

# Charlotte-Mecklenburg Storm Water Services

## Proprietary and Innovative SCM Testing and Approval Policy

March 2017

### I. MISSION:

*The mission of the Pilot SCM Program is to provide Charlotte-Mecklenburg citizens with the most technically-advanced, proven, and cost-effective stormwater treatment options designed to protect water quality and meet the requirements of the Post-Construction Stormwater Ordinance, while also offering developers a range of innovative practices that, if shown successful, may be added to the Charlotte-Mecklenburg BMP Design Manual.*

### II. PURPOSE:

Charlotte-Mecklenburg Storm Water Services; hereafter referred to as “CMSWS”, implements a proactive Pilot Stormwater Control Measure Program, which includes the study and testing of stormwater control measures (SCMs). The purpose of this document is to specify the requirements for the testing, review and approval of proprietary and innovative SCMs necessary to support the potential inclusion of these SCMs in the Charlotte-Mecklenburg BMP Design Manual.

### III. CMSWS REVIEW COMMITTEE:

All decisions, reviews, and SCM recommendations for the Pilot SCM Program will be made by an internal committee of City and County CMSWS staff. The committee will consist of the following staff positions:

- Post-Construction Stormwater Ordinance administrator-City
- Pilot SCM Program administrator-City
- NPDES section supervisor-City
- WQ monitoring supervisor-County
- Post-Construction Stormwater Ordinance project coordinator-City
- Water quality data analyst/modeler-City and County
- Water quality planner-City
- Senior water resources engineer-City
- Senior environmental specialist-County

The committee will be responsible for the following:

- reviewing all pertinent pilot SCM information and data

- approving pilot SCM test study projects
- ensuring that all pilot test study criteria and standards are met
- making determinations as to whether or not a pilot test study was positive
- making recommendations for pilot SCM approval in the BMP Design Manual

#### **IV. TESTING, REVIEW AND APPROVAL PROCESS:**

CMSWS will implement the following process for the testing, review and approval of proprietary and innovative SCMs:

1. The review committee will review each pilot SCM test study project application to determine eligibility and acceptance into the Program. Acceptance is contingent on the project meeting the minimum design specifications noted in subsequent sections of this document, and the requirements of the overall Pilot SCM Program.
2. For CMSWS administered studies, CMSWS staff will coordinate all aspects of the accepted pilot SCM project study and testing for the purpose of generating appropriate study data to support the review and approval process. This will involve the development, implementation and management of field study projects designed to produce data that meets the study criteria noted in subsequent sections of this document.
3. The review committee will review and qualify the study data to ensure that all criteria are met for each storm monitoring event for the purpose of developing an appropriate data set for analysis and evaluation. All collected monitoring data will be retained in a master dataset and may be reviewed for diagnostic and other purposes. However, for the determination of whether a pilot SCM Study is a positive result, only storm events meeting the criteria described in Section VI will be evaluated.
4. CMSWS staff will analyze the data set to determine the median influent and effluent event mean concentrations (EMCs) for Total Suspended Solids (TSS). Appropriate statistical analyses will then be used to determine whether or not the study results meet the applicable effluent criteria and EMC reduction requirements.
5. CMSWS staff will utilize the data analysis results to prepare a report of the pilot SCM study project which will include discussion on the project design, SCM type, watershed characteristics, monitoring procedure, data analysis and results. The report will include discussion on findings and conclusions and a recommendation on whether or not the proprietary and/or innovative SCM should be considered for further review for potential inclusion in the Charlotte-Mecklenburg BMP Design Manual.
6. The review committee will evaluate the study data and report to determine if the study criteria have been satisfactorily met and make a determination as to whether or not the results indicate a positive study. In order for a study to be considered positive, all study criteria must have been met. Also, results for median EMC SCM system influent and effluent TSS values must fall within the respective target ranges specified in subsequent sections of this document.

