11.8 minutes		

Table 15 - 50% MTFR Water Flow and Temperature

Run Parameters	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
	1551	1553.1	0.14%	0.002	74.2
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

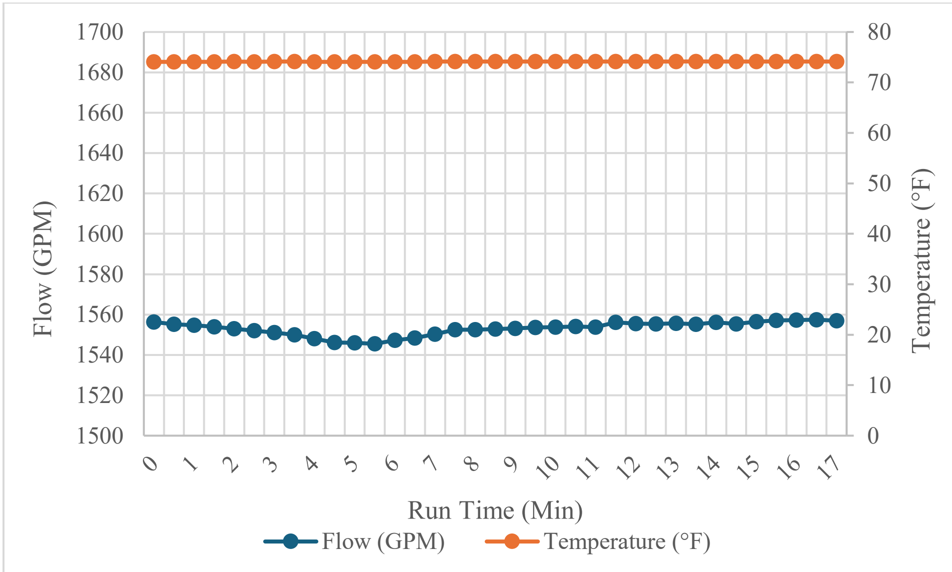


Figure 20 - 50% MTFR Water Flow and Temperature Graph

Table 16 - 50% MTFR Sediment Feed Rate Summary

Sediment Feed Rate (g/min)		Sediment Mass Balance	
1	1208.8	Starting Weight of Sediment (lbs)	121.86
2	1206.6		
3	1247.0	Recovered Weight of Sediment (lbs)	83.32
4	1198.2		
5	1188.2	Mass of Sediment Used (lbs) *	30.54
6	1207.2	Volume of Water Through MTD During Dosing (gal)	18,327
Average	1209.3		
COV	0.02	Average Influent Sediment Concentration (mg/L)	200
QA/QC Limit	≤ 0.10 PASS	QA/QC Limit	180 - 220 mg/L PASS

*Adjusted for feed rate calibration samples

Table 17 - 50% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2 mg/L reported as half the detection limit

75% MTFR Data (Table 18 through Table 21 and Figure 211)

Table 18 - 75% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
1.5		2
2.2	2	
3.1		3
4.3	3	
4.6		4
6.2		5
6.5	4	
7.7		6
8.7	5	
9.3		7
10.8	6	8
12.6	End of Testing	
MTD Detention Time = 1.8 minutes Sediment Sampling Time = 20 seconds Dosing Time = 9.133 minutes		

Table 19 - 75% MTFR Water Flow and Temperature

Run Parameters	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
	2326	2325.4	-0.03%	0.001	73.7
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

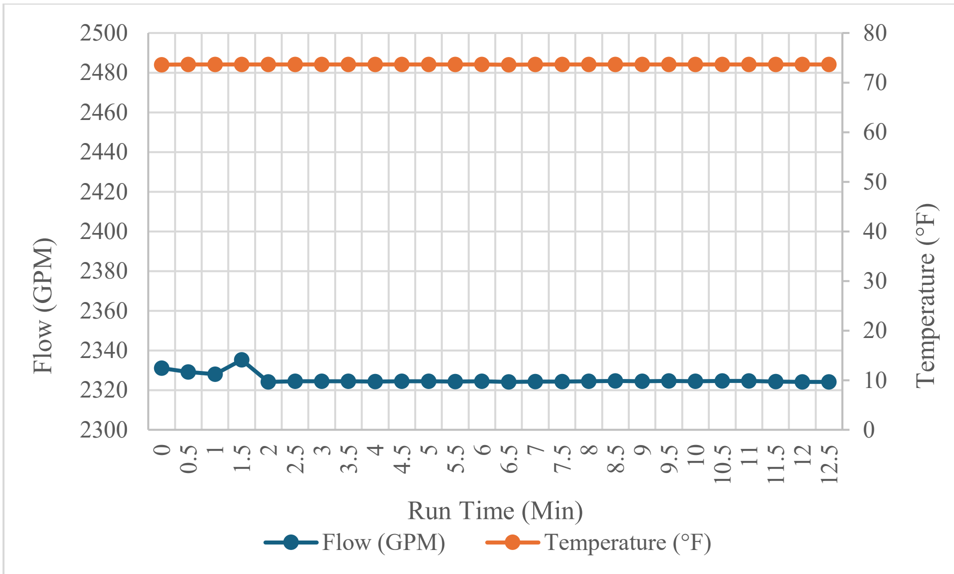


Figure 21 - 75% MTFR Water Flow and Temperature Graph

Table 20 - 75% MTFR Sediment Feed Rate Summary

Sediment Feed Rate (g/min)		Sediment Mass Balance	
1	1721.7	Starting Weight of Sediment (lbs)	132.78
2	1698.6		
3	1733.7	Recovered Weight of Sediment (lbs)	89.46
4	1754.7		
5	1801.5	Mass of Sediment Used (lbs) *	35.59
6	1805.4	Volume of Water Through MTD During Dosing (gal)	21,238
Average	1752.6		
COV	0.025	Average Influent Sediment Concentration (mg/L)	200
QA/QC Limit	≤ 0.10 PASS	QA/QC Limit	180 - 220 mg/L PASS

