NJCAT TECHNOLOGY VERIFICATION

Hydro DryScreen® Next Generation Baffle Box

Hydro International

April 2024

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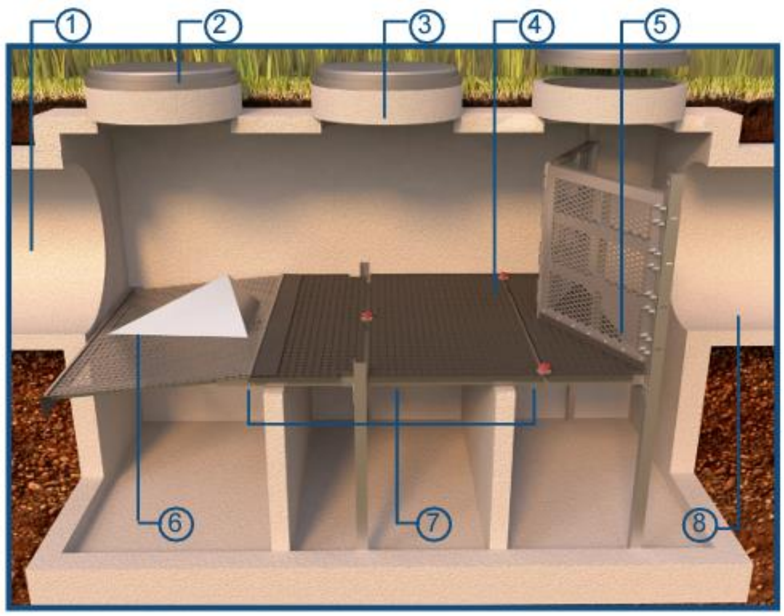
1. Description of Technology

The Hydro DryScreen® Next Generation Baffle Box (DryScreen®) is designed and supplied by Hydro International **(Figure 1)**. The Hydro DryScreen® is installed as part of typical drainage network systems to capture particulate and neutrally buoyant gross pollutants that have entered the system from surface runoff. The Hydro DryScreen® has flow-modifying internal components that lengthen the flow path within the treatment chamber for enhanced settling performance and screens positioned to capture trash and other debris.



Product Components

1. Inlet Pipe
2. Access Lids
3. Pracast Vault
4. Adjustable Height Dry Screen
5. Vertical Screened Weir
6. Flow Spreader
7. Sediment Storage Sump
8. Outlet Pipe

Figure 1 Rendering of the Hydro DryScreen® Showing System Components

The Hydro DryScreen® chamber is a precast concrete vault. The internal components are fabricated aluminum, stainless steel and fiberglass. Stormwater enters the Hydro DryScreen® through an inlet pipe. Trash, leaves and other gross solids are deposited on the integral screens as the stormwater is diverted by a flow spreader. Suspended solids are captured in one of three sediment storage sumps. Treated water exits the Hydro DryScreen® via an outlet pipe. In the case that inlet flow rates exceed design, flow can overtop the Vertical Screened Weir and bypass the system internally. The typical flow path and bypass flow condition are shown on **Figure 2.**

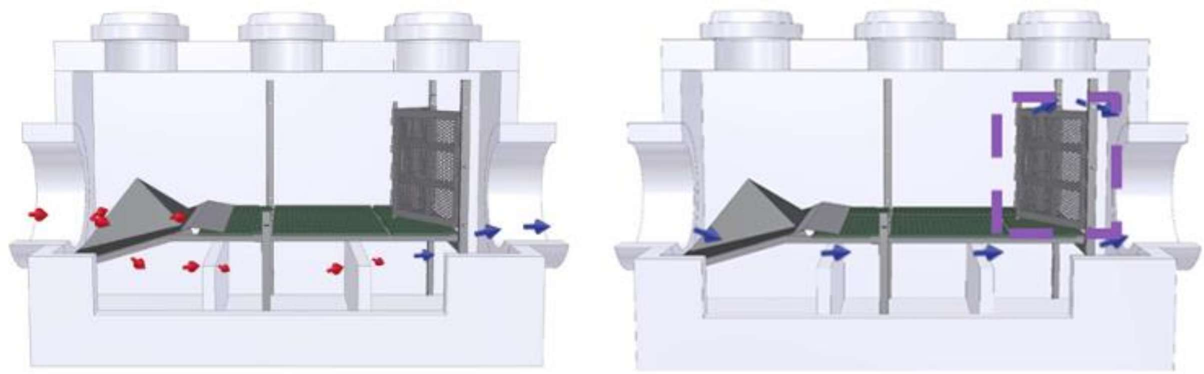


Figure 2 Diagram of Typical Flow Path (Left) and Bypass Condition (Right)

2. Laboratory Testing

The test program was conducted at the Alden Research Laboratory, LLC (Alden), Holden, Massachusetts, under the direct supervision of Alden's senior stormwater engineer, James Mailloux. Alden has performed verification testing on Hydrodynamic Separator and Filtration Manufactured Treatment Devices (MTDs) for manufacturers under various state and federal testing protocols. Particle size distribution (PSD) analysis was conducted by GeoTesting Express, Inc., Acton, Massachusetts. GeoTesting is an A2LA ISO/IEC 17025 accredited independent laboratory. Water quality samples collected during the testing process were analyzed in Alden's Stormwater Laboratory, which is ISO 17025 accredited to perform the analysis.

Laboratory testing was done in accordance with the New Jersey Department of Environmental Protection "Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device", January 2021, updated April 2023 (NJDEP Hydrodynamic Protocol). Prior to starting the performance testing program, a quality assurance project plan (QAPP) was submitted to, and approved by, the New Jersey Corporation for Advanced Technology (NJCAT) as per the NJDEP certification process.

2.1 Test Setup

Testing was conducted with a full-scale, 3-ft x 6-ft Hydro DryScreen® in January-March 2024. . The screen panels are fabricated from structural fiberglass and are installed in a horizontal orientation. The upstream panel has an upward slope and contains a wedge splitter to divert the flow to the sides. The sediment collection sump is separated into 3 isolated chambers by two 4" dividing walls, resulting in a collection sump area of 16 ft^2. The chambers are accessed by pivoting and/or removing the screen panels. A screen gate structure is located at the downstream end of the containment vault, on top of the last screen panel. The unit contained 8-inch influent and effluent pipes oriented on-center, with 1% slopes. The invert of each pipe was set at 1.70' above the vault floor. A drawing of the screening structure is shown on **Figure 3**.

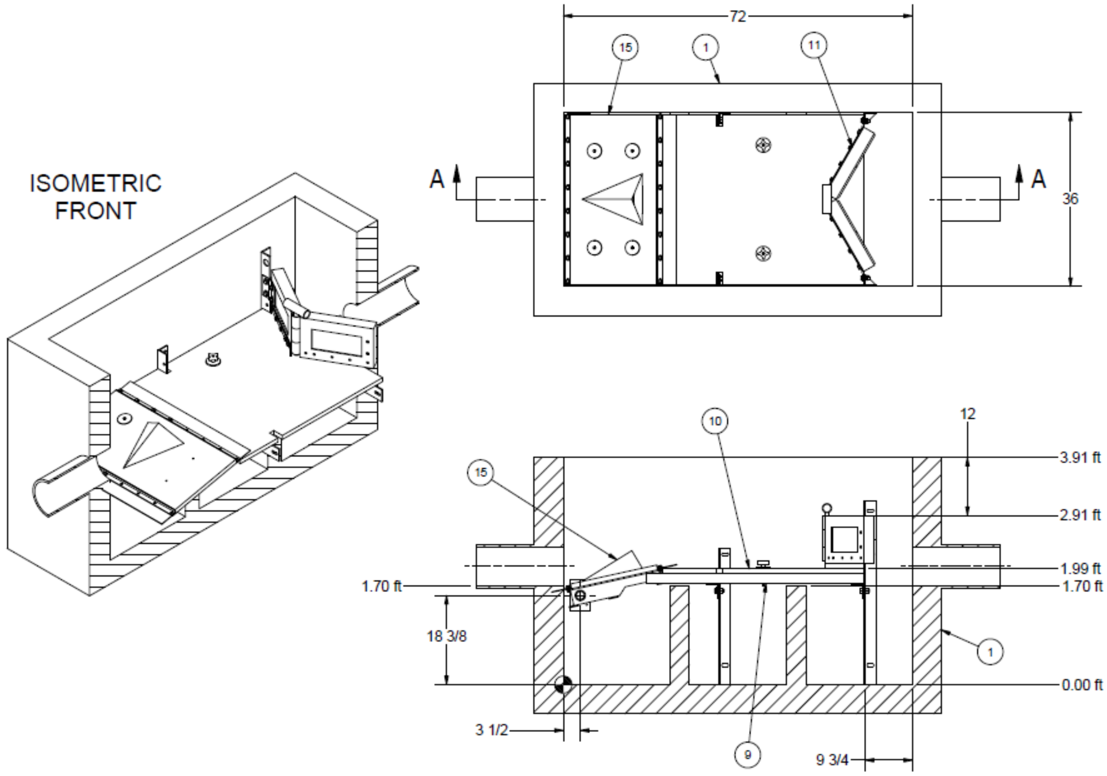


Figure 3 Isometric View of DryScreen® Test Unit

The test unit was installed in a test loop in Alden's Stormwater Testing Facility and is shown on **Figure 4**. A generic test loop set-up is shown on **Figure 5**, which is designed to provide metered flow up to approximately 9 cfs. Flow was supplied to the unit with a laboratory pump drawing water from an approximately 45,000-gallon supply sump, which can be heated or cooled as necessary. The flow was set and measured using a control valve and one of six calibrated flow meters, ranging from 1.5" to 10". Flow measurement accuracy is ±1%. The inlet flow was conveyed to the test unit by means of a straight 8" PVC influent pipe, with a minimum length of 20 pipe-diameters. Approximately 5 pipe-diameters of effluent piping returned the flow back to the sump as a free-discharge after it passed through the unit. A calibrated variable-speed, volumetric screw feeder discharged the test sediment into an 8" tee within the crown of the influent pipe, at a location 3' upstream of the treatment unit. The feeder provided a constant supply of sediment into the inflow to produce a target test concentration of 200 mg/l (± 20 mg/L). The mass capture methodology was used for the removal efficiency testing. The end-of-pipe grab sampling methodology was used for the scour test. An isokinetic sampler was installed in the center of the vertical pipe upstream of the inflow piping, to collect all background sediment concentration samples. Filtration of the supply sump was performed with an inline filter wall containing 1-micron bag filters.

Figure 4 DryScreen® Test Unit Installed in Alden Flow Loop

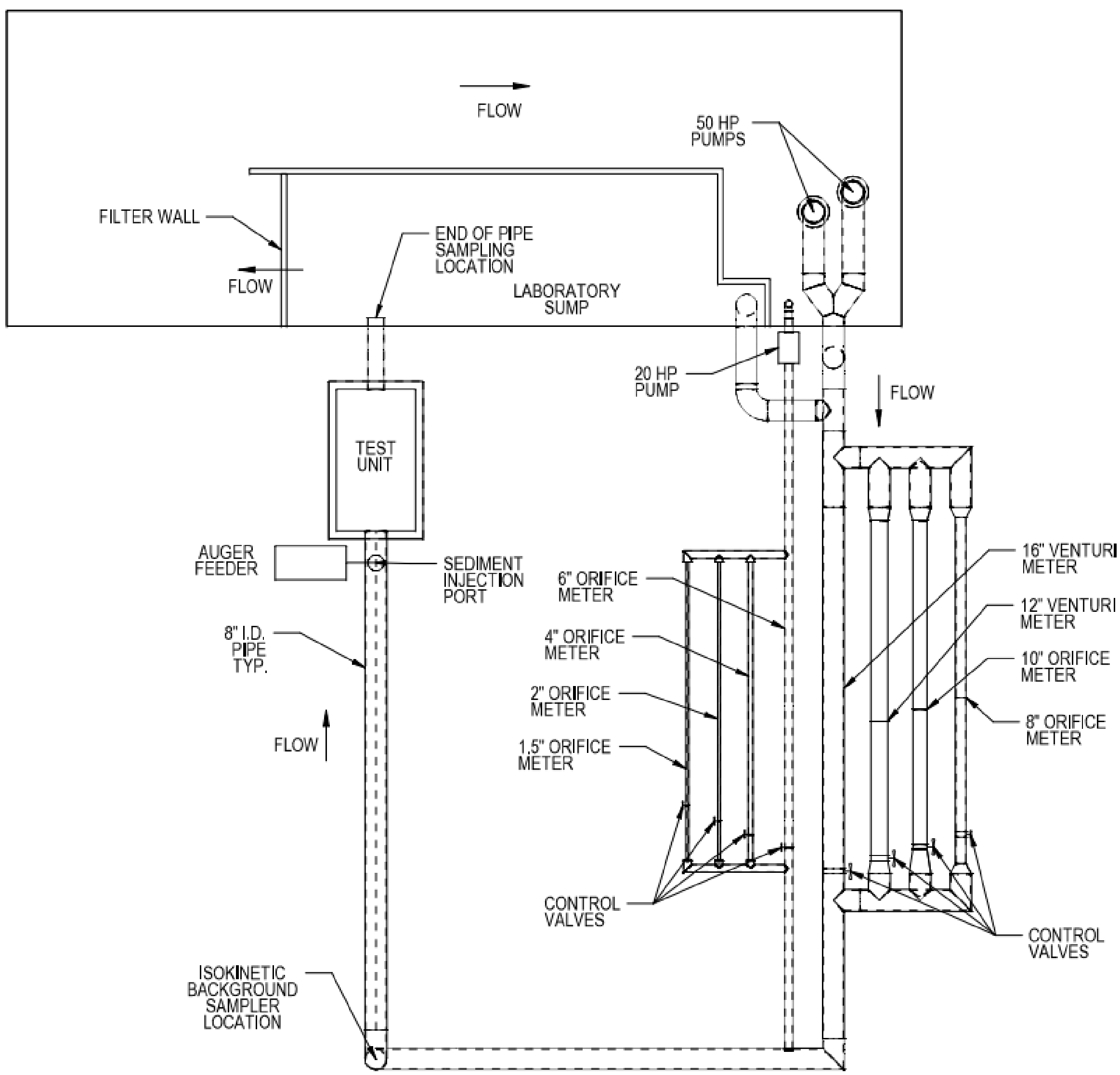


Figure 5 Plan View of Alden Flow Loop

2.2 Hydraulic Testing

The DryScreen was tested with clean water to establish the hydraulic characteristic curves. Flow and water level measurements were recorded at steady-state flow conditions using a computer Data-Acquisition (DA) system, which included a data collect program, 0-250” Rosemount differential-pressure (DP) cell, and Omegadyne PX419, 0 - 2.5 psi pressure transducer (PT). Flows were set and measured using calibrated differential-pressure flow meters and control valves. Each test flow was set and operated at steady state for approximately 5 minutes, after which time a minimum of 60 seconds of flow and pressure data were averaged and recorded for each pressure tap location. Water elevations were measured one pipe-diameter upstream and downstream of the unit, as well as within the test vault.

