

# NJDEP Laboratory Test Protocols and Verification Procedure: NJCAT Interpretations

## Introduction

The New Jersey Department of Environmental Protection (NJDEP) stormwater manufactured treatment devices (MTD) laboratory test protocols and procedure for verification<sup>1</sup> by New Jersey Corporation for Advanced Technology (NJCAT) have required clarifications and interpretations as they were being implemented. This required ongoing interaction between NJDEP and NJCAT to ensure that the protocols and procedure are being implemented as per NJDEP intent. In instances where the protocol requires an interpretation, the Department has indicated that NJDEP “fully supports NJCAT’s discretionary authority to provide such interpretations, with the expectation that such interpretation will be applied in a consistent manner”<sup>2</sup>.

Interpretations and clarifications resulting during the first two (2) years of the program are documented below. As additional interpretations are required, this document will be revised and updated.

## General

Items, issues, and edits that are common to both laboratory test protocols are listed below.

### **Definitions:**

- **Commercially Available**- For the purposes of the protocols, means available for purchase, with operational components at full size, identical dimensions and configurations, and comprised of materials specified for commercial use, with the exception of the housing or other components specifically used to facilitate laboratory testing.

### **Test Sediment Particle Size Distribution (PSD), as noted in Table 1 of each protocol<sup>1</sup>:**

- **Target Minimum % Less Than** – Meeting this requirement can be a challenge. Using a finer PSD is acceptable, but will lower MTD performance.
- **Table 1: Footnote 2** – There is an error in the footnotes to the Table where wording should not have been repeated. The statement should read: “A measured value may be lower than a target minimum % less than value by up to two percentage points, (e.g., at least 3% of the particles must be less than 2 microns in size [target is 5%]), provided the measured d50 value does not exceed 75 microns.”

### **Sample Size:**

- **Liquid Samples** – The minimum collected sample size, e.g., background, effluent, shall be 500 mL.

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<sup>1</sup> The MTD test protocols and technology verification procedure documents (dated January 25, 2013) can be found at:

[http://www.njstormwater.org/mtd\\_guidance.htm](http://www.njstormwater.org/mtd_guidance.htm)

More on the NJCAT Verification Program can be found at: <http://www.njcat.org/verification-process/general-protocol.html>

<sup>2</sup> Correspondence dated November 20, 2014, from NJDEP to NJCAT.

**Scour Testing:**

- **Preloading** – Only the sediment storage sump(s) is required to be preloaded with sediment, in accordance with the directions in the testing protocols, to satisfy the requirement of scour testing for on-line installation. If a MTD has more than one sediment storage sump, all sumps must be preloaded with sediment.

**Effluent Sampling Test Methods:**

- **Grab Sampling Method** – Grab sampling is not limited to flows less than 0.5 cfs (as may be inferred from the Isokinetic Sampling Method write-up). Grab sampling is acceptable without flow rate limitations.

**Hydrodynamic Sedimentation Laboratory Protocol****Definitions**

- **Effective Treatment Area (ETA)** means the entire area within the MTD where sedimentation occurs, including any pretreatment chambers or areas where sediment is known to collect outside of the primary sediment capture and storage location.
- **Geometrically Proportional**—this term is used in reference to scaling of MTDs. As specified below under Section 6, scaling of an MTD depth is determined from the top of the false floor, not from the physical bottom of the unit.

**Section 5B. TSS Removal Efficiency Testing**

- **1a. Background Sampling** – A minimum of eight (8) influent background TSS samples must be obtained.

**Section 5D. Effluent Sampling Test Methods**

- **Steps 5D.2, 5D.3, 5D.4 and 5B.2.c** – The following Sample Frequency Table is provided for guidance when conducting TSS Removal Efficiency Testing. Assumptions in generating this Table are: 1 min feedrate sampling time; 114 second MTD detention time; 30 seconds between effluent samples 1, 2, & 3; 4, 5, & 6; etc. Sample spacing must be adjusted to accommodate longer detention times or the desire to test for longer than the minimum duration.