*Adjusted for feed rate calibration samples

Table 21 - 75% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2mg/L reported as half the detection limit

100% MTFR Data (Table 22 through Table 25 and Figure 222)

Table 22 - 100% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
1.2		2
1.6	2	
2.3		3
3.2	3	
3.5		4
4.6		5
4.9	4	
5.8		6
6.5	5	
7.0		7
8.1	6	8
9.5	End of Testing	
MTD Detention Time = 1.4 minutes Sediment Sampling Time = 15 seconds Dosing Time = 6.85 minutes		

Table 23 - 100% MTFR Water Flow and Temperature

Run Parameters	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
	3101	3095.9	-0.2%	0.003	75.2
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

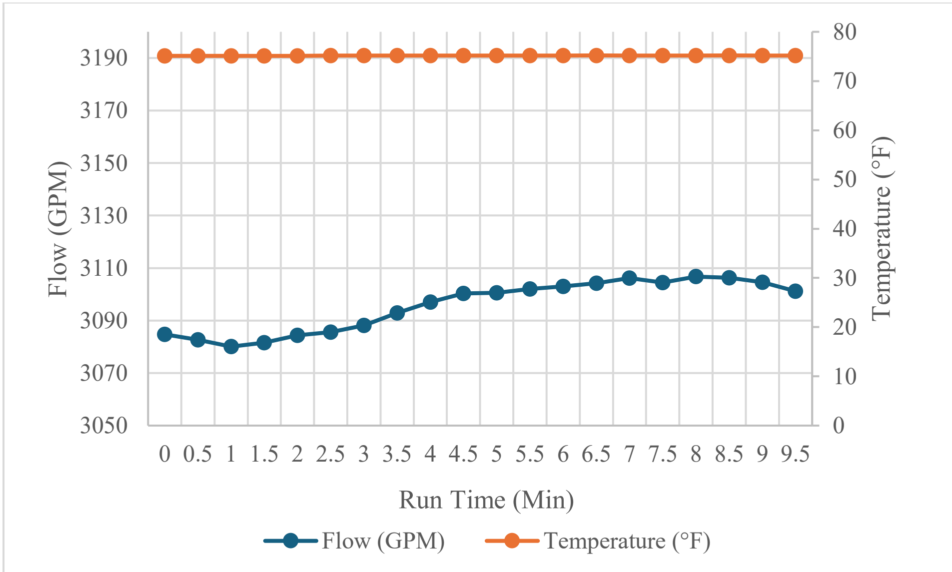


Figure 22 - 100% MTFR Water Flow and Temperature Graph

Table 24 - 100% MTFR Sediment Feed Rate Summary

<table>
<tr><th colspan="2">Sediment Feed Rate (g/min)</th><th colspan="2">Sediment Mass Balance</th></tr>
<tr><td>1</td><td>2328.4</td><td rowspan="2">Starting Weight of Sediment (lbs)</td><td rowspan="2">143.08</td></tr>
<tr><td>2</td><td>2354.4</td></tr>
<tr><td>3</td><td>2374.0</td><td rowspan="2">Recovered Weight of Sediment (lbs)</td><td rowspan="2">100.38</td></tr>
<tr><td>4</td><td>2392.0</td></tr>
<tr><td>5</td><td>2381.6</td><td>Mass of Sediment Used (lbs) *</td><td>34.88</td></tr>
<tr><td>6</td><td>2349.6</td><td rowspan="2">Volume of Water Through MTD During Dosing (gal)</td><td rowspan="2">21,207</td></tr>
<tr><td>Average</td><td>2363.3</td></tr>
<tr><td>COV</td><td>0.01</td><td>Average Influent Sediment Concentration (mg/L)</td><td>197</td></tr>
<tr><td>QA/QC Limit</td><td>≤ 0.10
PASS</td><td>QA/QC Limit</td><td>180 - 220 mg/L
PASS</td></tr>
</table>

*Adjusted for feed rate calibration samples

Table 25 - 100% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2mg/L reported as half the detection limit

125% MTFR Data (Table 26 through Table 29 and Figure 233)

Table 26 - 125% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
0.9		2
1.3	2	
1.9		3
2.6	3	
2.8		4
3.7		5
3.9	4	
4.6		6
5.2	5	
5.6		7
6.5	6	8
7.6	End of Testing	
MTD Detention Time = 1.1 minutes Sediment Sampling Time = 10 seconds Dosing Time = 5.667 minutes		

Table 27 - 125% MTFR Water Flow and Temperature

Run Parameters	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
	3877	3895.8	0.48%	0.001	73.5
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