2.3 Removal Efficiency Testing

Removal testing was conducted on a clean unit utilizing the mass capture methodology. A false floor was installed at the 50% collection sump sediment storage depth of 6”, as stated by Hydro. All tests were run with clean water containing an average sediment solids concentration (SSC) of less than 20 mg/L.

A minimum of seven sediment removal efficiency tests were conducted at flows ranging from 7% to 174% of the selected maximum treatment flow rate (MTFR) of 225 gpm.

The test sediment was prepared by Alden to meet the PSD gradation of 1-1000 microns in accordance with the distribution shown in column 2 of **Table 1**. The sediment was silica based, with a specific gravity of 2.65. Random PSD samples of each test sediment batch were analyzed by GeoTesting Express, Acton, MA., an independent ISO17025 accredited analytical laboratory.

The target influent sediment concentration was 200 mg/L (±20 mg/L) for all tests. The concentration was verified by collecting a minimum of eight timed dry samples at the injector and correlating the data with the measured flow rate. Each sample volume was a minimum of 0.1 liters. The collection times did not exceed 1 minute for all tests except the 7% MTFR test, which were collected over a duration of 2 minutes to increase accuracy. The allowed Coefficient of Variance (COV) for the measured samples was 0.10. The reported test concentration was calculated based on the total mass injected during the test and total volume of water introduced during sediment dosing.

A minimum of 25 lbs of test sediment was introduced into the test unit for each test. The moisture content of the test sediment was determined using ASTM D2216 (2019) “Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass”, for each test conducted. Alden is ISO 17025 accredited for conducting the D2216 analysis. The allowed supply water maximum temperature of ≤ 80 degrees F was met for all tests conducted.

A minimum of 8 background samples of the supply water were collected at evenly spaced intervals throughout each test. Samples were collected every hour for any test ≥ 8 hours in duration. Collected samples were analyzed for Suspended Sediment Concentration (SSC) using ASTM D3977-97 (2019) “Standard Test Methods for Determining Sediment Concentration in Water Samples”. Alden is ISO 17025 accredited for conducting the D3977 analysis

After completion of a selected test, the unit was decanted over a period not exceeding 30 hours. The remaining water and sediment were collected from the treatment unit and dried in designated pre-weighed nonferrous trays in compliance with ASTM D2216 (2019).

Table 1 NJDEP Target Test Sediment Particle Size (PSD) Distribution

	TSS Removal Test PSD	Scour Test Pre-load PSD
Particle Size (Microns)	Target Minimum % Less Than[2]	Target Minimum % Less Than[3]
1,000	100	100
500	95	90
250	90	55
150	75	40
100	60	25
75	50	10
50	45	0
20	35	0
8	20	0
5	10	0
2	5	0

1. The material shall be hard, firm, and inorganic with a specific gravity of 2.65. The various particle sizes shall be uniformly distributed throughout the material prior to use.
2. A measured value may be lower than a target minimum % less than value by up to two percentage points, provided the measured d_{50} value does not exceed 75 microns.
3. This distribution is to be used to pre-load the MTD's sedimentation chamber for off-line and on-line scour testing.

2.4 Scour Testing

A sediment scour test was conducted to evaluate the ability to retain captured material during high flows. A false floor was installed in the unit and 4" of 50-1000 micron sediment was pre-loaded in each chamber of the collection sump to the 50% capacity level, in accordance with the protocol. All test sediment was evenly distributed and levelled prior to testing as per the protocol. Based on the non-uniform sediment deposition patterns observed during the removal efficiency testing, it was deemed appropriate to conduct contouring of the bed prior to performing the scour test. Details of the contouring procedure are discussed in **Section 4.3.**

The unit was filled with clean water (< 20 mg/L sediment concentration) to the dry-weather condition prior to testing. Testing was conducted at a temperature not exceeding 80 degrees F. The test was initiated within 96 hours of filling the unit.

The test was conducted at a minimum of 200% MTFR for online certification. Testing consisted of conveying the selected target flow through the unit and collecting 15 time-stamped effluent samples (every 2 minutes) for SSC analysis, with the first sample being collected 1 minute after initiating the flow. The target flow was reached within 3 minutes of commencement of the test. A minimum of 8 evenly spaced time-stamped background samples were collected throughout the test. Flow data was recorded every 3 seconds throughout the test.

Each effluent grab sample for sediment concentration analysis was collected from the end of the effluent pipe by sweeping a 1 liter wide-mouth bottle through the effluent free-discharge stream.

2.5 Instrumentation and Measuring Techniques

Flow

The inflow to the test unit was measured using one of six (6) calibrated DP flow meters (1.5”, 2”, 4”, 6”, 8” and 10”). Each meter was fabricated per ASME guidelines and calibrated in Alden’s ISO 17025 accredited Calibration Department. The high and low-pressure lines from each meter were connected to manifolds containing isolation valves. Flows were set with a control valve and the differential pressure from the meter was measured using a Rosemount® 0 to 250-inch DP cell, also calibrated at Alden prior to testing. The test flow was averaged and recorded every 3-30 seconds (flow dependent) throughout the duration of the test using an in-house computer data acquisition (DA) program. The accuracy of the flow measurement was ±1%. The allowable Coefficient of Variance (COV) for flow documentation was ≤ 0.03. A photograph of the flow meters is shown on **Figure 6** and the pumps on **Figure 7.**

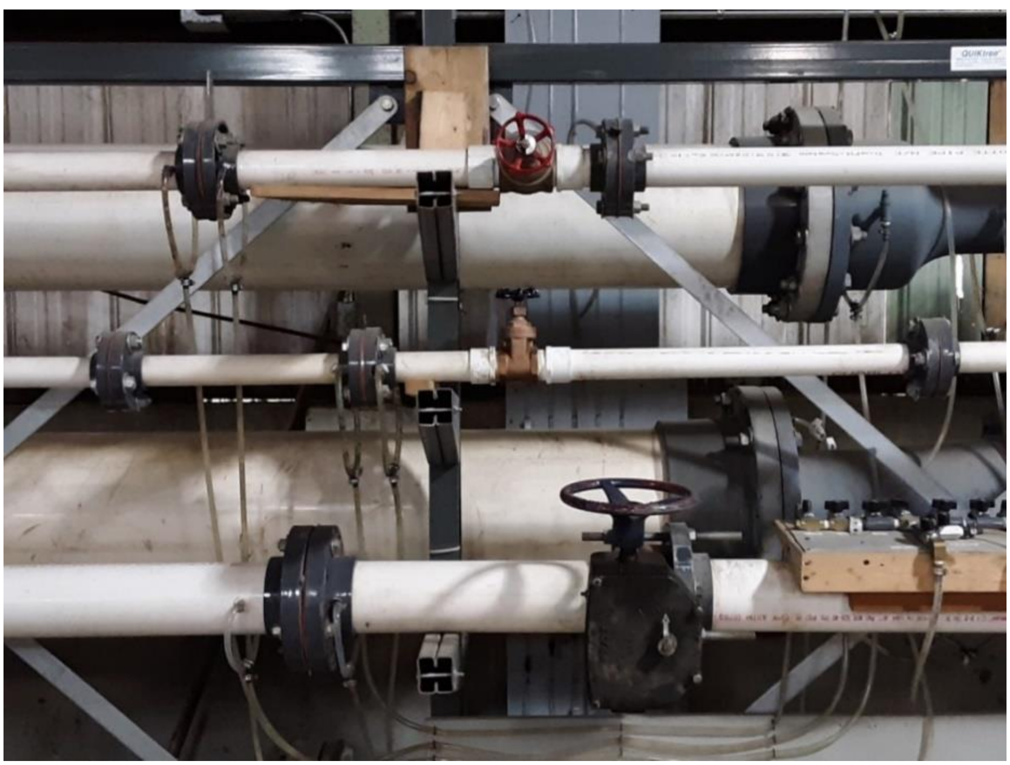


Figure 6 Photograph Showing Laboratory Flow Meters

Figure 7 Photograph Showing Laboratory Pumps

Temperature

Water temperature measurements within the supply sump were obtained using a calibrated Omega® DP25 temperature probe and readout device. The calibration was performed at the laboratory prior to testing. The temperature measurement was documented at the start, middle and end of each test, to assure a testing temperature of ≤ 80 degrees F per NJDEP protocol requirement.

Pressure Head

Pressure head measurements were recorded at multiple locations using piezometer taps and an Omegadyne PX419, 0 - 2.5 psi pressure transducer (PT). The PT was calibrated at Alden prior to testing. Accuracy of the readings was ± 0.001’. The cell was installed at a known datum of 1.969’ below the outlet pipe, allowing for elevation readings through the full range of flows. A minimum of 60 seconds of pressure data was averaged and recorded for each pressure tap, under steady-state flow conditions, using the computer DA program. A photograph of the pressure instrumentation is shown on **Figure 8**.

Figure 8 Pressure Measurement Instrumentation

Sediment Injection

The test sediment was injected into the crown of the influent pipe using an Auger Feeders Ltd.® volumetric screw feeder, model VF-1, shown on **Figure 9.** The feed augers ranged in size from 0.5” to 1.0”, depending on the test flow. Each auger screw, driven with a variable-speed drive, was calibrated with the test sediment prior to testing. The pre-test calibration, as well as test verification of the sediment feed was accomplished by collecting 1-minute timed dry samples (2 minutes for 7% MTFR flow) and weighing them on a calibrated Ohaus® 2200g x 0.1g, model SPX2201 digital scale. The allowable COV for sediment feed was ≤ 0.10.

Figure 9 Photograph Showing Variable-Speed Auger Feeder

Sample Collection

Background concentration samples were collected from the center of the vertical riser pipe upstream of the test unit inlet pipe, with the use of a 0.75" diameter isokinetic sampler, shown in **Figure 10**. The sampler was calibrated for each test flow. All scour test effluent grab samples were collected from the free-discharge at the end of the effluent pipe, using 1 L wide-mouth bottles. All collected samples were a minimum of 0.5 L in volume.

Figure 10 Photograph Showing the Background Isokinetic Sampler

Sample Concentration Analysis

Effluent and background concentration samples were analyzed by Alden in accordance with Method B, as described in ASTM Designation: D 3977-97 (Re-approved 2019), "Standard Test Methods for Determining Sediment Concentration in Water Samples". Alden has assigned a minimum detection limit (MDL) of 1.0 mg/L. To be conservative, all concentrations below the MDL were assigned a value of 0.5 mg/L. Alden is ISO 17025 accredited to perform the analysis.

Mass Capture Analysis

The mass capture test methodology, in which the injected and captured sediment masses are quantified, was used to determine the sediment removal efficiency for each test flow. The mass of injected sediment was determined by weighing the prepared test batch prior to testing and subtracting the remaining mass in the feeder, as well as the injection calibration samples at the conclusion of the test. All captured material was collected in designated pre-weighed non-ferrous trays and dried in a Binder® laboratory oven, model ED-400, in accordance with ASTM D2216 (2019) "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass." Depending on collected mass, each tray was weighed on either an Ohaus® 40000 g x 0.1 g; model SP4001, or Adam® 16 kg x 0.0005 kg; model GBK-35A digital scale. Alden is ISO 17025 accredited for conducting the ASTM D2216 analysis.

2.6 Data Management and Acquisition

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

A personal computer running an Alden in-house Labview® Data Acquisition program was used to record all data related to instrument calibration and testing. A 16-bit National Instruments® NI6212 Analog to Digital board was used to convert the voltage signal from the pressure cells for input to the DA program. Alden's in-house data collection software, by default, collects one-second averages of data collected at a raw rate of 250 Hz. The system allows very long contiguous data collection by continuously writing the collected 1 second averages and their RMS values to disk. The data output from the program is in tab delimited text format with user-defined number of significant figures. The recorded data files were imported into Excel for further analysis and plotting.

Test flow and pressure data were continuously collected at a frequency of 250 Hz. The flow data was averaged and recorded to file every 3 to 30 seconds, depending on the duration of the test. Steady-state pressure data were averaged and recorded over a duration of 60 seconds for each point. The recorded data files were imported into Excel for further analysis and plotting.

Excel based data sheets were used to record all sediment related data used for quantifying injection rate, effluent (scour) and background sample concentrations, flow, pressure, mass, and PSD data. The data was input to the designated spreadsheet for final processing.

2.7 Quality Assurance and Control

All instruments were calibrated prior to testing and periodically checked throughout the test program. Instrumentation calibrations were provided to NJCAT.

Flow

The flow meters and pressure cells were calibrated in Alden's Calibration Laboratory, which is ISO 17025 accredited. All pressure lines were purged of air prior to initiating each test. A standard water manometer board and Engineers Rule were used to measure the differential pressure and verify the computer measurement of the selected flow meter.

Sediment Injection

The sediment feed (g/min) was verified with the use of a NIST traceable digital stopwatch and a 2200 g x 0.1 g calibrated digital scale. The tare weight of the sample container was recorded prior to collection of each sample. The samples were a minimum of 0.1 liters in size, with a maximum collection time of 1 minute. The reported overall mass/volume sediment concentrations were adjusted for moisture.

3. Performance Claims

Per the NJDEP verification procedure and based on the laboratory testing conducted for the 3-ft x 6-ft Hydro DryScreen®, the following are the performance claims made by Hydro.

Total Suspended Solids (TSS) Removal Efficiency

The TSS removal rate of the Hydro DryScreen® is dependent upon flow rate, particle density and particle size. For the particle size distribution and weighted calculation method required by the NJDEP Protocol, the 3-ft x 6-ft Hydro DryScreen® at an MTFR of 0.50 cfs will demonstrate at least 50% TSS removal efficiency.

Effective Sedimentation Treatment Area (ESTA)

The effective sedimentation treatment area (ESTA) of the 3-ft x 6-ft Hydro DryScreen® is 16.0 sq. ft.

Maximum Treatment Flow Rate (MTFR)

The MTFR for the 3-ft x 6-ft Hydro DryScreen® was demonstrated to be 225 gpm (0.50 cfs) which corresponds to a hydraulic loading rate of 14.1 gpm/sq. ft.

Sediment Storage Depth and Volume

The maximum sediment storage depth of the Hydro DryScreen® is 12 inches. Available sump volume varies with each Hydro DryScreen® model. The available sump volume for a 3-ft x 6-ft

Hydro DryScreen® model is 0.59 cubic yards. The maximum sediment storage depth is 6 inches, which corresponds to a 50% full sump capacity (or 0.30 cubic yards) for this model (**Appendix Table A-1**)

Online Installation

Based on the Scour Test results described in Section 4.3, the Hydro DryScreen® qualifies for online installation.

Wet Volume and Detention Time

The detention time of the Hydro DryScreen® depends on flow rate and model size. The detention time is calculated by dividing the treatment volume by the flow rate. The treatment volume is defined as the volume between the pipe invert and the top of the sediment storage zone. For the tested 3-ft x 6-ft Hydro DryScreen® at the MTFR of 0.50 cfs, the detention time is 38 seconds.

System Loss

Hydraulic testing was conducted at flows ranging from 30 to 596 gpm. The maximum recorded system energy loss was 0.34 ft at 596 gpm.