7. On a case by case basis and as necessary, the review committee will consider accepting for review and approval study information and data from SCM testing conducted outside of the City of Charlotte or City ETJ area. All aspects of any such study and testing, including monitoring site set-up, equipment management, sample collection, sample laboratory analysis, and data analysis, must be exclusively overseen and coordinated by a third party independent investigator that are not affiliated with the manufacturer or vendor of the SCM being studied, except via the sampling arrangement. A third party independent investigator is defined as faculty and staff of an accredited university, staff of a federal, state, tribal, or local governmental agency, or staff of a private consultant. All independent third party investigators may be required to provide statements of qualifications demonstrating sufficient capability and experience needed to carry out the work under consideration. All laboratory analysis of samples collected must be conducted by an accredited laboratory not affiliated with the manufacturer or vendor of the SCM being studied. The SCM testing, information and data submitted must meet all requirements contained in this document to be considered for study approval and acceptance. It is required that persons or entities wishing to submit study information and test data for review and approval coordinate with the CMSWS review committee prior to beginning a study.
8. Upon the collection of sufficient information and test study data showing positive studies from at least two (2) different study sites that have been conducted and approved, the review committee will conduct a final review of all information and data and make a determination as to whether or not the SCM is approved within the Pilot SCM Program utilizing the criteria noted in subsequent sections of this document.
9. If an SCM is approved, per the procedure described in the preceding paragraph, the review committee will make a recommendation to both the City and County Water Quality Program Managers within CMSWS that the SCM be included in the Charlotte-Mecklenburg BMP design manual. CMSWS water quality manager approval will be considered “conditional” pending review and final approval for inclusion of the SCM in the Charlotte-Mecklenburg BMP design manual by the North Carolina Department of Environmental Quality – Division of Energy, Mining and Land Resources (NCDEQ-DEMLR). The conditional approval will allow the use of the SCM as an approved practice in the Charlotte-Mecklenburg BMP design manual; however, use of the SCM will be suspended from further use should NCDEQ-DEMLR disapprove the change to the Charlotte-Mecklenburg BMP design manual following its review.

## **V. DESIGN REQUIREMENTS:**

All pilot SCM test study projects must meet all specifications and design requirements of the City of Charlotte Post-Construction Stormwater Ordinance, the overall Pilot SCM Program, and the Charlotte-Mecklenburg BMP Design Manual, as applicable. In addition, the following design specifications are required:

1. The proprietary and/or innovative SCM must be designed and sized to achieve a minimum of 85% average annual removal for total suspended solids (TSS).
2. The proprietary and/or innovative SCM must be designed and sized to treat the entire runoff volume generated from the first one inch of rainfall from the watershed area draining to the SCM [the water quality volume (WQv)]. The SCM must be designed and sized to completely treat the entire WQv within 52 hours. This is typically accomplished by capturing and holding the WQv in a detention structure upstream of the SCM.
3. The proprietary and/or innovative SCM must be designed to allow for proper access and monitoring of stormwater runoff as it flows into and out of the detention system and SCM, per CMSWS specifications.
4. The proprietary and/or innovative SCM must be designed to allow for proper gravity free-flow of stormwater runoff as it flows into, through and out of the detention system and SCM, with no back water conditions that would adversely affect monitoring at the detention system inflow and SCM outflow monitoring locations.
5. The proprietary and/or innovative SCM must be designed to include a separate 110/120 volt, 20 ampere AC power supply via ground fault (GFCI) protected receptacles at each monitoring location within the detention system and SCM project design.

## **VI. STUDY CRITERIA:**

The following study criteria must be met for each pilot SCM study conducted:

1. Storm monitoring events must be qualifying events. A storm monitoring event will be deemed a qualifying event if the storm monitoring event meets all of the following conditions:
  - Stormwater flow through the SCM system must be at Normal Base Flow Stage prior to the beginning of the storm monitoring event.
  - Rainfall depth must be at least 0.10 inches of rainfall, but not greater than 2.5 inches.
  - The storm hydrograph must be successfully sampled via a flow-weighted program at both the influent and effluent monitoring stations, with individual flow-paced sample aliquots collected over at least 70% of the area of the flow hydrograph. Composite or discrete flow weighted sampling may be used.
2. A study must include at least 15 qualifying events, but not more than 48 qualifying events.
3. The time period between the first and last qualifying event may not exceed 48 months.

4. A minimum of three (3) qualifying events must be collected in each of the four meteorological seasons. Meteorological seasons are defined as winter (Dec – Feb); spring (Mar – May); summer (Jun – Aug); fall (Sep – Nov).
5. No more than two (2) qualifying events may be conducted in any one calendar month in any given year.
6. A quality assurance project plan (QAPP) and SCM monitoring plan must be in place for each study.
7. CMSWS reserves the right to terminate a pilot study early at any time for any reason. Specifically, CMSWS may terminate a pilot study early if it appears that after eight (8) qualifying events have been conducted, the study results will likely not show a positive result.