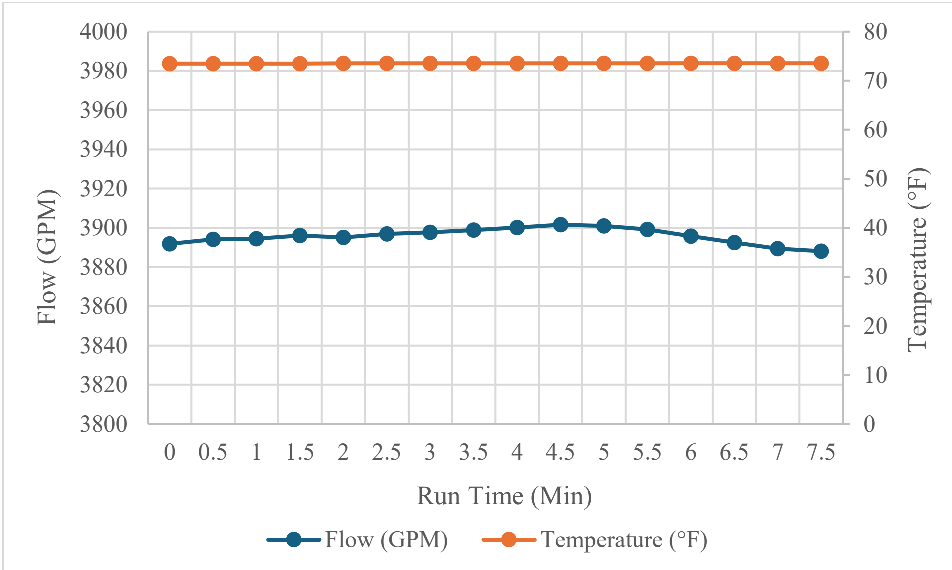


Figure 23 - 125% MTFR Water Flow and Temperature Graph

Table 28 - 125% MTFR Sediment Feed Rate Summary

Sediment Feed Rate (g/min)		Sediment Mass Balance	
1	3071.4	Starting Weight of Sediment (lbs)	115.42
2	2908.2		
3	2980.8	Recovered Weight of Sediment (lbs)	74.12
4	2904.6		
5	2842.8	Mass of Sediment Used (lbs) *	34.85
6	2854.2	Volume of Water Through MTD During Dosing (gal)	22,076
Average	2927.0		
COV	0.029	Average Influent Sediment Concentration (mg/L)	189
QA/QC Limit	≤ 0.10 PASS	QA/QC Limit	180 - 220 mg/L PASS

*Adjusted for feed rate calibration samples

Table 29 - 125% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2mg/L reported as half the detection limit

150% MTFR Data (Table 30 through Table 33 and Figure 245)

Table 30 - 150% MTFR Sampling Schedule

Run Time (min)	Sampling Schedule	
	Sediment Feed	Background
0.0	1	1
0.8		2
1.1	2	
1.5		3
2.2	3	
2.3		4
3.1		5
3.2	4	
3.9		6
4.3	5	
4.6		7
5.4	6	8
6.3	End of Testing	
MTD Detention Time = 0.9 minutes Sediment Sampling Time = 10 seconds Dosing Time = 4.567 minutes		

Table 31 - 150% MTFR Water Flow and Temperature

Run Parameters	Water Flow Rate (gpm)				Maximum Water Temperature (°F)
	Target	Actual	Difference	COV	
	4652	4642.2	-0.2%	0.002	71.6
QA/QC Limit	-	-	± 10% PASS	≤ 0.03 PASS	≤ 80.0 PASS

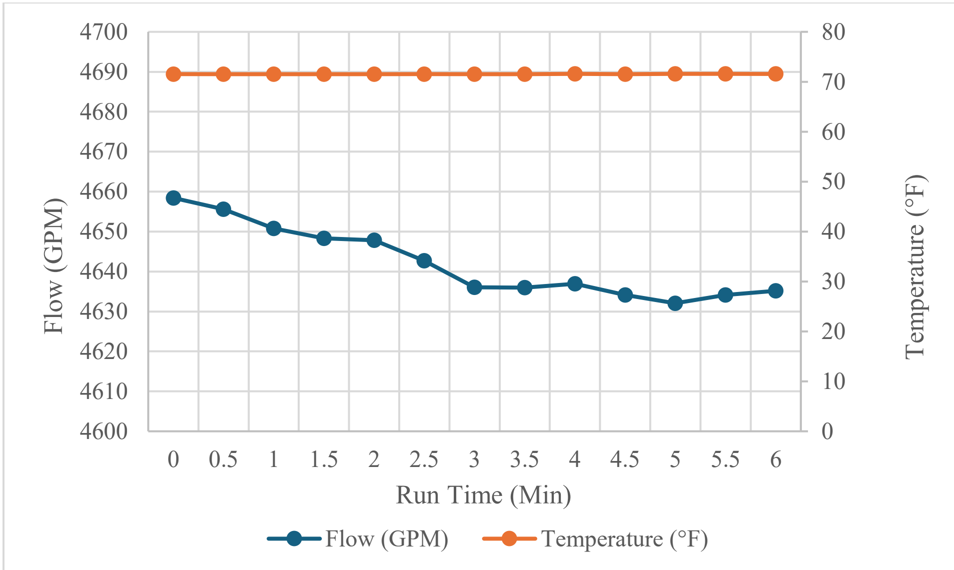


Figure 24 - 150% MTFR Water Flow and Temperature Graph

% Table 32 - 150MTFR Sediment Feed Rate Summary

Sediment Feed Rate (g/min)		**Sediment Mass Balance**	
1	3515.4	Starting Weight of Sediment (lbs)	151.58
2	3445.8		
3	3419.4	Recovered Weight of Sediment (lbs)	107.84
4	3414.6		
5	3369.6	Mass of Sediment Used (lbs) *	36.15
6	3489.0	Volume of Water Through MTD During Dosing (gal)	21,199
Average	3442.3		
COV	0.015	Average Influent Sediment Concentration (mg/L)	204
QA/QC Limit	≤ 0.10 PASS	QA/QC Limit	180 - 220 mg/L PASS

*Adjusted for feed rate calibration samples

Table 33 - 150% MTFR Background SSC Results

	Suspended Sediment Concentration (mg/L) *								
Sample #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**QA/QC Limit**
Background	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	≤ 20.0 mg/L PASS

*Detection limit is 2 mg/L. All samples < 2mg/L reported as half the detection limit

5.2. Annualized Weighted Removal Efficiency

A plot was made of the seven removal efficiency runs, and a curve of best fit was obtained using a third-order polynomial (R^2=0.998) shown below in **Figure 25**. The curve was used to determine the SurgeSettler 90° coarse sediment MTFR and the annualized weighted removal efficiency for sediment in stormwater has been calculated using the rainfall weighting factors provided in the NJDEP protocol. For a MTFR of 3.94 cfs (1768 gpm), the annual weighted removal is 80.0%, as shown in **Table 34**.