4. Supporting Documentation

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

4.1 Test Sediment PSD Analysis

The sediment particle size distribution (PSD) used for scour and removal efficiency testing was comprised of 50-1000 and 1–1000 micron (respectively) silica particles with a SG of 2.65. All sediment batches were prepared by Alden to meet the protocol specifications using commercially available silica products. A random sample from each test batch was analyzed in accordance with ASTM D6913/D7928, by GeoTesting Express, an A2LA ISO/IEC 17025 accredited independent laboratory. The specified less than (%-finer) values of the sample average were within the 2-percentage point tolerance listed in the protocol.

Sediment test batches of approximately 30-35 Lbs were prepared in individual 5-gallon buckets, which were arbitrarily selected for each removal test. A well-mixed sample was collected from each test batch and analyzed for PSD by GeoTesting Express. The average of the samples was used for compliance with the protocol specifications. The removal efficiency PSD data are shown in **Table 2** and the corresponding curves are shown on **Figure 11**. The scour PSD data are shown in **Table 3** and the corresponding curves are shown on **Figure 12**.

Table 2 PSD Analyses of the Removal Efficiency (1-1000 micron) Sediment

Particle size (µm)	PSD %-Finer Target	15.7 gpm	31.4 gpm	78.6 gpm	157 gpm	236 gpm	300 gpm	393 gpm	Average	QA / QC Compliant
1000	**100%**	99%	99%	99%	99%	99%	99%	99%	**99%**	**Y**
500	**95%**	94%	94%	94%	94%	95%	95%	94%	**94%**	**Y**
250	**90%**	88%	89%	89%	89%	90%	89%	89%	**89%**	**Y**
150	**75%**	74%	73%	73%	74%	74%	76%	73%	**74%**	**Y**
100	**60%**	59%	59%	58%	59%	58%	62%	58%	**59%**	**Y**
75	**50%**	51%	50%	50%	51%	52%	53%	50%	**51%**	**Y**
50	**45%**	47%	47%	46%	47%	47%	48%	46%	**47%**	**Y**
20	**35%**	33%	33%	36%	39%	36%	34%	36%	**35%**	**Y**
8	**20%**	16%	17%	18%	19%	18%	17%	21%	**18%**	**Y**
5	**10%**	11%	10%	11%	12%	11%	11%	14%	**11%**	**Y**
2	**5%**	4%	3%	5%	5%	3%	4%	6%	**4%**	**Y**
D_{50}	**75**	69	72	74	64	64	61	75	**68**	**Y**

The sediment particle size distribution (PSD) used for removal efficiency testing is finer than the NJDEP PSD sediment specifications (**Table 1**) across the entire distribution. The median (D_{50}) of 68 microns was less than the required 75 microns.

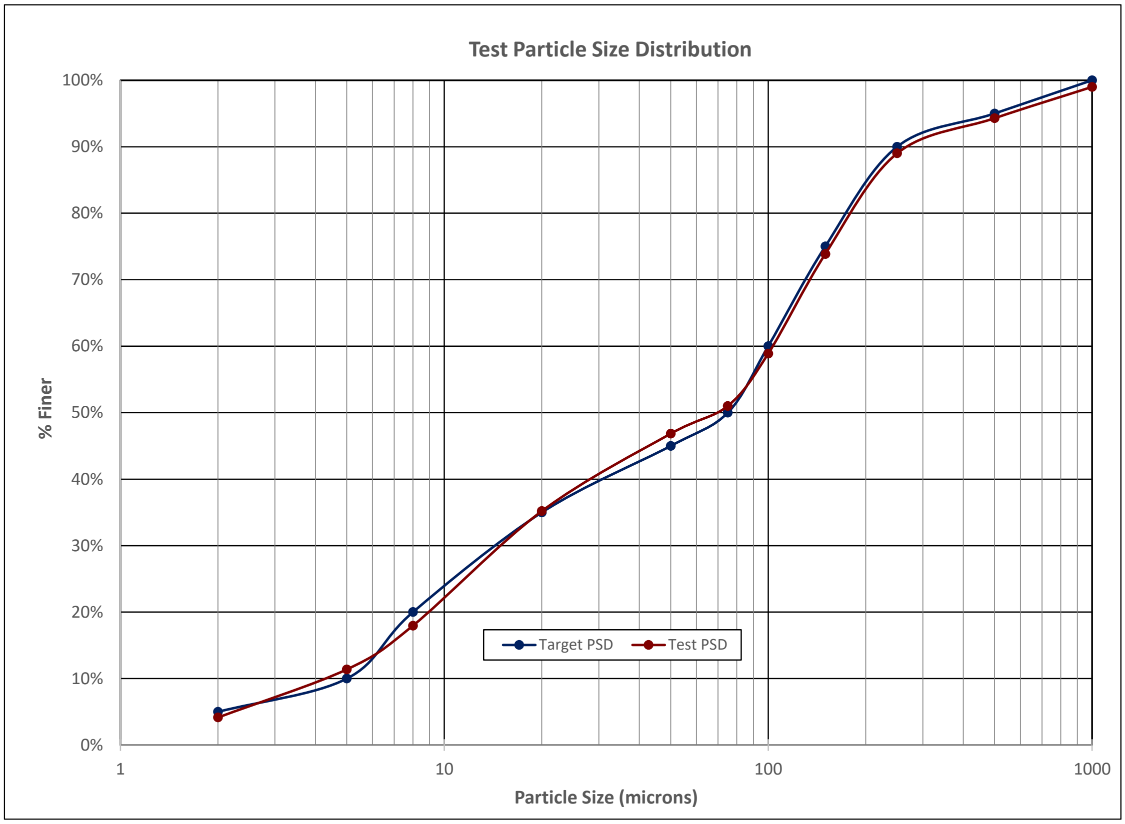


Figure 11 Average Removal Efficiency Test Sediment PSD

Table 3 PSD Analysis of the Scour (50-1000 micron) Sediment

Particle size (μm)	NJDEP	Sample 1	Sample 2	Sample 3	Sample 4	Average
1000	100%	99%	99%	99%	99%	99%
500	90%	89%	89%	90%	89%	89%
250	55%	60%	61%	60%	60%	60%
150	40%	45%	48%	43%	51%	47%
100	25%	20%	24%	20%	28%	23%
75	10%	11%	15%	10%	14%	13%
50	0%	5%	9%	5%	6%	6%

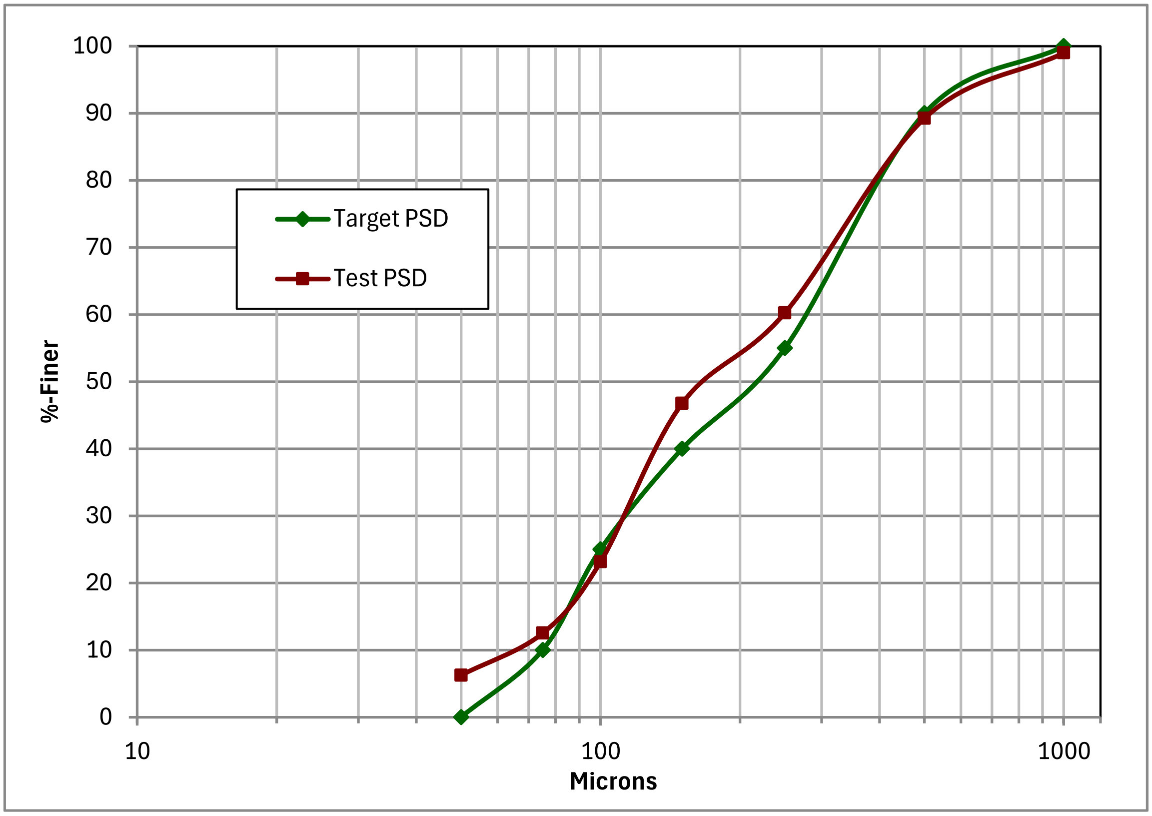


Figure 12 Average Scour Test Sediment PSD

4.2 Removal Efficiency Testing

Testing Summary

Removal efficiency tests were conducted at 7 flows ranging from 15.7 gpm to 393 gpm to allow for the development of the removal efficiency curve and corresponding equation.

At the end of each test run, the captured sediment was collected and quantified. For all runs there was zero sediment in the inlet pipe. The removal efficiency was determined by dividing the sediment captured in the DryScreen sump by the injected sediment mass:

$$\% \, \textbf{Removal} = \frac{\textbf{Captured Sediment Mass}}{\textbf{Injected Sediment Mass}} \, \textbf{x 100}$$

The removal efficiencies of the tested flows ranged from 30.2% to 64.3%. The test data was plotted, and a 3rd-order polynomial curve and equation was applied. The R^2 value of the curve equation was 0.998, exceeding the 0.95 criterion. The equation was used to select the 100% MTFR and calculate the NJDEP weighted removals for the 25%, 50%, 75%, 100% and 125% MTFR flows.

The summary removal efficiency data is shown in **Table 4 – Table 6,** and the removal efficiency curve and equation are shown on **Figure 13.** The calculated NJDEP weighted removal efficiency was 50.2% and is shown in **Table 7**.

Table 4 Removal Efficiency Testing Summary

Measured Flow		NJDEP	Removal
gpm	cfs	% MTFR	Efficiency
15.7	0.04	0.07	64.3%
31.4	0.07	0.14	60.9%
78.7	0.18	0.35	54.8%
157	0.35	0.70	49.2%
236	0.53	1.05	42.7%
301	0.67	1.34	39.8%
393	0.88	1.74	30.2%

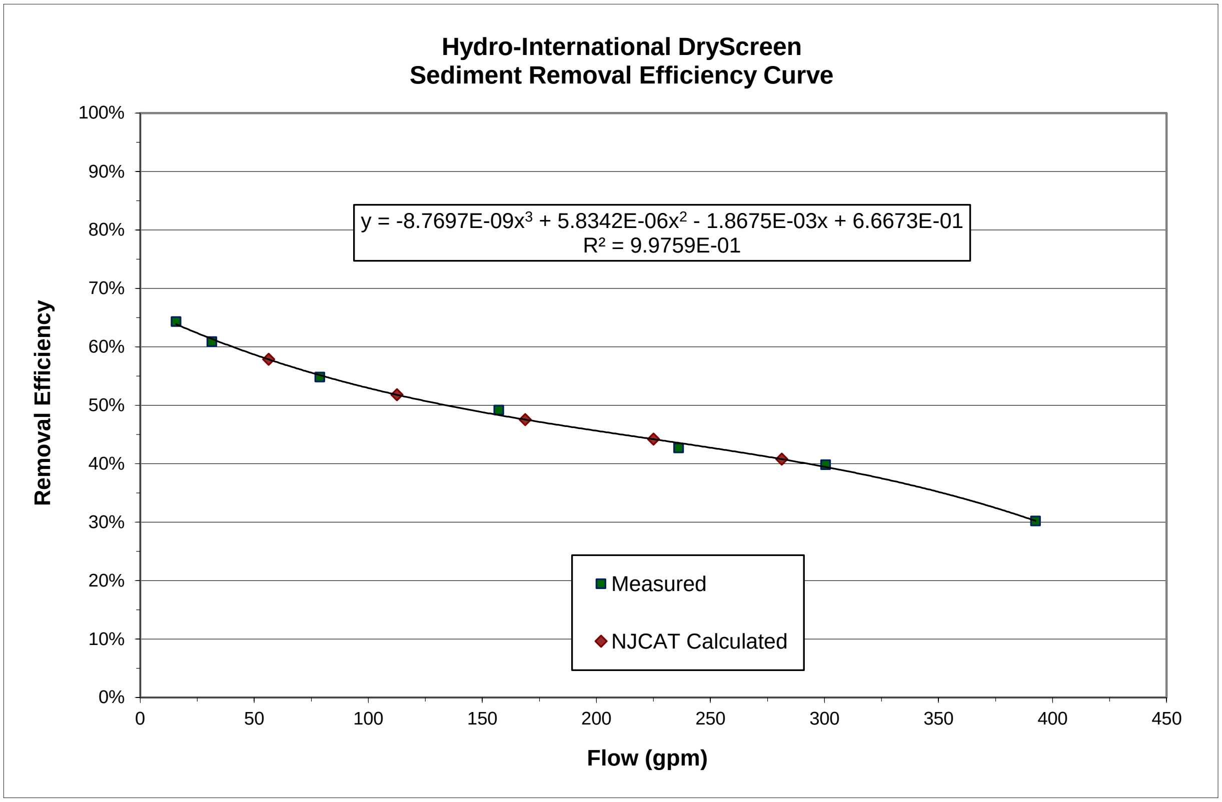


Figure 13 DryScreen Removal Efficiency Curve

Table 5 Injected Sediment Summary

Measured Flow		Target Concentration	Injector Wts. Concentration	Injector Measurements	Mass/Volume Concentration	Total Injected Mass	QA / QC Compliant
gpm	cfs	mg/L	mg/L	**COV**	mg/L	Lbs	
15.7	0.04	200	197	0.06	196	26.36	**Y**
31.4	0.07	200	205	0.03	206	27.57	**Y**
78.7	0.18	200	202	0.04	200	26.76	**Y**
157	0.35	200	200	0.02	197	26.13	**Y**
236	0.53	200	198	0.01	192	25.68	**Y**
301	0.67	200	197	0.05	194	26.03	**Y**
393	0.88	200	192	0.04	191	25.86	**Y**

Table 6 Test Flow and Water Temperature Summary

Measured Flow	Flow Measurement	Maximum Temperature	Maximum Background	QA / QC Compliant
gpm	**COV**	Deg. F	mg/L	
15.7	0.003	65.1	2.4	**Y**
31.4	0.001	69.1	9.5	**Y**
78.7	0.001	67.9	13.5	**Y**
157	0.002	72.5	1.8	**Y**
236	0.002	76.6	1.7	**Y**
301	0.002	66.0	7.9	**Y**
393	0.002	71.7	5.0	**Y**

Table 7 Weighted Removal Efficiency

MTFR	Flow (gpm)	Removal	Weighting Factor	Weighted Removal
25%	56.3	57.9%	0.25	14.5%
50%	112.5	51.8%	0.30	15.5%
75%	168.8	47.6%	0.20	9.5%
100%	225.0	44.2%	0.15	6.6%
125%	281.3	40.8%	0.10	4.1%
				50.2%

7% MTFR (15.7 gpm)

The test was conducted over a period of 2.5 days, with a total test duration of 18.4 hours. The test flow was averaged and recorded every 30 seconds throughout the test. The average recorded test flow was 15.7 gpm, with a COV of 0.003. The recorded temperature for the full test ranged from 64.2 to 65.1 degrees F.