**Sample Frequency**

		50% MTR		
Time (min)	Time (sec)	Feedrate	Background	Effluent
0.00	0	1		
6.70	402		1	1
7.20	432			2
7.70	462	2	2	3
14.40	864			4
14.90	894		3	5
15.40	924	3		6
22.10	1,326		4	7
22.60	1,356			8

23.10	1,386	4	5	9
29.80	1,788			10
30.30	1,818		6	11
30.80	1,848	5		12
37.50	2,250		7	13
38.00	2,280			14
38.50	2,310	6	8	15

### **Section 6. Scaling of HDS MTDs**

- **Scaling** – Scaling is based on the horizontal footprint of the device and other scaling approaches fall under the alternative approach requiring two (2) models with an MTFR difference of at least 250% to be tested. For the purpose of “scaled geometrically proportional”, the depth of the reference (tested) MTD is determined from the top of the false floor utilized during removal efficiency testing, not from the physical bottom of the unit.

## Filtration Sedimentation Laboratory Protocol

### **Section 4A. Scour Testing Procedure**

- **Filtration Cartridges** – Since the protocol is silent on the condition of the filters to be installed for scour testing, the use of virgin or mature (loaded during prior removal efficiency/loading capacity testing) filter cartridges is allowable when conducting scour testing. Should a mature filter be used, the preload mass may be quantified or estimated; however, the mass cannot be included in the 50% sediment preload mass required for scour testing.
- **Sediment Distribution Following Performance Testing** – Sediment distribution in filtration system chambers following TSS removal efficiency and capacity testing may be quantified by mass and the mass distribution used as a basis for scour testing. These mass distribution results shall be documented in the performance test report. Sediment distribution measurements are optional; however, they may be helpful in planning scour testing.
- **Sediment Distribution Among Multiple Chambers** – The protocol states that “sedimentation chamber(s) shall be preloaded to 50% of the manufacturer’s recommended maximum sediment storage volume.” This calculated preload volume of sediment may be distributed among the filtration system’s different chambers in proportion to available sediment storage volumes and in accordance with maintenance recommendations **or** may be distributed in proportion to the sediment deposition measurements made following performance testing.

### **Section 5D.3 Test Sediment Particle Size Distribution (PSD)**

- As specified under 5.B, a minimum of three (3) samples are necessary for determining PSD, provided the same batch of sediment is used for removal efficiency, sediment mass loading capacity testing (Section 5.B), and scour testing (section 4.A). If a different batch of sediment is used for each test, a minimum of three (3) sediment samples must be collected from each batch and analyzed for PSD.

### ***Section 5D.3 Test Sediment Feed***

- **Influent Sediment Concentration** – The influent sediment concentration must be within 10% of 200 mg/L or 400 mg/L, depending on the testing. The 10% requirement is calculated on a per test run basis. This could result in a test run(s) being disqualified from removal efficiency testing, but the sediment introduced should still be calculated into the overall sediment mass load capacity.
- **Sediment Mass Load Capacity Testing** – Sediment mass load capacity testing is considered complete when 90% of the MTFR is reached (MTD operating under no driving head), or when the MTD exceeds its maximum design driving head at 90% MTFR, or when an unacceptable reduction in pollutant removal efficiency at MTFR occurs, as demonstrated by the TSS removal efficiency (on a cumulative mass basis) drops below 80%. The mass loading capacity is determined by the mass captured in the runs prior to the run where the TSS removal efficiency drops below 80%. However, for some filtration systems, these criteria for ending testing are not achieved following extensive sediment loading on the filter system. The testing can be terminated when the manufacturer feels that the system has demonstrated sufficient capacity to ensure that the filter system installation will not be limited by sediment loading.