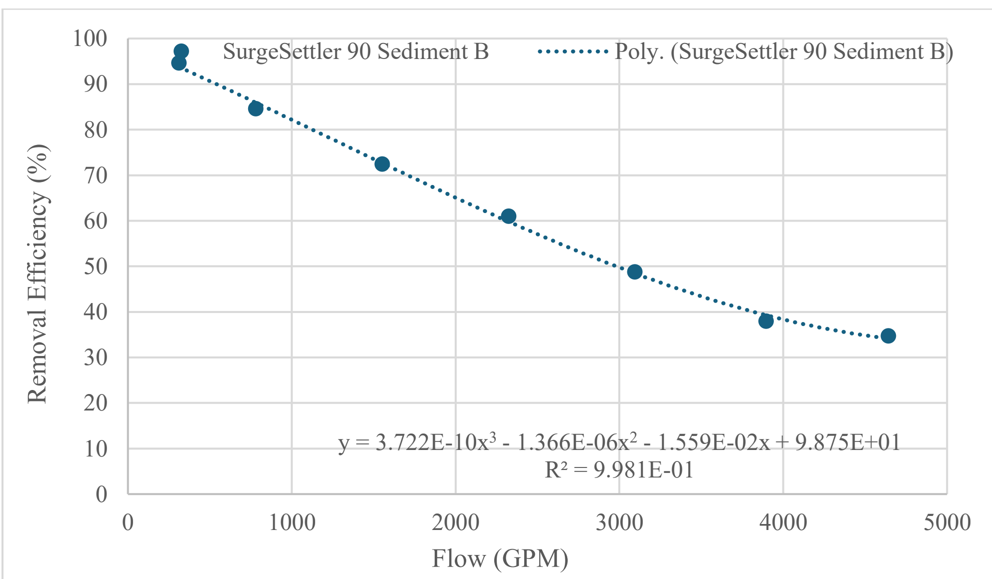


Figure 25 - SurgeSettler 90° Coarse Sediment Removal Efficiency Curve

Table 34 - SurgeSettler 90° Coarse Sediment Annualized Weighted Removal Efficiency

% MTFR	Flow Rate (GPM))	Removal Efficiency (%)	Annual Weighting Factor	Weighted Removal Efficiency (%)
25	442	91.6	0.25	22.9
50	884	84.2	0.30	25.3
75	1326	76.6	0.20	15.3
100	1768	69.1	0.15	10.4
125	2210	61.9	0.10	6.2
Annualized Weighted Removal Efficiency				80.0

5.3. Scour Testing

Scour testing was conducted in accordance with Section 5 of the NJDEP protocol. Scour testing was performed with the Test Loop 3 configuration (**Figure 12**). In preparation for the scour test, the false floor inside the unit sump was set to a height of 4". The sump was then loaded with scour test sediment. When leveled, the sediment formed a layer 4" thick, so the top of the sediment was 8" above the sump floor, corresponding to the 50% level of the maximum sediment storage depth. After sediment loading, the sump was filled with clear water to the invert of the inlet pipe. The water was added in such a way as to avoid disturbance of the sediment bed. The filled SurgeSettler 90° unit was allowed to sit for a total of 95 hours prior to the commencement of the scour test.

Per the calculated MTFR above, the average scour test flow rate had to be at least 7.88 cfs (3536 gpm). Testing was conducted at a flow rate of 17.5 cfs (7863 gpm), 445% of the calculated MTFR. Scour testing began by increasing the flow rate to the target flow within a 3-minute period. Samples were taken after the commencement of conveying clear water through the MTD. The sampling frequency for background and effluent samples is summarized in **Table 35** below. Scour testing flow and temperature data are reported in **Table 36** and **Figure 26** below.

Table 35 - Scour Test Sampling Schedule

Sample/Measurement Taken	Run Time (Minutes)														
	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
Effluent	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Background	X		X		X		X		X		X		X		X

Table 36 - Scour Test Water Flow and Temperature

Run Parameters	Water Flow Rate (GPM)			Maximum Water Temperature (°F)
	Minimum	Actual	COV	
	3536	7863.2	0.0008	66.3
QA/QC Limit	-	-	0.03 PASS	≤ 80.0 PASS

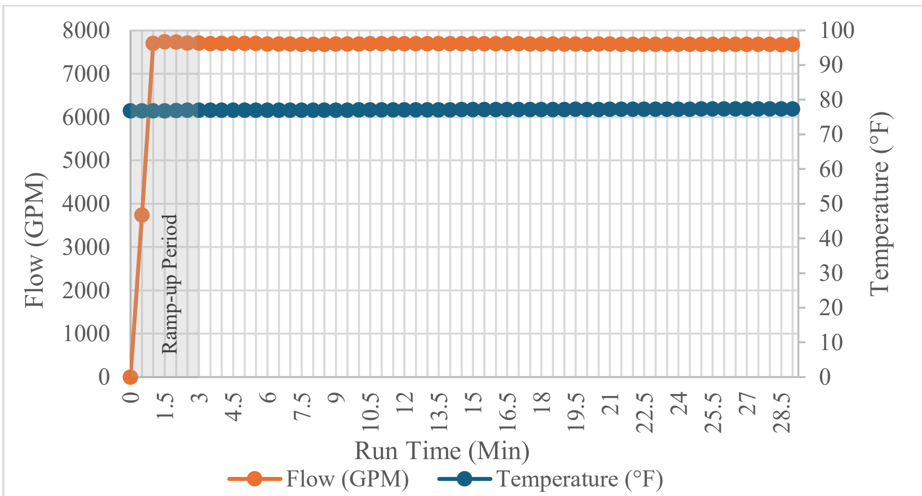


Figure 26 - Scour Test Water Flow and Temperature Graph

The effluent and background SSC results are reported in **Table 37** below. The adjusted effluent concentration was calculated using the following equation:

$$Adjusted\ Effluent\ Concentration\ \left(\frac{mg}{L}\right) = Initial\ Concentration - Background\ Concentration$$

For effluent samples that did not have a corresponding background sample, the background value was interpolated from the previous and subsequent samples. The average adjusted effluent concentration was 6.9 mg/L at >200% of the MTFR; therefore, the SurgeSettler 90° meets the criteria for online use.