The injection feed rate of 11.9 g/min was verified by collecting timed weight samples from the injector. The calculated influent injection concentrations for the full test ranged from 180 mg/L to 218 mg/L, with a mean of 197 mg/L and COV of 0.06. The total mass injected into the unit was 26.36 Lbs. The calculated mass/volume concentration for the test was 196 mg/L. The measured flow and influent concentration data for the complete test is shown on **Figure 14**.

Twenty (20) background concentrations samples were collected throughout the test and ranged from 0.5 to 2.4 mg/L. The background concentration data are shown on **Figure 15**.

The total mass collected from the unit was 16.95 Lbs resulting in a removal efficiency of 64.3%.

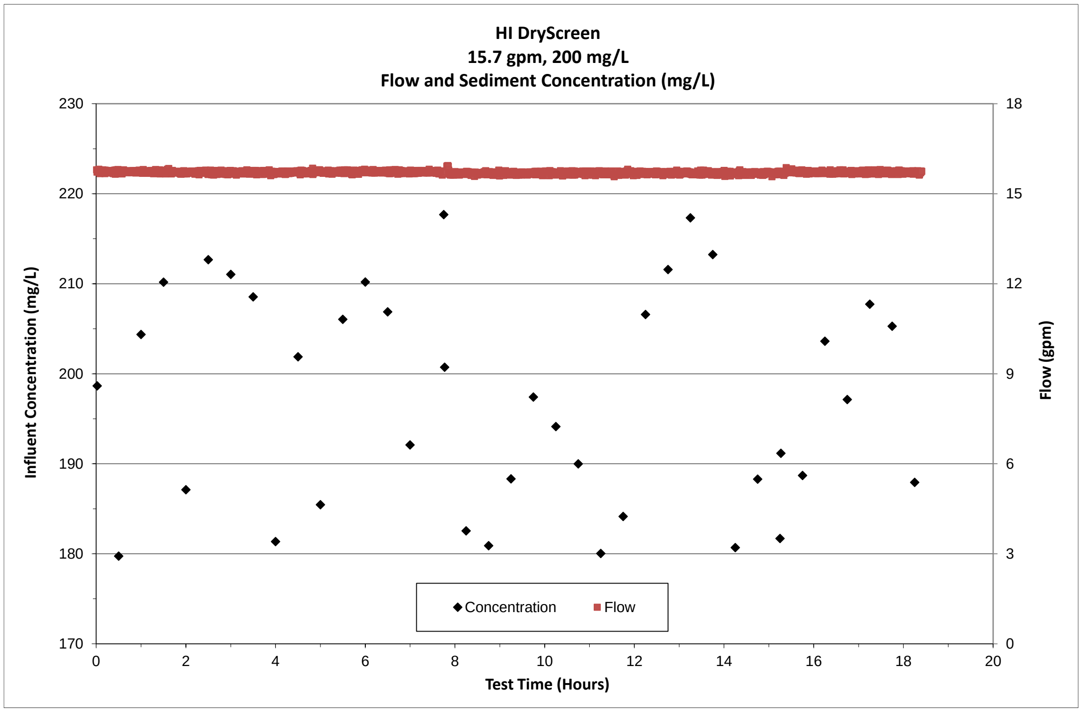


Figure 14 15.7 gpm Measured Flow and Influent Concentrations

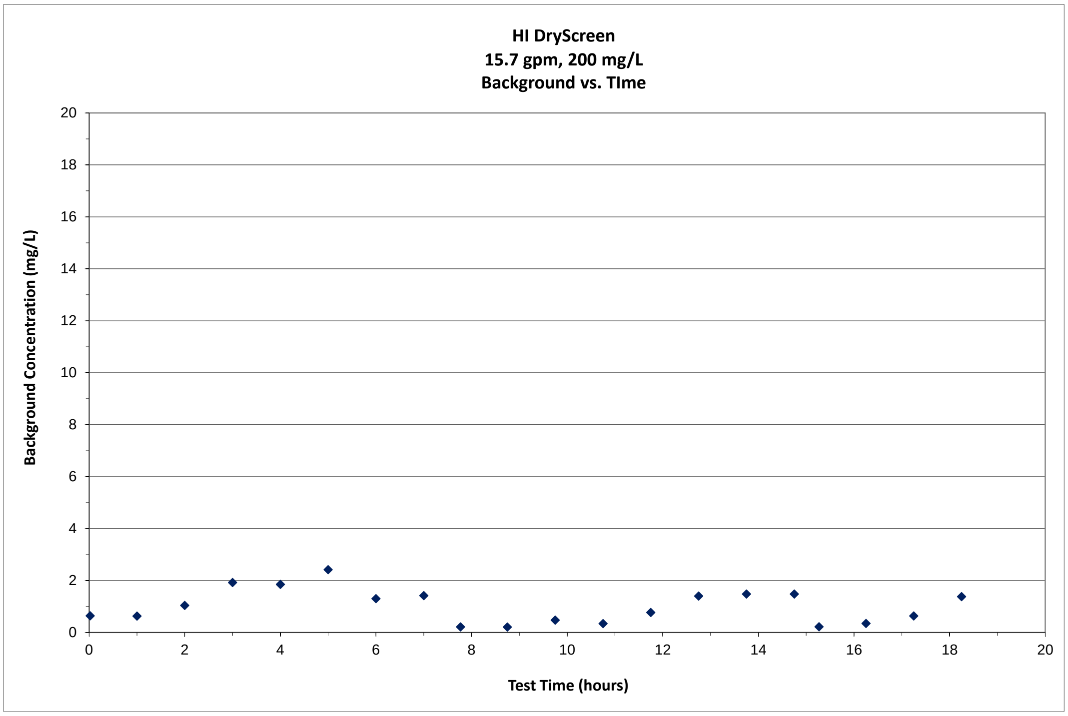


Figure 15 15.7 gpm Measured Background Concentrations

14% MTFR (31.4 gpm)

The test was conducted over a period of 8.9 hours (over 2 day duration) to meet the minimum 25 Lb feed requirement. The test flow was averaged and recorded every 30 seconds throughout the test. The average recorded test flow was 31.4 gpm, with a COV of 0.001. The recorded temperature for the full test ranged from 68.0 to 69.1 degrees F.

The injection feed rate of 23.8 g/min was verified by collecting timed weight samples from the injector. The calculated influent injection concentrations for the full test ranged from 193 mg/L to 215 mg/L, with a mean of 205 mg/L and COV of 0.03. The total mass injected into the unit was 27.57 Lbs. The calculated mass/volume concentration for the test was 206 mg/L. The flow and measured influent concentration data for the complete test is shown on **Figure 16**.

Eight (8) background concentrations samples were collected throughout the test and ranged from 0.5 to 9.5 mg/L. The background concentration data are shown on **Figure 17**.

The total mass collected from the unit was 16.79 Lbs, resulting in a removal efficiency of 60.9%.

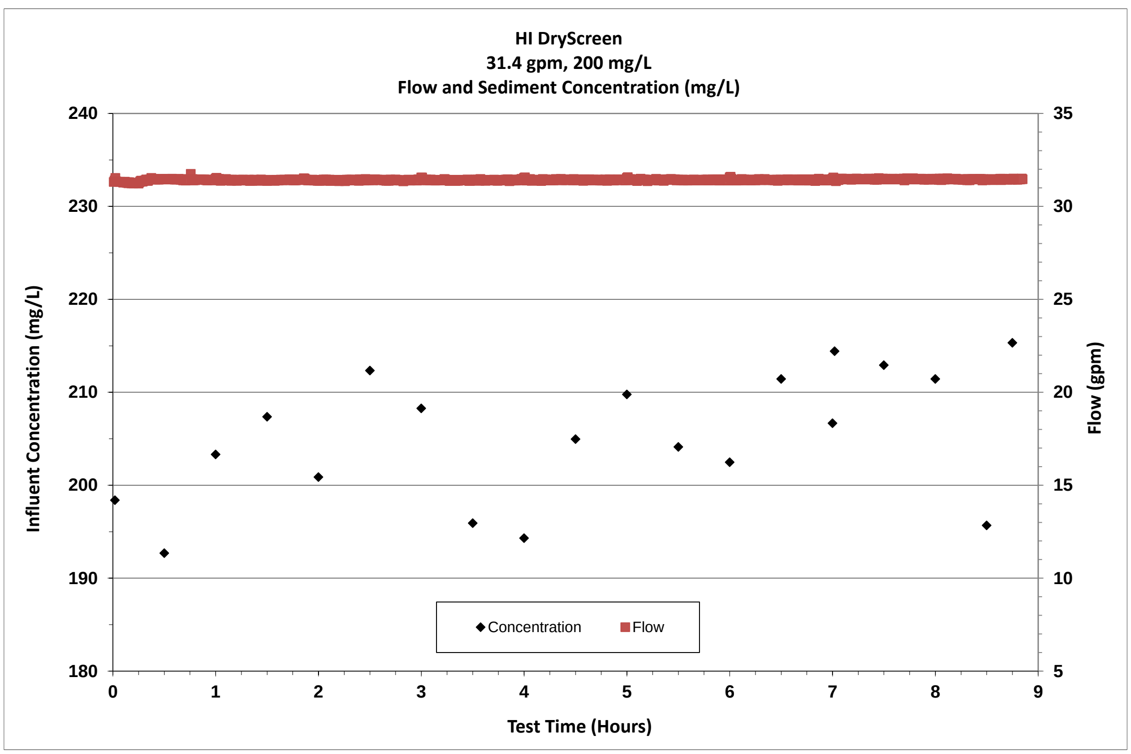


Figure 16 31.4 gpm Measured Flow and Influent Concentrations

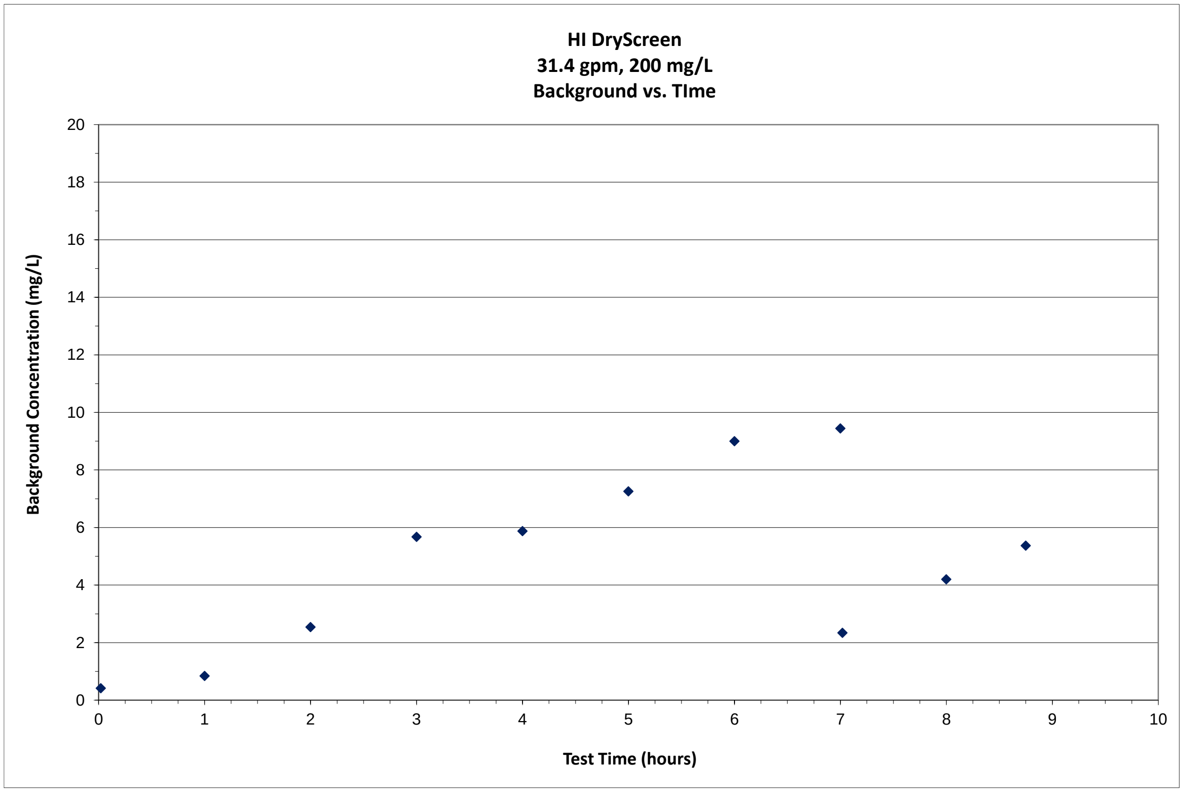


Figure 17 31.4 gpm Measured Background Concentrations

35% MTFR (78.7 gpm)

The test was conducted over a duration of 3.5 hours to meet the minimum 25 Lb feed requirement. The test flow was averaged and recorded every 30 seconds throughout the test. The average recorded test flow was 78.7 gpm, with a COV of 0.001. The maximum recorded temperature for the full test was 67.9 degrees F.

The injection feed rate of 59.5 g/min was verified by collecting timed weight samples from the injector. The calculated influent injection concentrations for the full test ranged from 192 mg/L to 214 mg/L, with a mean of 202 mg/L and COV of 0.04. The total mass injected into the unit was 26.76 Lbs. The calculated mass/volume concentration for the test was 200 mg/L. The measured test flow and influent concentration data for the complete test is shown on **Figure 18**.

Eight (8) background concentrations samples were collected throughout the test and ranged from 0.5 to 13.5 mg/L. The background concentration data are shown on **Figure 19**.

The total mass collected from the unit was 14.67 Lbs, resulting in a removal efficiency of 54.8%.