## **VII. DETERMINATION OF POSITIVE STUDY:**

A pilot SCM study shall be deemed a positive study if the study meets all of the following:

1. The study has satisfactorily met all the conditions of the Pilot SCM Program, including the study criteria stated in Section VI.
2. The data set of qualifying events has a statistically significant reduction (i.e.,  $p < 0.05$ ) in effluent TSS, relative to influent TSS, using an appropriate statistical test. The statistical test used will depend on the properties of the data set (i.e., sample size, skewness, presence of censoring), using the highest power test that can be justified given the data set.
3. The requirements for the median TSS effluent EMC are set based on the median TSS influent EMC measured at the study site (i.e., cleaner influent will require cleaner effluent to demonstrate adequate performance). The effluent requirements given different ranges of influent are specified below:
  - The median TSS EMC influent value must be at least 15 mg/L or greater, but not more than 150 mg/L.
  - For median TSS EMC influent values ranging from 50 mg/L to 150 mg/L, the median TSS EMC effluent value must be 25.00 mg/L or less.
  - For median TSS EMC influent values ranging from 40 mg/L to 49.999 mg/L, the median TSS EMC effluent value must be 20.00 mg/L or less.
  - For median TSS EMC influent values ranging from 30 mg/L to 39.999 mg/L, the median TSS EMC effluent value must be 15.00 mg/L or less.
  - For median TSS EMC influent values ranging from 20 mg/L to 29.999 mg/L, the median TSS EMC effluent value must be 10.00 mg/L or less.
  - For median TSS EMC influent values ranging from 15 mg/L to 19.999 mg/L, the median TSS EMC effluent value must be 7.50 mg/L or less.

## **VIII. DETERMINATION OF APPROVABILITY WITHIN THE PILOT SCM PROGRAM:**

A proprietary and/or innovative SCM studied within the Pilot SCM Program shall be deemed approved/approvable if the following criteria have been met:

1. At least two (2) positive studies at two (2) different study sites have been conducted, reviewed and approved within the CMSWS Pilot SCM Program, with at least one (1) of the studies having been conducted by CMSWS staff on a pilot SCM at a test study site located in the City of Charlotte or City ETJ area.
2. For studies conducted by others and approved for use that were conducted outside of the City of Charlotte or City ETJ area, the study must have been conducted on a SCM located in the southern piedmont physiographic region in either North Carolina, South Carolina, Virginia, Georgia, or Alabama; and in areas of this region with similar climate, soils, and topography as that of the Charlotte-Mecklenburg, NC geographic area. In addition, the study must have been conducted by a third party independent investigator, as defined in Section IV, paragraph 7.
3. In the event that a pilot SCM study conducted by CMSWS within the City of Charlotte or City ETJ area does not show a positive study result, CMSWS reserves the right not to conduct additional studies on that particular pilot SCM within the Program.

For questions or additional information, contact:

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## **IX. DEFINITIONS:**

For purposes of the CMSWS Pilot SCM Program, the following terms are defined as:

*Effluent monitoring station* – the monitoring station located at the point downstream of the SCM outlet, the point where treated stormwater runoff would first enter the downstream stormwater pipe system or receiving water.

*Influent monitoring station* – the monitoring station located at the point upstream of the detention structure and/or SCM in the SCM system, the point where untreated stormwater runoff would first enter the SCM system from the upstream watershed.

*Meteorological storm system* – a weather system such as a low pressure system, upper level low pressure system, frontal passage, thunderstorm, hurricane, etc. that produces rainfall.

*Normal base flow stage* – the expected level of water at a point within a SCM system (e.g., a monitoring station) when it is not influenced by stormwater runoff. For most SCMs, this will be when there is no flow coming into or out of the SCM system.

*Rainfall event* – the time period between the point in time at which a meteorological storm system first begins producing rainfall in the SCM system watershed and the point in time at which the meteorological storm system completely stops producing any rainfall in the SCM system watershed, which is typically when the meteorological storm system moves away from the SCM system watershed. There may be intermittent periods of rainfall and no rainfall within the overall meteorological storm system rainfall event encountering the SCM watershed.

*SCM system* – includes the SCM, any upstream detention structure(s), and the influent and effluent monitoring stations.

*SCM system watershed* – the land area upstream of the SCM system, and the SCM system itself for which a rainfall event producing stormwater runoff in the watershed would flow to the SCM system.

*Storm monitoring event* – the time period between the point in time at which stormwater runoff flow begins at the influent monitoring station of the SCM system and the point in time that stormwater runoff flow ceases, or returns to normal base flow stage at the effluent monitoring station of the SCM system.

*Storm monitoring event hydrograph* – the graphic representation of the stormwater flow during the time period between the point in time at which stormwater runoff flow begins and the point in time that stormwater runoff flow ceases for each monitoring station of the SCM system. For systems with flow-through base flow conditions, the storm monitoring event hydrograph will be the time period between the point in time at which flow stage begins to consistently rise above normal base flow stage and the point in time that flow stage returns to normal base flow stage for each monitoring station of the SCM system.