Table 37 - Scour Test Suspended Sediment Concentrations

	Scour Suspended Sediment Concentration (mg/L)														
Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Effluent	22.6	17.1	12.7	10.1	8.16	8.69	9.25	8.20	10.9	10.1	9.59	8.23	9.46	10.5	9.71
Background	2.25		2.52		4.27		4.85		4.57		4.85		4.71		4.24
Adjusted Effluent	20.4	14.7	10.2	6.7	3.9	4.1	4.4	3.5	6.3	5.4	4.7	3.5	4.8	6.0	5.5
Average Adjusted Effluent Concentration (mg/L)											6.9				

5.4. Hydraulic Testing

Hydraulic testing of the SurgeSettler 90° was conducted on a clean unit free of sediment with a false floor installed at 8" above the floor, corresponding to the 50% level of the maximum sediment storage depth. Water flow and corresponding water surface elevation levels were measured in the influent and effluent pipes to determine head loss across the unit. Piezometer taps were placed on the invert of the influent and effluent pipe one pipe-diameter upstream and downstream of the test unit, respectively. Each piezometer tap was connected to a clear PVC 6" diameter 40" tall tube with a calibrated Vega VEGAPULS 31 radar level sensor installed to the top of the tube per the manufacturer's specifications. Bypass of the back middle baffle was also observed during hydraulic testing which occurred at 2000 gpm while bypass of the right and left back baffles was observed at 7000 gpm. Head loss measurements across the span of 10 to 200% of the MTFR are shown in **Table 38** and **Figure 27** below. Flow rates up to 4262 gpm (9.50 cfs) were tested using Test Loop 1. Flows above 9.50 cfs were tested using Test Loop 2. Notably, the piezometers were raised to accommodate higher water surface elevations during testing above 9 cfs. Inlet, outlet and differential elevations were adjusted to reflect this change in piezometer height for the respective tests. The velocity reported in **Table 38** is the upstream velocity.

Table 38 - SurgeSettler 90^0 Hydraulics

Flow Rate		Velocity	$V^2/2g$	Water Surface Elevation (in)		
gpm	cfs	ft/s	(ft)	h_{inlet}	h_{outlet}	Δh
343	0.76	2.20	0.07	4.52	2.74	1.78
845	1.88	2.35	0.09	8.34	4.69	3.64
1705	3.80	2.68	0.11	13.47	6.82	6.65
2568	5.72	3.24	0.16	17.95	8.68	9.28
3406	7.59	4.29	0.29	22.82	9.83	12.99
4253	9.48	5.36	0.45	27.94	10.23	17.71
5178	11.54	6.53	0.66	33.30	11.70	21.60
7543	16.81	9.51	1.41	47.04	17.94	29.09

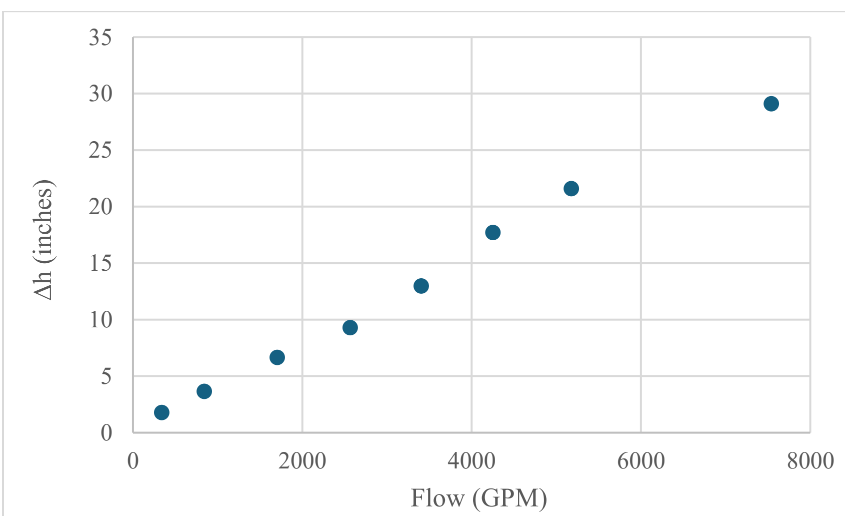


Figure 27 - SurgeSettler 90° Head Loss vs Flow Rate

Figure 28 plots head loss versus $v^2/2g$ for full pipe flow for the purpose of calculating the minor loss coefficient, k_L. In flow where the atmospheric pressure is the same upstream and downstream, Bernoulli's equation can be reduced to:

$$\Delta h = k_L \frac{v^2}{2g}$$

Where Δh= head loss (ft)

k_L = head loss (minor loss) coefficient (dimensionless)

V = velocity (ft/s)

g = acceleration due to gravity, 32.174 ft/s^2

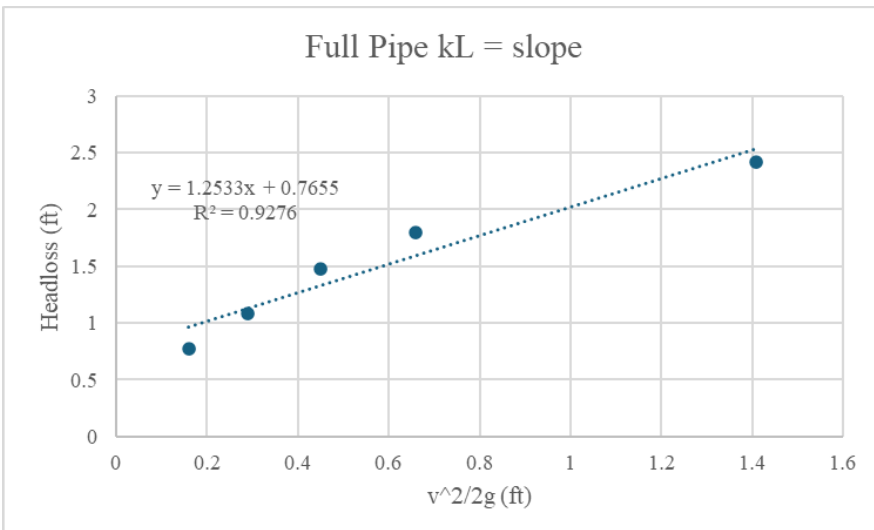


Figure 28 – SurgeSettler 90^0 Head Loss as a Function of Velocity

5.5. Excluded Results

The NJDEP Verification Procedure requires disclosure and discussion of any data excluded from analysis. No data was excluded from this report.