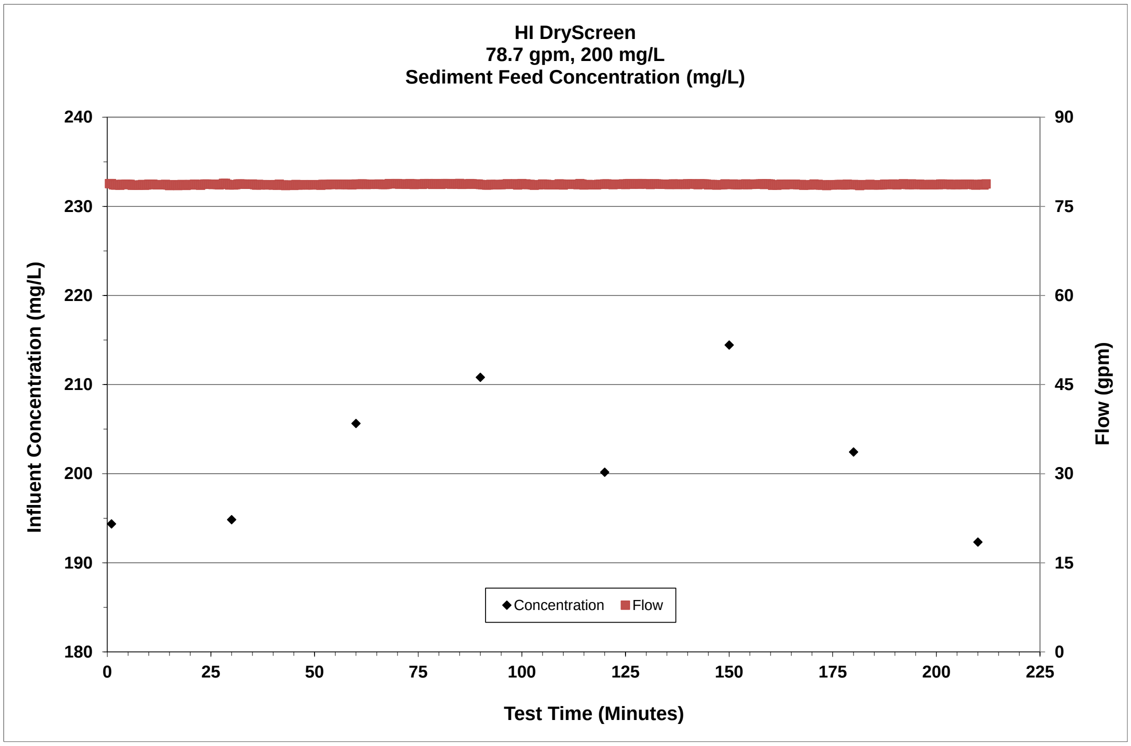


Figure 18 78.7 gpm Measured Flow and Influent Concentrations

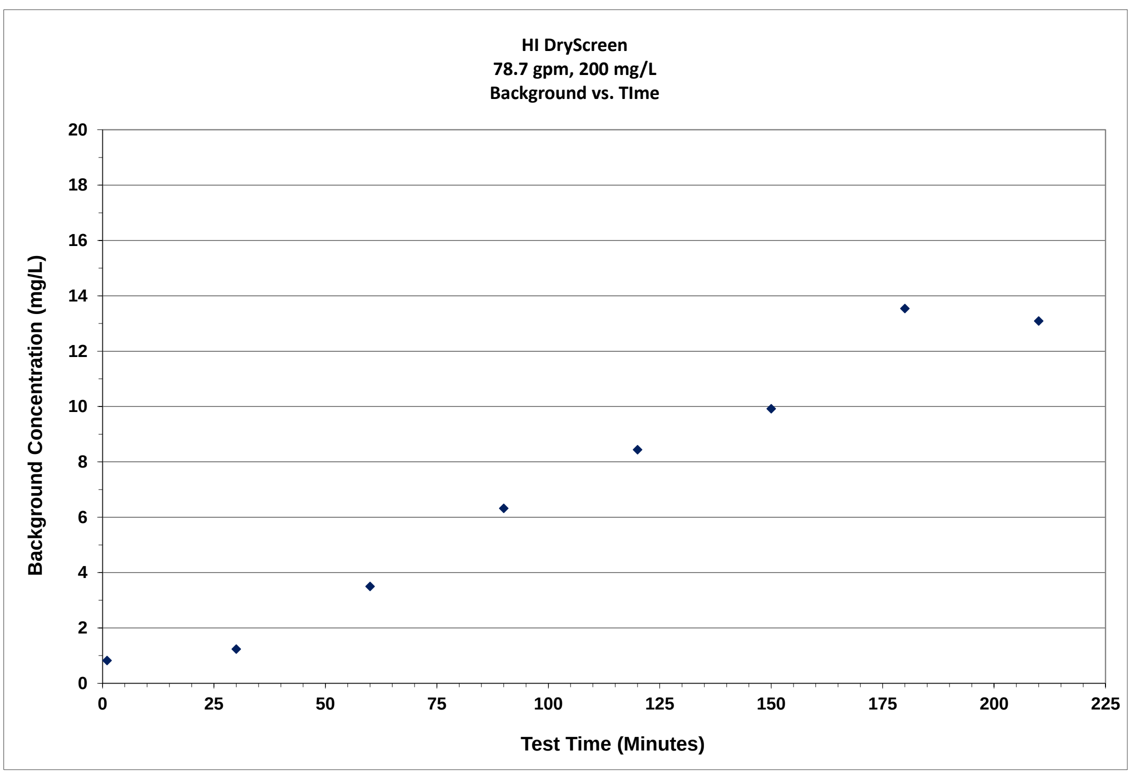


Figure 19 78.7 gpm Measured Background Concentrations

70% MTFR (157 gpm)

The test was conducted over a duration of 109 minutes to meet the minimum 25 Lb feed requirement. The test flow was averaged and recorded every 10 seconds throughout the test. The average recorded test flow was 157.3 gpm, with a COV of 0.002. The maximum recorded temperature for the full test was 72.5 degrees F.

The injection feed rate of 119 g/min was verified by collecting timed weight samples from the injector. The calculated influent injection concentrations for the full test ranged from 194 mg/L to 206 mg/L, with a mean of 200 mg/L and COV of 0.02. The total mass injected into the unit was 26.13 Lbs. The calculated mass/volume concentration for the test was 197 mg/L. The measured flow and influent concentration data for the complete test is shown on **Figure 20**.

Eight (8) background concentrations samples were collected throughout the test and ranged from 0.5 to 1.8 mg/L. The background concentration data are shown on **Figure 21**.

The total mass collected from the unit was 12.85 Lbs, resulting in a removal efficiency of 49.2%.

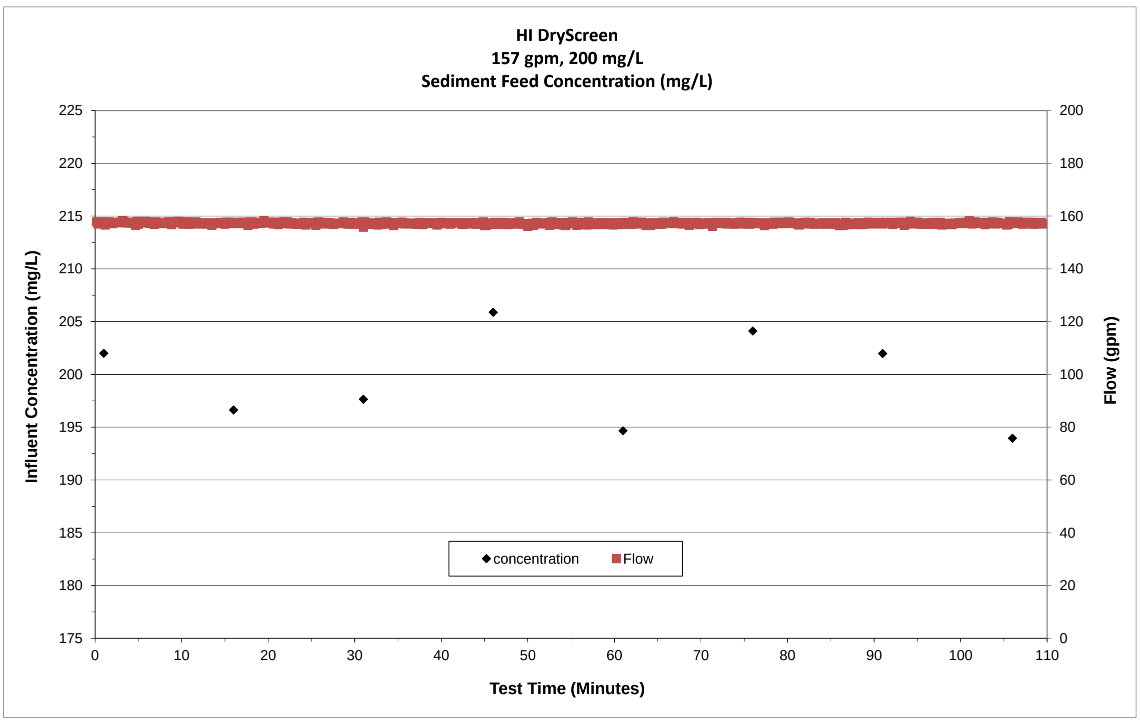


Figure 20 157 gpm Measured Flow and Influent Concentrations

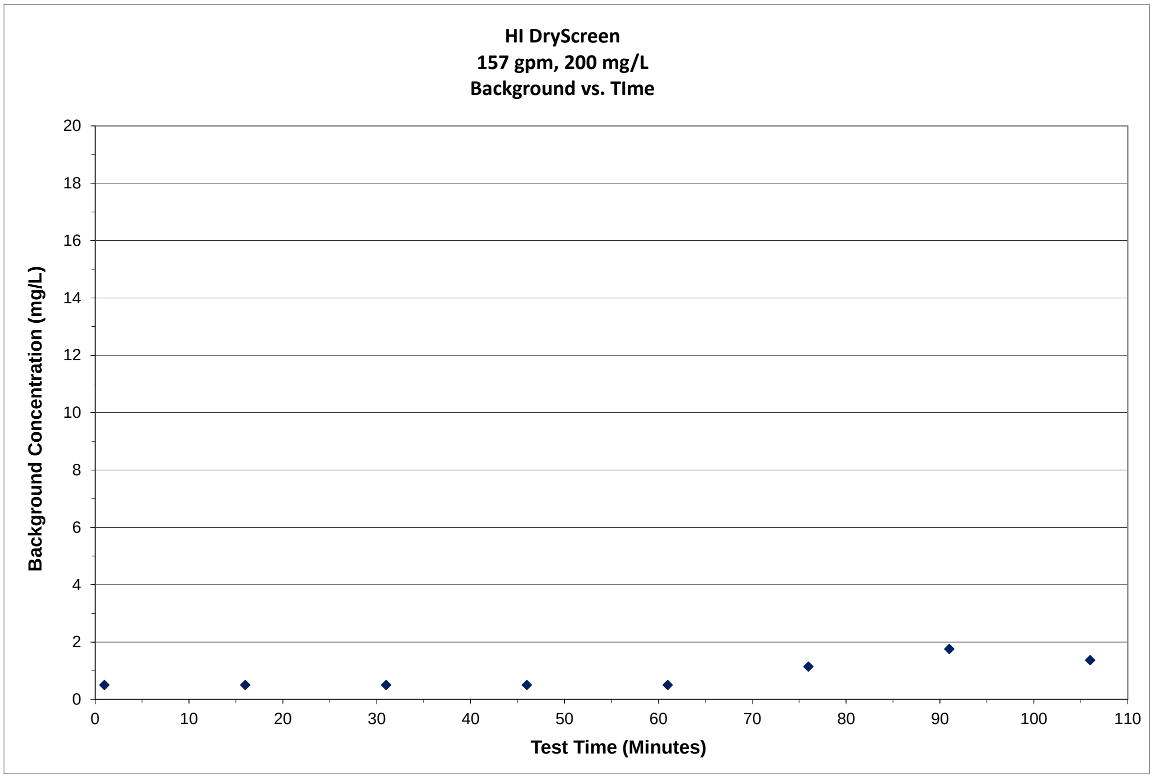


Figure 21 157 gpm Measured Background Concentrations

105% MTFR (236)

The test was conducted over a duration of 77 minutes to meet the minimum 25 Lb feed requirement. The test flow was averaged and recorded every 10 seconds throughout the test. The average recorded test flow was 236.1 gpm, with a COV of 0.002. The maximum recorded temperature for the full test was 76.6 degrees F.

The injection feed rate of 178.5 g/min was verified by collecting timed weight samples from the injector. The measured influent injection concentrations for the full test ranged from 195 mg/L to 201 mg/L, with a mean of 198 mg/L and COV of 0.01. The total mass injected into the unit was 25.68 Lbs. The calculated mass/volume concentration for the test was 192 mg/L. The measured flow and influent concentration data for the complete test is shown on **Figure 22**.

Eight (8) background concentrations samples were collected throughout the test and ranged from 0.5 to 1.7 mg/L. The background concentration data are shown on **Figure 23.**

The total mass collected from the unit was 10.97 Lbs, resulting in a removal efficiency of 42.7%.