### ***Section 5.D.5 Test Sediment Feed***

- **Feedrate** – During Sediment Mass Load Capacity testing, a continuous test run can be employed. However, the test sediment feedrate should be measured in accordance with the procedures in Section 5.D a minimum of every hour to ensure compliance with the influent sediment concentration. The one (1) hour time interval between test sediment feedrate sampling shall begin upon conclusion of the three (3) times detention period.
- **Coefficient of Variation** – The coefficient of variation (COV) for test sediment feed samples shall not exceed 0.10. This also applies to influent samples if conducting paired sample testing (Section 5.D.6). The COV for both methods (test sediment feed and paired samples) is based on a per test run basis.
- **Flow Rate** – Flow rate needs to be  $\pm 10\%$  of the MTFR with a  $COV \leq 0.03$ .

### ***Section 5.G Effluent Sampling Test Methods***

- **Number of Effluent Samples** – The minimum number of effluent samples required per test run using any of the three methods described in Section 5.G is five (5) as specified in 5.G.5 of the “Effluent Grab Sampling Method”. If the alternative to test sediment feed sampling (Section 5.D.6), paired influent and effluent samples is used during testing, a minimum of five (5) sample pairs is required per test run.
- **Sample Interruption** – Per Section 5.G.3, if the test sediment feed is interrupted the next effluent sample shall be collected following a minimum of three (3) detention times. However, Section 5.G.5 states that the sample interval shall not exceed 15 minutes. If the test sediment feed is interrupted, the next effluent sample should be collected after three (3) detention times have passed, even if that exceeds the 15-minute maximum interval between samples. Sampling should continue with a 15-minute maximum time interval between samples until the next test sediment feed interruption.

- **Backwash or Drawdown Flows (Section 5.G.6)** – For filtration MTDs that have backwash or post-operation drawdown flows, the effluent shall be volumetrically quantified and sampled. Two evenly spaced samples shall be collected of the effluent to determine TSS concentration. These samples may be either time-spaced or volume-spaced.
- **Removal Efficiency Calculation (Section 5.G.8)** – There is a minor error in the removal efficiency equation. In the second term in the numerator the “Adjusted Effluent TSS Concentration” should be multiplied by the “Total Volume of Effluent Water” not the “Total Volume of Test Water” as written:

$$\text{Total Volume of Effluent Water} = \text{Total Volume of Test Water} - \text{Total Volume of Drawdown Water}$$

### **Section 6 Scaling of Filtration MTDs**

- **Maximum Allowable Drainage Area (MADA)** – Since the protocol is silent on what to base the MADA on, this clarification is being provided: The maximum inflow area should be based on the sediment mass load capacity per filter cartridge or sediment mass load capacity per filter surface area.

### Procedure for Obtaining MTD Verification from NJCAT

- **Supporting Documentation** - The NJDEP Procedure<sup>1</sup> (NJDEP, 2013) for obtaining verification of a stormwater manufactured treatment device (MTD) from the NJCAT requires under Section 5.D 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 that it would not be prudent or necessary to include all this information in this verification report.
- **Review Panels (Double Jeopardy)** – If an issue arises between the manufacturer and NJCAT prior to NJCAT preparing a verification report, the “*Outstanding Issue Resolution Process*” (In Appendix C of the “*Procedure for Obtaining Verification of a Stormwater MTD from NJCAT*” document) provides for the issue to be resolved by a review panel. Should the same issue be raised during the public comment period, NJCAT in consultation with the chair of the review panel, will determine if any new information has been raised that was not raised during the original issue review. If not, the issue will be considered already addressed. If it is determined that new information has been brought forth that was not considered in the earlier review, NJCAT will convene a second review panel to consider the issue along with all other issues raised during the public comment process.
- **Outstanding Issues** – Appendices A and C of the “*Procedure for Obtaining Verification of a Stormwater MTD from NJCAT*” document describe two potential origins of the Outstanding Issues and Resolution Process. A separate document “*Clarifications on the Outstanding Issues Resolution Process*” details the process to be followed in each case.