6. Design Limitations

StormTrap's SurgeSettler 90° is an engineered system designed to meet site-specific requirements. Design parameters and limitations are listed below.

Soil Characteristics

The SurgeSettler 90° is an enclosed flow-through system that can be installed and function as intended in all soil types. The SurgeSettler 90^0 units are installed in accordance with ASTM C-891 "Standard Practice for Installation of Underground Precast Concrete Utility Structures".

Slope of Drainage Pipe

The system was verified with an inlet pipe slope of 1.6%, in accordance with the protocol and both the inlet and outlet pipe elevations were identical. For pipe slopes greater than 10% the StormTrap Design team will evaluate the site-specific parameters.

Maximum Treatment Flow Rate

The MTFR for SurgeSettler 90° models is based upon the size of the system as shown in **Table A-1**. Systems shall be sized to a hydraulic loading rate of 21.05 gpm/ft^2 of effective treatment/sedimentation area.

Maintenance Requirements

SurgeSettler 90° systems should be inspected and maintained following the recommendations and guidelines included in the SurgeSettler Operation and Maintenance Manual available at:

http://stormtrap.com/products/SurgeSettler

Section 6 of this report includes a detailed description of inspection and maintenance requirements.

Driving Head

The SurgeSettler 90° will operate with minimal driving head.

Installation Limitations

StormTrap provides contractors with detailed installation and assembly instructions as well as specific pick weights prior to delivery.

Configurations

The SurgeSettler 90^0 has an internal bypass and can be installed online or offline.

Structural Load Limitations

SurgeSettler 90^0 modules are typically designed for HS-20 loading. Contact StormTrap if alternate design loadings are anticipated or required for site-specific conditions.

Pre-treatment Requirements

The SurgeSettler 90^0 has no pre-treatment requirements.

Depth to Seasonal High-Water Table

SurgeSettler 90^0 performance is independent of high groundwater conditions. Contact StormTrap if groundwater is above the system invert for site-specific structural/flotation calculations.

7. Maintenance Plans

The SurgeSettler 90° treatment device, manufactured by StormTrap, is a hydrodynamic separator designed to capture and store pollutants from stormwater.

The SurgeSettler 90° maintenance frequency is site-dependent and routine inspections are recommended to ensure that the system is functioning as designed. Please contact your authorized StormTrap representative if you have questions regarding the operation and maintenance of the SurgeSettler 90^0 system.

Inspection Scheduling

SurgeSettler 90^0 inspections are important to assess the condition of the system internals to ensure peak performance. The frequency of inspections and maintenance depends on site-specific loading conditions and rainfall frequency. Within the first year of operation, it is recommended that the unit be inspected quarterly to determine the rate of pollutant accumulation to develop a more accurate maintenance schedule. Inspections should be performed during dry weather conditions when no flow is entering the system.

SurgeSettler 90^0 systems are recommended to be inspected whenever the upstream and downstream catch basins and stormwater pipes of the stormwater collection system are inspected or maintained. If checked on an annual basis, the inspection should be conducted before the stormwater season begins to ensure that the system is functioning properly for the upcoming storm season.

Inspection and Maintenance Equipment

The following equipment and materials are recommended to be available during inspections and maintenance:

- The SurgeSettler Operation and Maintenance Manual and Inspection Checklist
- Flashlight
- Manhole hook/lifter or pry bar to lift the manhole cover
- Measuring device(s) of sufficient length to reach the bottom of the device's sump
- Proper personal protective equipment
- Adequate traffic control signage
- Pole with skimmer or net (optional for maintenance procedure)
- Vacuum truck or similar trailer-mounted equipment (for maintenance procedure)

Inspection Procedure

Inspections should be done after a sufficient time has lapsed since the most recent rain event to allow for a static water condition, and when rainfall is not anticipated to occur during the inspection procedure. The SurgeSettler does not require entry into the system for inspection or maintenance; however, if entering the system is deemed necessary, it is prudent to note that before entering any underground storm sewer or underground structure, appropriate OSHA and local safety regulations and guidelines should be followed.

To begin the inspection process, set up the necessary traffic control signage. Open all manhole covers using appropriate equipment and ensure the manhole covers are in a location that would not prohibit the inspection process. Visually inspect the system at all manhole access opening locations.

During the visual inspection, ensure that all components are in working order. An inspection checklist is provided within the O&M manual for easy reference. If any components are not working, contact your authorized StormTrap representative. After the components are inspected, visually quantify the accumulation of trash, debris, and hydrocarbons within the system by using a measuring device such as a tape measure, grade stick, dipstick, etc.

For sediment accumulation, utilize either a sludge sampler or a sediment pole to measure and document the amount of sediment accumulation. To determine the amount of sediment in the system with a sludge sampler, follow the manufacturer's instructions. If utilizing a sediment pole or similar device, first insert the pole to the top of the sediment layer and record the depth. Then, insert the pole into the bottom of the system and record the depth. The difference in the two measurements corresponds to the amount of sediment in the system. Alternatively, sediment depth can also be determined by taking a measurement from a known and consistent elevation (manhole frame, pipe invert, vertical baffle top, etc.) to the top of the sediment layer. That distance can then be compared to the measurement between the known elevation to the sump floor. The sediment layer may be hardened, and care needs to be taken to make sure that the true floor of the unit is measured. The difference between these two measurements will correspond to the sediment layer depth. After completion of the inspection process, ensure that manhole covers are replaced and securely seated in the manhole frame and remove traffic control signage.