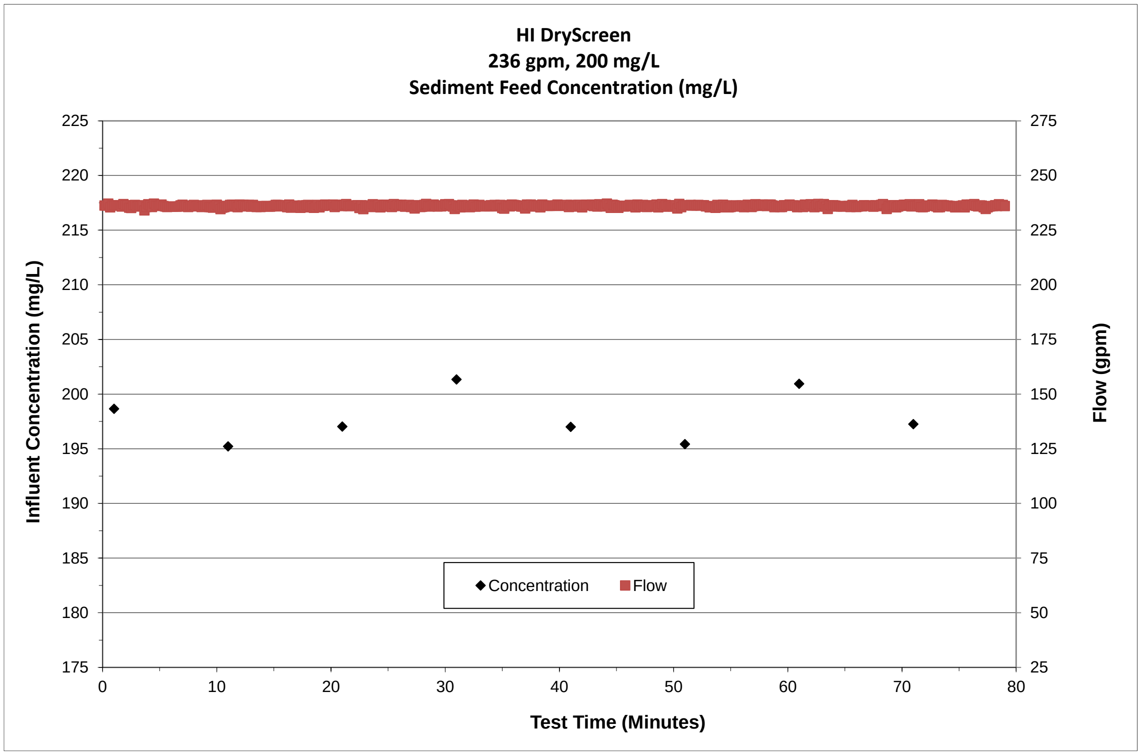


Figure 22 236 gpm Measured Flow and Influent Concentrations

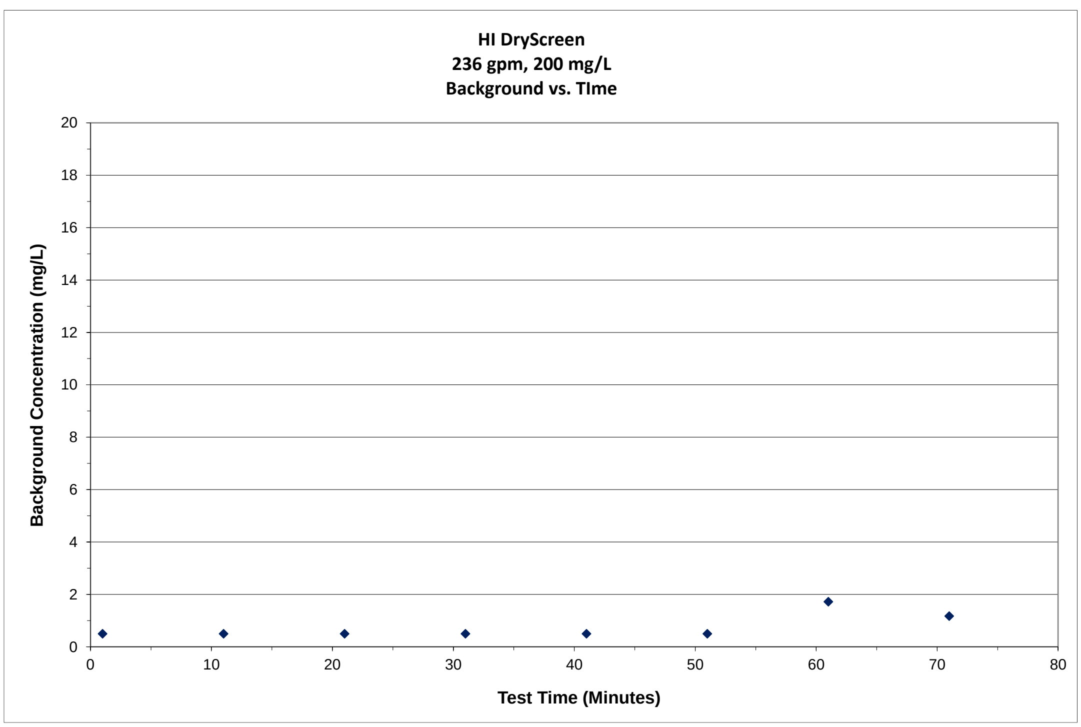


Figure 23 236 gpm Measured Background Concentrations

134% MTFR (301 gpm)

The test was conducted over a duration of 62 minutes to meet the minimum 25 Lb feed requirement. The test flow was averaged and recorded every 10 seconds throughout the test. The average recorded test flow was 300.5 gpm, with a COV of 0.002. The maximum recorded temperature for the full test was 66.0 degrees F.

The injection feed rate of 227.2 g/min was verified by collecting timed weight samples from the injector. The measured influent injection concentrations for the full test ranged from 180 mg/L to 210 mg/L, with a mean of 197 mg/L and COV of 0.05. The total mass injected into the unit was 26.03 Lbs. The calculated mass/volume concentration for the test was 194 mg/L. The measured flow and influent concentration data for the complete test is shown on **Figure 24**.

Eight (8) background concentrations samples were collected throughout the test and ranged from 1.1 to 7.9 mg/L. The background concentration data are shown on **Figure 25**.

The total mass collected from the unit was 10.37 Lbs, resulting in a removal efficiency of 39.8%.

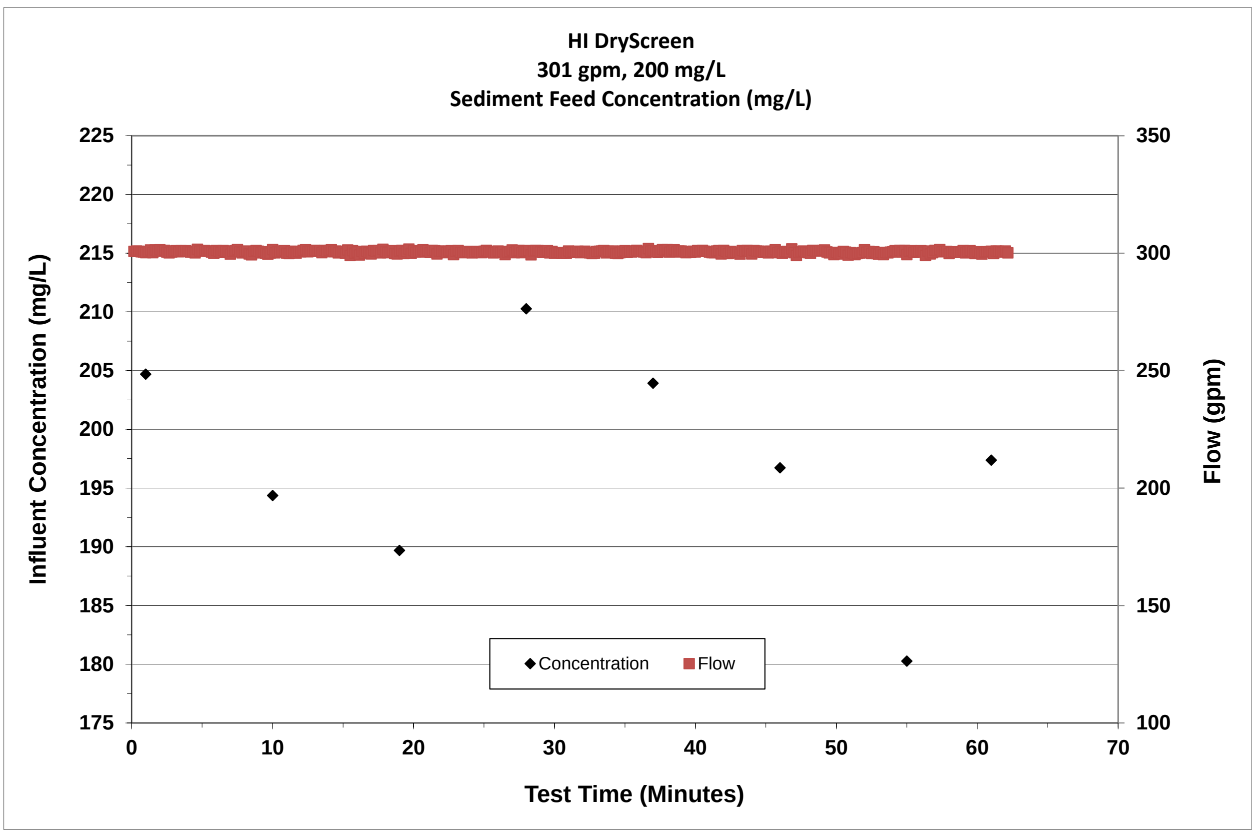


Figure 24 301 gpm Measured Flow and Influent Concentrations

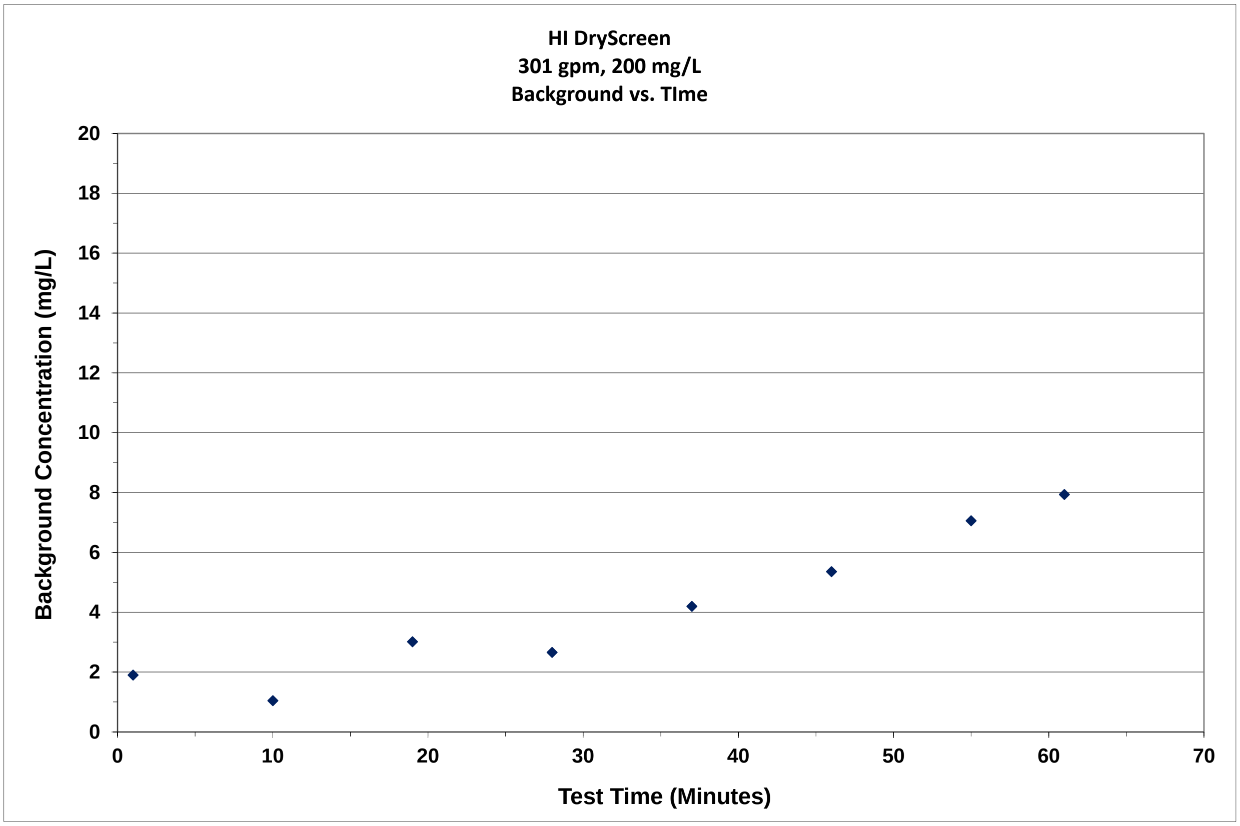


Figure 25 301 gpm Measured Background Concentrations

174% MTFR (393 gpm)

The test was conducted over a duration of 45 minutes to meet the minimum 25 Lb feed requirement. The test flow was averaged and recorded every 10 seconds throughout the test. The average recorded test flow was 392.5 gpm, with a COV of 0.002. The maximum recorded temperature for the full test was 71.7 degrees F.

The injection feed rate of 297.4 g/min was verified by collecting timed weight samples from the injector. The measured influent injection concentrations for the full test ranged from 180 mg/L to 202 mg/L, with a mean of 192 mg/L and COV of 0.04. The total mass injected into the unit was 25.86 Lbs. The calculated mass/volume concentration for the test was 191 mg/L. The measured flow and influent concentration data for the complete test is shown on **Figure 26**.

Eight (8) background concentrations samples were collected throughout the test and ranged from 0.5 to 5.0 mg/L. The background concentration data are shown on **Figure 27**.

The total mass collected from the unit was 7.80 Lbs, resulting in a removal efficiency of 30.2%.