Maintenance Procedure

Maintenance should be done after sufficient time has lapsed since the most recent rain event to allow for a static water condition, and when rainfall is not anticipated to occur during the duration of the maintenance procedure. To begin the maintenance process, set up the necessary traffic control signage per local ordinances. Open all manhole covers using appropriate equipment and ensure the manhole covers are in a location that would not prohibit the maintenance process.

Visually inspect the system at all manhole access opening locations. During the visual inspection, ensure that all components are undamaged. If any components are not in working order, contact your authorized StormTrap representative. After the components are inspected, remove all the settled sediment on the bottom of the unit as well as any accumulated trash, debris, and hydrocarbons stored on the surface of the water using the vacuum hose or pole with an attached skimmer or net.

To remove sediment, insert the vacuum truck's hose in each of the three access openings. The system should be completely drained, and all sediment should be removed from the sump. If excessive sediment or debris buildup occurs within the device, components can be washed with sewer jetting equipment or a spray lance to remove stubborn materials. Particular attention must be taken when spraying the enhanced settling pack. A wide spray nozzle is recommended around the enhanced settling pack to ensure there is no damage to the material. After completing the maintenance procedure, complete a post-maintenance inspection to ensure that all components are in good condition. Ensure that manhole covers are replaced and securely seated in the manhole frame and remove traffic control signage. Dispose of all pollutants removed during maintenance per local, state, and federal guidelines and regulations.

8. Statements

The following attached pages are signed statements from StormTrap LLC, Spaceco, and NJCAT. These statements are a requirement of the verification process. In addition, it should be noted that this report has been subject to review, and all comments and concerns have been satisfactorily addressed.

July 14, 2025

StormTrap

To: Dr. Richard Magee, Sc.D., P.E. BCEE
Executive Director
New Jersey Corporation for Advanced Technology
c/o Center for Environmental Systems
Stevens Institute of Technology
One Castle Point on Hudson
Hoboken, NJ 07030

Subject: SurgeSettler Side Outlet Configuration Coarse Silica Sediment Laboratory Verification Report – Manufacturer's Statement of Compliance

Dr. Magee,

Previous verified laboratory testing demonstrated that the SurgeSettler™ Hydrodynamic Separator – Side Outlet Configuration can achieve a weighted annual removal rate of at least 50% based on the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device", dated January 1, 2021, updated April 25, 2023. This protocol specifies testing with a sediment particle size distribution (PSD) with a median particle size, d_{50}, of ≤75μm. Some authorities having jurisdictions outside of New Jersey are interested in 80% removal of coarser particles with a median particle size of ≤110 μm. Since there are no widely accepted models for translating removal performance with one PSD to removal performance with another PSD, additional testing was undertaken to look at capture with a PSD with a d_{50} of ≤110 μm.

In order to be as consistent as possible with other testing submitted to NJCAT this second testing program followed the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device", dated January 1, 2021, updated April 25, 2023, with the following exceptions:

1. The performance testing was done with a coarse sediment having a PSD matching that of Sediment B in ASTM E3317-22 "Standard Specification for Silica-Based Sediments for the Evaluation of Stormwater Treatment Devices" with a d_{50} of ≤110 μm
2. Scour testing and hydraulic testing were not repeated since the testing was done on the same test unit in the same laboratory

StormTrap LLC acknowledges that the above deviations prevent certification of this report, but we request verification by NJCAT. We certify that the requirements of the "NJDEP Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology (NJCAT)", dated August 4, 2021, updated April 25, 2023, were met or exceeded, with the exceptions outlined above.

Sincerely,

Greg Williams

Greg Williams, PhD., P. Eng.
Director of Water Quality Technology

224 1/2 N. Liberty St, Morris, IL 60450 | spacecoinc.com

September 9, 2026

RE: StormTrap SurgeSettler Side Outlet Configuration High Flow Hydrodynamic Separator with the NJDEP Laboratory Testing Protocol Using Coarse Silica Sediment (ASTM E3317 Sediment B) Performance Testing

To Whom It May Concern:

Spaceco Inc. was contracted by StormTrap LLC as a 3rd party observer during their SurgeSettler Side Outlet Configuration Coarse Silica Sediment removal testing. The results of this testing will be used by a variety of public and private users to improve the removal of sediment and to capture and store pollutants from stormwater runoff for specific site conditions.

The StormTrap LLC SurgeSettler Side Outlet Configuration testing took place at the StormTrap Research & Development facility located in Morris, IL. I certify that I was present at the said facility and that I observed this testing from September 2025 – March 2026. The results presented in the StormTrap SurgeSettler High Flow Hydrodynamic Separator Side Outlet Configuration Testing Report dated July 2026 are accurate and all procedures and requirements stated in the Report were met or exceeded. I confirm that all test data that was collected is included or referenced in the Report.

Considering the above information and on behalf of Spaceco, Inc., I confirm the following:

- that I do not have any conflict of interest in connection with the sediment removal testing;
- that I have not granted, sought, attempted to obtain or accepted and will not grant, seek, attempt to obtain, or accept any advantage, financial or in kind, to or from any party whatsoever, constituting an illegal or corrupt practice, either directly or indirectly, as an incentive or reward relating to the outcome of the testing.

Sincerely,

Spaceco, Inc.

Jason Wiesbrock, P.E.
Vice President

cc: Greg Williams, StormTrap LLC
Jessica Willis, StormTrap LLC

Rosemont (847) 696-4060 | Morris (815) 941-0260 | Indianapolis (317) 779-2194

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September 5, 2026

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 StormTrap SurgeSettler™ Separator – Side Outlet Configuration (SurgeSettler 90^0), the test protocol requirements contained in the *"New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device"* (NJDEP HDS Protocol, January 1, 2021- Updated April 25, 2023), **with the exception of PSD for the sediment removal tests,** were met or exceeded consistent with the NJDEP Approval Process. Specifically:

Test Sediment Feed

Historically, US Silica's OK-110 PSD was used for testing the coarse particle removal performance of HDS. That gradation has not been commercially available for several years, so an equivalent blend was created. Given that there is no NJDEP protocol for this PSD, test sediment used for removal efficiency testing was comprised of high purity silica blended to have Particle Size Distributions (PSD) that meet the required tolerances of Sediment B specified in ASTM E3317 "Standard Specification for Silica-Based Sediments for the Evaluation of Stormwater Treatment Devices". The test sediment was blended at the StormTrap Research and Development laboratory facility. The median (d_{50}) was 108 µm. The scour test sediment was also blended by StormTrap at their Research and Development laboratory facility. The scour test sediment PSD analysis was plotted against the NJDEP scour test PSD specification and shown to meet the NJDEP protocol specifications. The median (d_{50}) was 183 µm.

Removal Efficiency Testing

In accordance with the NJDEP HDS Protocol, removal efficiency testing was executed on the SurgeSettler 90^0 6 x14 ft. unit comprised of full-scale, commercially available internal components to demonstrate the ability of the StormSettler 90^0 to remove 80 % of the coarse test sediment PSD.

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Scour Testing

The scour testing was conducted at 7687 gpm (17.1 cfs), which is equal to 445% of the MTFR. The scour test was conducted with the unit preloaded with 4.0″ of levelled sediment to the 50% capacity level prior to conducting the test. The median (d_{50}) was 183 µm. A total of 15 effluent samples were collected throughout the test. The average calculated effluent concentration, adjusted for background, was 6.9 mg/L.

Sincerely,

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

9. References

1. Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology. August 4, 2021 (Last updated April 25, 2023).

2. New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device. January 1, 2021.

3. New Jersey Corporation for Advanced Technology (NJCAT) verification report: "StormTrap™ SurgeSettler High Flow Hydrodynamic Separator – Side Outlet Configuration" (June 2026)

4. ASTM E3317-22 "Standard Specification for Silica-Based Sediments for the Evaluation of Stormwater Treatment Devices"

5. ASTM D6913-17, "Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis"

6. ASTM D7928-21 "Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis"

7. ASTM D3977-97, "Standard Test Methods for Determining Sediment Concentration in Water"

8. ASTM C-891 "Standard Practice for Installation of Underground Precast Concrete Utility Structures"

9. ASTM E29-22 "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications"

VERIFICATION APPENDIX

Introduction

- Manufacturer - StormTrap LLC, 1287 Windham Parkway, Romeoville, IL 60446
  Website: www.stormtrap.com General Phone: (815) 941-4663

- MTD: StormTrap SurgeSettler 90° Hydrodynamic Separator. Verified SurgeSettler models are shown in **Table A-1**.

- TSS Removal Rate: 80% (Coarse Sediment OK-110 Equivalent PSD)

- Offline or Online Installation

Detailed Specification

- NJDEP sizing and dimensional table is attached as **Table A-1**.

- New Jersey requires that the peak flow rate of the New Jersey Water Quality Design Storm (NJWQDS), 1.25 inches of rainfall in a 2-hour duration, shall be used to determine the appropriate size for the MTD. The SurgeSettler 90° 6'x14' has a maximum treated flow (MTFR) of 3.94 cfs (1768 gpm) which equates to a hydraulic loading rate of 21.05 gpm/ft^2.

- Pick weights and installation procedures vary with model size. StormTrap provides contractors with project-specific unit pick weights and installation instructions prior to delivery.

- Maximum sediment depth for all units is 16 inches. StormTrap recommends that the units be cleaned when sediment depth reaches 8 inches, representing 50% sediment storage capacity.

- An Inspection and Maintenance Manual is provided for each project installation and available at:
  http://stormtrap.com/products/SurgeSettler

- According to N.J.A.C. 7:8-5.5, NJDEP stormwater design requirements do not allow a hydrodynamic separator such as the StormTrap SurgeSettler 90^0 to be used in series with another hydrodynamic separator to achieve an enhanced TSS removal rate.

Table A-1 SurgeSettler 90° Coarse Sediment MTFRs, Sediment Removal Intervals, and Standard Dimensions

Model	Model Width (ft)	Model Length (ft)	NJDEP 80% TSS Maximum Treatment Flow Rate (MTFR) (cfs)	Effective Treatment Area (ft^2)	Hydraulic Loading Rate[1] (gpm/ft^2)	Effective Sedimentation Treatment Area (ESTA) (ft^2)	Enhanced Settling Pack Footprint (ft^2)	50% Max. Sediment Storage (ft^3)	Sediment Removal Interval[2] (years/ months)	Chamber Depth[3] (ft)	Effective Treatment Depth[4] (ft)	Aspect Ratio Treatment Depth: Diameter[5]			
												MTFR: ESTA	Length: Width	SD[6] /Width	SD[6] /Length
SurgeSettler 6 x 14	6	14	3.94	84	21.05	84	44	56	5 / 61	6.67	6.00	0.05	2.33	1.00	0.43
SurgeSettler 8 x 21	8	21	7.88	168	21.05	168	88	112	5 / 61	6.67	6.00	0.05			
SurgeSettler 10 x 21	10	21	9.85	210	21.05	210	112	140	5 / 61	6.67	6.00	0.05			
SurgeSettler 12 x 24	12	24	13.51	288	21.05	288	160	192	5 / 61	12.5	11.83	0.05	2.00	0.99	0.49
SurgeSettler 12 x 32	12	32	18.01	384	21.05	384	208	256	5 / 61	13.5	12.83	0.05	2.67	1.07	0.40

[1] Hydraulic loading rate is defined as the ratio of MTFR to effective treatment area.
[2] Sediment removal interval is calculated using the equation presented in Appendix A, Section B of the NJDEP Protocol.
[3] Chamber depth is defined as depth from effluent invert to sump floor.
[4] Effective treatment depth is defined as depth from effluent invert to 50% the sediment storage depth.
[5] Larger models (>250% MTFR of the tested unit) must be geometrically proportionate to the tested unit (6 x 14 model). A variance of 15% is allowable. For units <250% MTFR (6 x 14) the depth may be equal or greater than the depth of the test unit.
[6] Standard Depth (SD) is equivalent to Effective Treatment Depth.