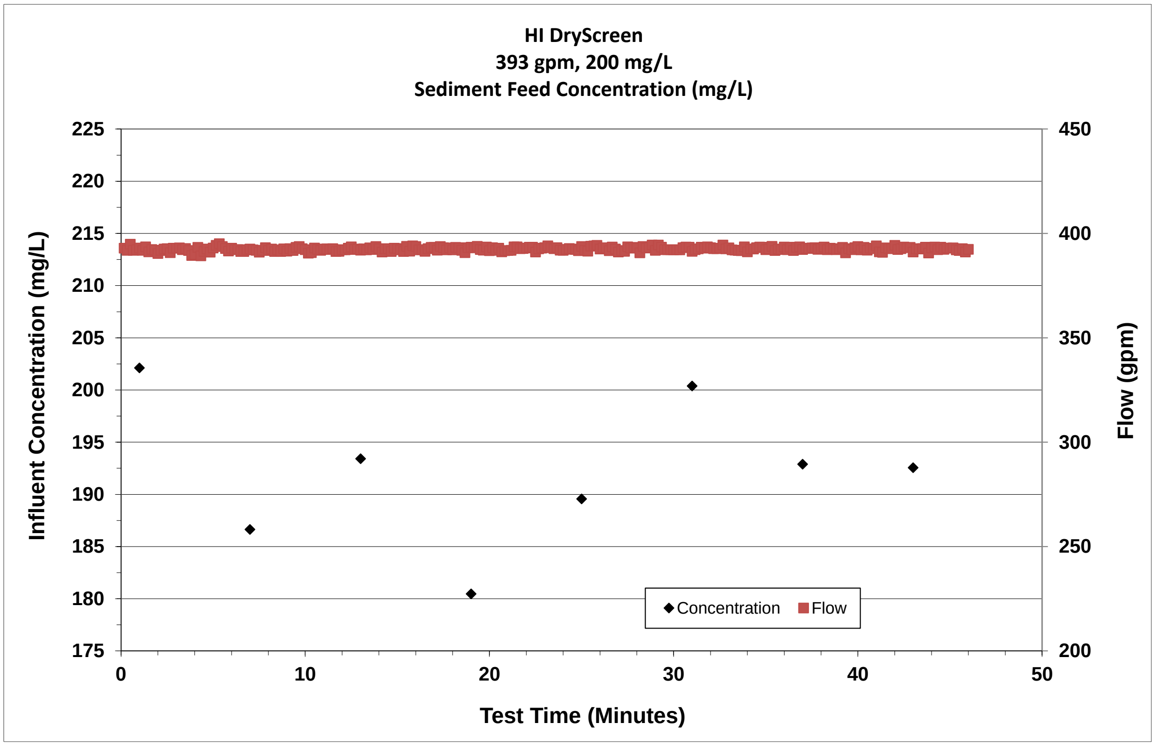


Figure 26 393 gpm Measured Flow and Influent Concentrations

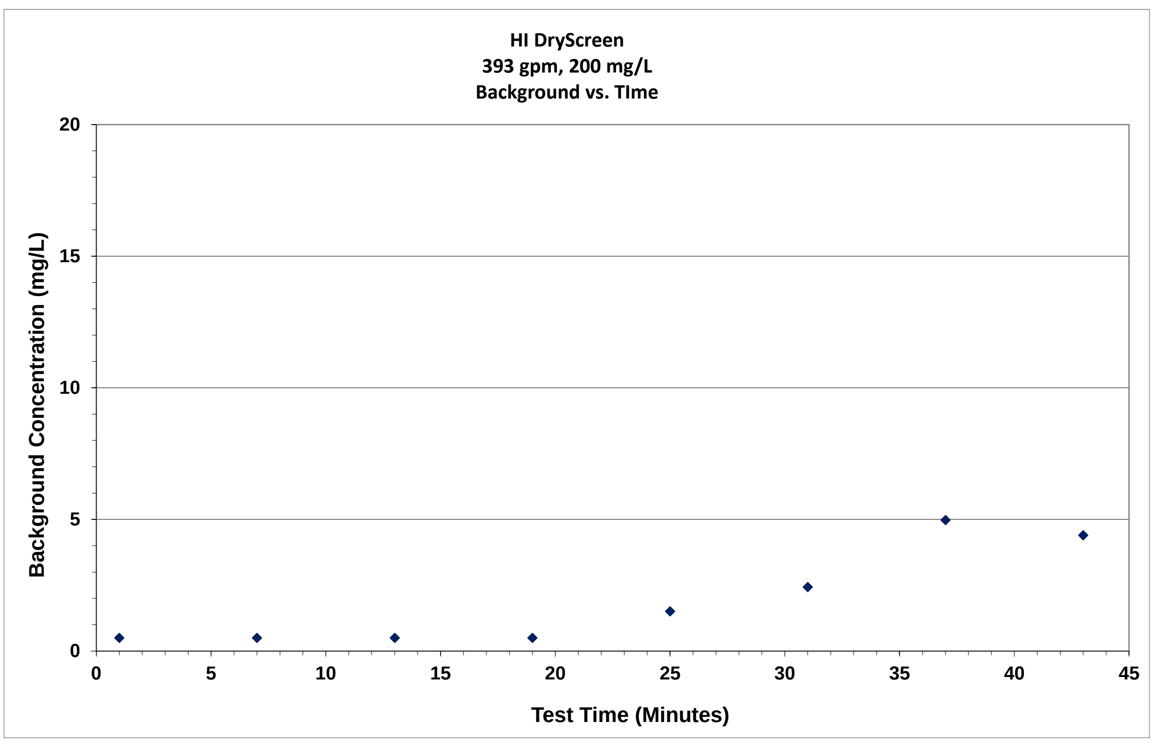


Figure 27 393 gpm Measured Background Concentrations

4.3 Scour Test

Preliminary tests and Bed Contouring

The sump was uniformly preloaded to the 50% sump capacity level of 6 inches, with 50-1000 micron sediment shown in **Table 3** and **Figure 12**. An initial test was conducted at 450 gpm (200% MTFR), which resulted in effluent concentrations above the accepted limit of 20 mg/L. Inspection of the bed showed areas of scour that agreed with the removal efficiency deposition patterns. The bed was replenished with 5.5 Lbs of sediment which was estimated to have been lost during the test and an additional test was conducted at 281 gpm (125% MTFR), which met the acceptance criteria. It was deemed likely that the unit would pass the 200% MTFR if the bed was contoured prior to conducting the test. The top 2” of the bed was replaced, as the 96-hour time criterion had expired, and the bed was levelled prior to filling to the dry-weather condition. The 200% MTFR test condition was repeated to allow contouring of the bed. The sediment bed was replenished with 7 Lbs of sediment (to be conservative) and the unit was allowed to sit for 24 hours before running the final test.

200% MTFR Sour Test

The test was conducted as described in **Section 2.4** , at the target 200% MTFR flow of 450 gpm. The flow was measured and averaged every 3 seconds throughout the test. The average measured steady-state flow was 449.8 gpm, with a corresponding COV of 0.003. The 8 background concentrations were below the MDL of 1.0 mg/L and therefore were assigned values of 0.5 mg/L. The adjusted effluent concentrations ranged from 4.9 to 32.6 mg/L, with an average concentration of 14.3 mg/L, meeting the NJDEP acceptance criterion for online designation. The effluent and background data are shown in **Table 8** and on **Figure 28**. The recorded flow data is shown on **Figure 29**.

Table 8 Scour Effluent and Background Concentrations

Sample ID	Timestamp (minutes)	Effluent Concentration (mg/L)	Background Concentration (mg/L)	Adjusted Effluent Concentration (mg/L)
EFF 1	1	5.36	0.50	4.86
EFF 2	3	17.12	0.50	16.62
EFF 3	5	14.77	0.50	14.27
EFF 4	7	7.36	0.50	6.86
EFF 5	9	11.80	0.50	11.30
EFF 6	11	6.10	0.50	5.60
EFF 7	13	9.47	0.50	8.97
EFF 8	15	12.89	0.50	12.39
EFF 9	17	18.81	0.50	18.31
EFF 10	19	16.56	0.50	16.06
EFF 11	21	16.83	0.50	16.33
EFF 12	23	33.12	0.50	32.62
EFF 13	25	25.67	0.50	25.17
EFF 14	27	17.25	0.50	16.75
EFF 15	29	8.74	0.50	8.24
	Average	**14.79**	**0.50**	**14.29**

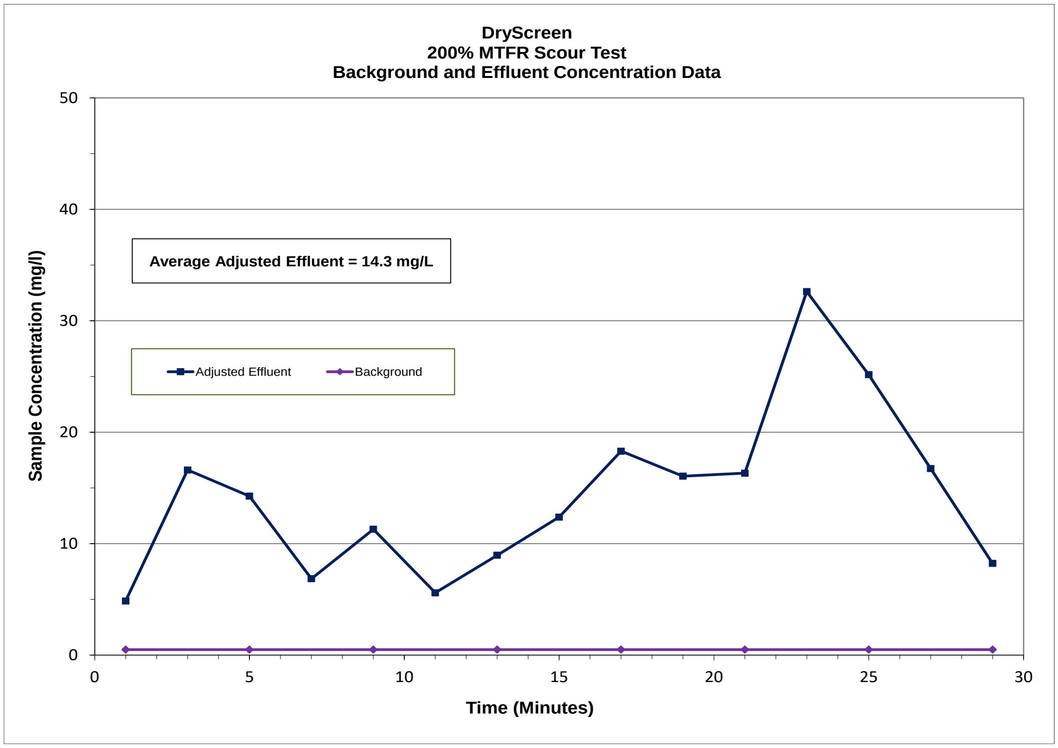


Figure 28 200% MTFR Scour Test Measured Concentration Data

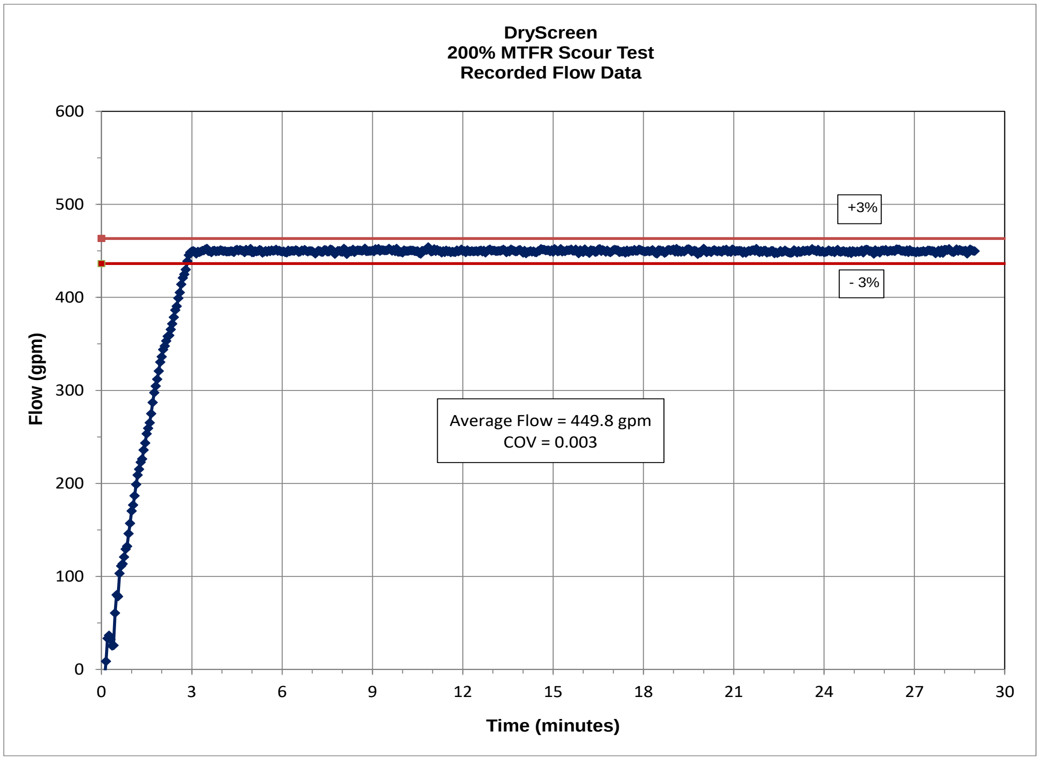


Figure 29 200% MTFR Measured Scour Test Flow Data

4.4 Hydraulics

Piezometer taps were installed as described in **Section 2.2**. Flow and water levels within the system were measured for 11 flows ranging from 30 to 596 gpm. The recorded elevation data and system loss are shown in **Table 9.** The maximum calculated loss was 0.34 ft at 596 gpm. The elevation and system loss curves are shown on **Figure 30 and Figure 31.** The pressure data for the inlet and outlet pipes were corrected for velocity head.

Table 9 Recorded Flow and Elevation Data

	Losses			
Flow	Inlet El. (A')	Outlet El. (C')	System Energy Loss	
gpm	Corrected for V-head	Corrected for V-head	A'-C'	Outlet V-head
	ft	ft	ft	ft
0	1.731	1.691	0	0
30.3	1.953	1.863	0.089	0.078
69.9	1.982	1.938	0.044	0.080
110.0	2.046	2.003	0.043	0.085
140.0	2.087	2.046	0.040	0.090
201.0	2.164	2.127	0.038	0.102
251.9	2.238	2.186	0.052	0.119
301.4	2.308	2.238	0.070	0.144
349.8	2.388	2.287	0.101	0.175
401.1	2.503	2.340	0.163	0.220
495.5	2.686	2.435	0.251	0.276
596.2	2.901	2.564	0.336	0.411

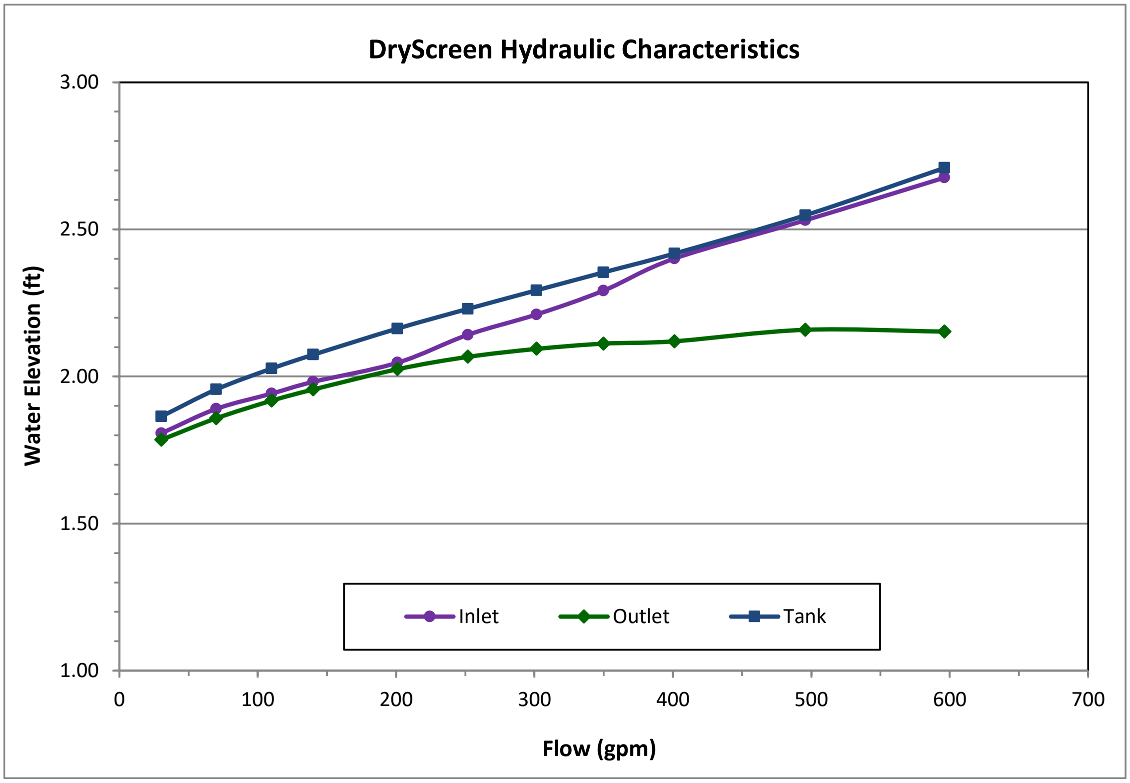


Figure 30 Measured Flow vs Water Elevations

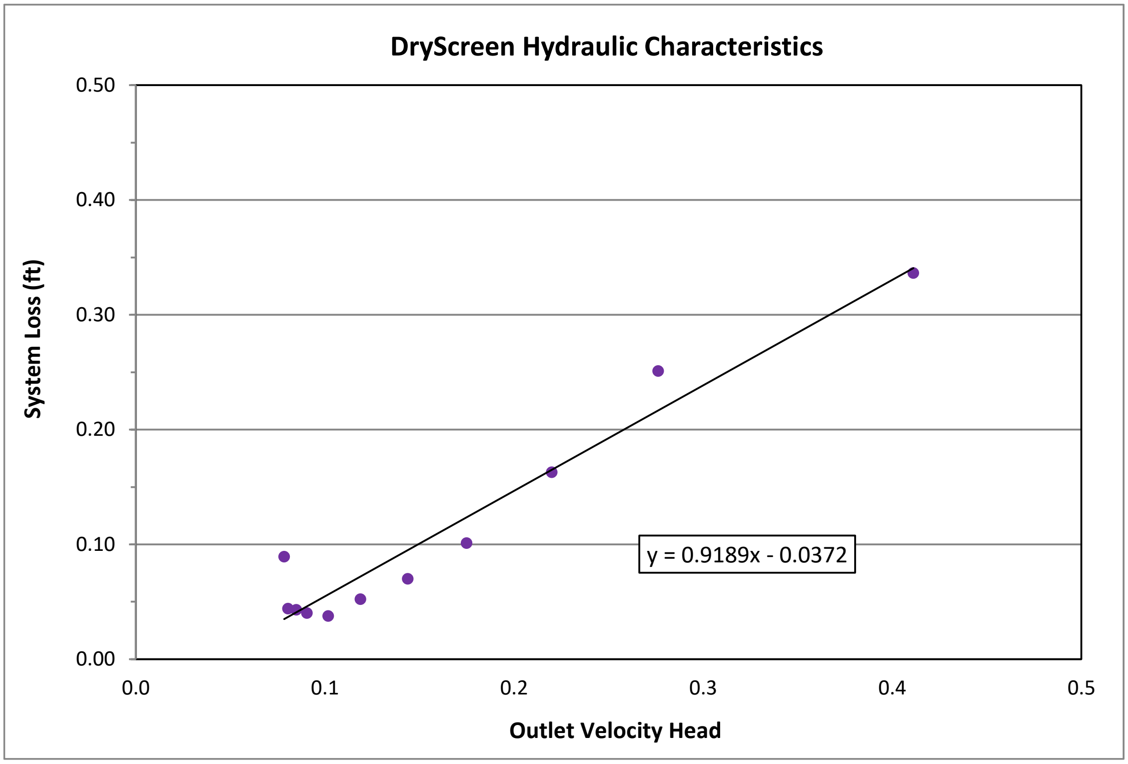


Figure 31 System Loss vs Outlet Velocity Head

5. Design Limitations

The Hydro DryScreen® is an engineered system for which Hydro International's engineers work with site designers to generate a detailed engineering submittal package for each installation. As such, design limitations are typically identified and managed during the design process. Design parameters and limitations are discussed in general terms below.

Required Soil Characteristics

The Hydro DryScreen® is a flow-through system contained within a watertight concrete vault. Therefore, the Hydro DryScreen® can be installed and function as intended in all soil types.

Slope

Hydro International recommends contacting our design engineers when the Hydro DryScreen® is going to be installed on a drainage line with a slope greater than 10%. With steeply sloping pipe, site specific parameters such as pipe size, online vs. offline arrangement of the Hydro DryScreen® and the frequency of peak flow are taken into consideration by the Hydro International team.

Maximum Treatment Flow Rate (MTFR)

The MTFR of the Hydro DryScreen® is dependent upon model size. The recommended maximum treatment flow rate is dependent on Hydro DryScreen® model size and other design and performance specifications. Hydro International recommends contacting their engineering staff with questions about managing high peak flow rates.

Maintenance Requirements

The Hydro DryScreen® should be inspected and maintained in line with the recommendations and guidelines set forth in the Operation and Maintenance manual at: https://hydro-int.com/sites/default/files/hds_om_manual_a1604.pdf. A detailed discussion of inspection and maintenance requirements is discussed later in Section 6.

Installation limitations

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

Structural Load Limitations

Standard Hydro DryScreen® units are designed for HS-20 loading. Contact Hydro International engineering staff when heavier load ratings are required.

Pretreatment Requirements

The Hydro DryScreen® has no pre-treatment requirements.

Limitations on Tailwater

As the Hydro DryScreen® includes an internal bypass, Hydro International recommends working with their engineering team if tailwater is present to increase the available driving head to ensure that the full water quality treatment flow rate is treated prior to internal bypass.

Depth to seasonal high water table

Although the functionality of the Hydro DryScreen® is not impacted by high groundwater, Hydro International recommends consulting their engineering staff to determine whether the addition of anti-flotation collars to the base of the Hydro DryScreen® chamber are necessary to counterbalance buoyant forces.

Pipe Size

Each Hydro DryScreen® model has a maximum recommended inlet and outlet pipe size. When the diameter of the main storm drain line exceeds the maximum Hydro DryScreen® pipe size, Hydro International recommends contacting their engineering team. In some circumstances larger pipe sizes can be safely accommodated; otherwise, Hydro International recommends the Hydro DryScreen® be designed in an offline configuration. The maximum recommended inlet and outlet pipe diameter for each Hydro DryScreen® model are shown in **Table A-2** of the Verification Appendix.

Additional Limitations

None.

6. Maintenance

Inspection and maintenance of the Hydro DryScreen® are simple procedures conducted from the surface. An Operation and Maintenance Manual can be found at: https://hydro-int.com/sites/default/files/hds_om_manual_a1604.pdf

Neither inspection nor maintenance require the purchasing of spare parts or tools from Hydro International.

The Hydro DryScreen® has three 30-in manhole lids positioned over the sump areas to provide inspection and maintenance access to both the internal bypass chamber and treatment chamber.

Inspection

The required frequency of cleanout depends on site use and other site specific characteristics and should therefore be determined by inspecting the unit after installation. During the first year of operation, the unit should be inspected at least every six months to determine the rate of sediment and trash accumulation. More frequent inspections are recommended at sites that would generate heavy solids loads, like parking lots with winter sanding or unpaved maintenance lots. A sediment probe can be used to determine the level of accumulated solids stored in the sump.

Hydro International recommends that the units are cleaned when sediment volumes reach 50% sump capacity. The standard sediment storage depth in the Hydro DryScreen® is 12 inches. Because Hydro DryScreen® model sizes vary in size, pollutant storage volumes vary with model size as shown in **Table A-1**. When sediment and oil depths are measured during inspection, they should be recorded on the Operation & Maintenance manual log and compared to the as-built drawings of the Hydro DryScreen® to assess whether accumulated sediment has reached 6 inches in depth.

Maintenance

The interval of required clean-out should be determined by post-installation inspection of pollutant accumulation rates. If post-installation inspection cannot be conducted for some reason, Hydro International recommends the Hydro DryScreen® be cleaned out at least once per year.

There is no need for man entry into the Hydro DryScreen® during maintenance. However, if man entry does occur then proper confined space entry procedures must be followed.

Floatable trash and debris can be removed by lifting the floatable access lid and using a netted skimming pole or a vactor truck to skim trash from the surface of the standing water. Accumulated oil must be removed from the surface using a vactor truck or sump vac. Accumulated sediment can be removed by lifting the central access lid and dropping a vactor hose down the center shaft to the sump. The entire sump liquid volume does not necessarily need to be removed from the Hydro DryScreen® during maintenance.

When all pollutants have been removed from the Hydro DryScreen®, the manhole lids should be put securely back in place.

Sediment, floatables, gross debris, and spent media can generally be disposed of at the local landfill in accordance with local regulations. The toxicity of the residues produced will depend on the activities in the contributing drainage area. Testing of the residues may be required if they are considered potentially hazardous. In all cases, local regulators should be contacted about disposal requirements.

7. Statements

The following signed statements from the manufacturer (Hydro International), independent testing laboratory (Alden Research Laboratory) and NJCAT are required to complete the NJCAT verification process. In addition, it should be noted that this report has been subjected to public review (e.g., stormwater industry) and all comments and concerns have been satisfactorily addressed.

Stormwater Solutions

Hydro International

Turning Water Around...®

March 27, 2024

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

Re: Manufacturers Statement of Compliance

Dear Dr. Magee:

Hydro International has completed verification testing for the Hydro DryScreen® Next Generation Baffle Box 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"* (April 25, 2023). As required by the *"NJDEP Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology (NJCAT)"*, this letter serves as Hydro International's statement that all procedures and requirements identified in the aforementioned protocol and process document were met or exceeded.

Specifically, a 3-ft x 6-ft Hydro DryScreen® was tested at Alden Research Laboratory in Holden, Massachusetts for hydraulic characterization, sediment scour and sediment removal efficiency. To ensure that all procedures and methods were met, a test plan was completed and submitted to NJCAT for review and approval, all testing and sample collection was conducted under the direct supervision of Alden Lab. With this in mind, the preparation of the verification report and the documentation contained therein fulfill the submission requirements of the process document and protocol.

If you have any questions or comments regarding the verification please do not hesitate to contact us.

Sincerely,

Jeremy Fink, PE
Associate Director of Product Development

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

ALDEN a verdantas company

March 15, 2024

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

Conflict of Interest Statement

Alden Research Laboratory (ALDEN) is a non-biased independent testing entity which receives compensation for testing services rendered. ALDEN does not have any vested interest in the products it tests or their affiliated companies. There is no financial, personal, or professional conflict of interest between ALDEN and Hydro International.

Protocol Compliance Statement

Alden conducted the performance testing on the Hydro International DryScreen Baffle Box. The Technical Report and all required supporting data documentation has been submitted to NJCAT as required by the protocol.

Testing performed by ALDEN on the DryScreen Baffle Box met or exceeded the requirements as stated in the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device", January 1, 2021, (Updated April 25, 2023).

James T. Mailloux

James T. Mailloux

Senior Consultant
Alden Research Laboratory, LLC
A Verdantas LLC Company
jmailloux@verdantas.com

(508) 500-6209

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

March 26, 2024

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 Hydro DryScreen® Next-Generation Baffle Box at the Alden Research Laboratory, Inc. (Alden), Holden, Massachusetts, under the direct supervision of Alden's senior stormwater engineer, James Mailloux, 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) were met or exceeded consistent with the NJDEP Approval Process. Specifically:

Test Sediment Feed

The mean PSD of the test sediments comply with the PSD criteria established by the NJDEP HDS protocol. The removal efficiency test sediment PSD analysis was plotted against the NJDEP removal efficiency test PSD specification. The test sediment was shown to be slightly finer than the sediment blend specified by the protocol (<75µ); the test sediment D_{50} was 68 microns. The scour test sediment PSD analysis was plotted against the NJDEP scour test PSD specification and shown to meet the protocol specifications.

Removal Efficiency Testing

In accordance with the NJDEP HDS Protocol, removal efficiency testing was executed on the 3-ft x 6-ft Hydro DryScreen® Model, a commercially available stormwater treatment unit, to establish the ability of the DryScreen® to remove the specified test sediment at 25%, 50%, 75%, 100% and 125% of the target MTFR. The DryScreen® demonstrated an annualized weighted solids removal as defined in the NJDEP HDS Protocol of 50.2%. The flow rates, feed rates, and influent concentration all met the NJDEP HDS test protocol's coefficient of variance requirements. Background concentrations never exceeded 20 mg/L.

Scour Testing

The scour testing was conducted at 450 gpm, which is equal to 200% of the MTFR. The scour test was conducted with the unit preloaded with 6" of sediment to the 50% capacity level, contoured prior to conducting the test. A total of 15 effluent samples were collected throughout the test. The calculated concentrations, adjusted for background, ranged from 4.9 to 32.6 mg/L, with an average concentration of 14.3 mg/L, qualifying the Hydro DryScreen® for online installation.

Maintenance Frequency

The predicted maintenance frequency for all Hydro DryScreen® models exceeds 9 years.

Sincerely,

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

8. References

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

ASTM (2019), *"Standard Test Methods for Determination of Water (Moisture) Content of Soil by Direct Heating"*, Annual Book of ASTM Standards, D2216, Vol. 04.08.

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NJDEP 2021. *New Jersey Department of Environmental Protection Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology*. Trenton, NJ. August 4, 2021.

NJDEP 2021. *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device.* Trenton, NJ. January 1, 2021 (Updated April 25, 2023).

VERIFICATION APPENDIX

Introduction

- Manufacturer – Hydro International, 94 Hutchins Drive, Portland, ME 04102. *General Phone: (207)756-6200. Website:* www.hydro-int.com/us.
- MTD – Typical Hydro DryScreen® Design Specifications are shown in **Table A-1**.
- TSS Removal Rate – 50%
- Online installation

Detailed Specification

- Hydro DryScreen® Model maximum treatment flow rates (MTFRs), sediment storage amounts and sediment removal intervals per NJDEP sizing requirements are attached as **Table A-1**.
- Standard Hydro DryScreen® Model dimensions are attached as **Table A-2**.
- Pick weights and installation procedures vary slightly with model size. Hydro International provides contractors with project-specific unit pick weights and installation instructions prior to delivery.
- Maximum recommended sediment depth prior to cleanout is 6 inches for all model sizes.
- For a reference maintenance plan, download the Hydro DryScreen® O & M Manual at: https://hydro-int.com/sites/default/files/hds_om_manual_a1604.pdf
- Under N.J.A.C. 7:8-5.5, NJDEP stormwater design requirements do not allow a hydrodynamic separator such as the Hydro DryScreen® to be used in series with another hydrodynamic separator to achieve an enhanced total suspended solids (TSS) removal rate.

Table A-1 MTFRs and Sediment Removal Intervals for Hydro DryScreen® Models

Hydro DryScreen® Model	NJDEP 50% TSS Maximum Treatment Flow Rate (cfs)	Surface Area (ft^2)	Hydraulic Loading Rate (gpm/ ft^2)	50% Max Sediment Storage Volume (ft^3)	Required Sediment Removal Interval[1] (months)
3-ft x 6-ft	0.50	16	14.1	8	114
4-ft x 8-ft	0.92	29.3	14.1	14.7	114
6-ft x 12-ft	2.14	68	14.1	34	114
8-ft x 14-ft	3.35	106.7	14.1	53.4	114
10-ft x 16-ft	4.82	153.3	14.1	76.7	114
12-ft x 20-ft	7.29	232	14.1	116	114

[1]Required sediment removal interval was calculated using the equation specified in Appendix B Part B of the NJDEP Laboratory Protocol for HDS MTDs:

$$\text{Sediment Removal Interval (months)} = \frac{\text{(50\% HDS MTD Max Sediment Storage Volume * 3.57)}}{\text{(MTFR * TSS Removal Efficiency)}}$$

Table A-2 Standard Dimensions for Hydro DryScreen® Models

Hydro DryScreen® Model (W x L)	Width (W) (ft)	Length (L) (ft)	Total Depth (ft)	Scaling Depth (SD)[1] (ft)	L/W	SD/W	SD/L	Max Pipe Size (in)
3 x 6	3	6	1.7	1.2	2.00	0.40	0.20	24
4 x 8	4	8	2.1	1.6	2.00	0.40	0.20	30
6 x 12	6	12	2.6	2.1	2.00	0.35	0.18	42
8 x 14	8	14	3.2	2.7	1.75	0.34	0.19	48
10 x 18	10	18	3.9	3.4	1.80	0.34	0.19	54
12 x 22	12	22	4.6	4.1	1.83	0.34	0.19	60

[1]Scaling Depth (SD) is the chamber depth minus ½ the sediment sump depth. Larger models (>250% MTFR of the tested unit) must be geometrically proportionate to the tested unit (3-ft x 6-ft model). A variance of 15% is allowable. For units <250% MTFR (4-ft x 8-ft model) the depth must be equal or greater than the depth of the unit treated.