

COMPREHENSIVE PROTOCOL FOR PERFORMANCE EVALUATION OF PROPRIETARY STORMWATER CONTROL PRODUCTS

The Sacramento Stormwater Quality Partnership (County of Sacramento, and the Cities of Sacramento, Elk Grove, Rancho Cordova, Folsom, Citrus Heights, and Galt) has a comprehensive protocol to evaluate the performance of proprietary stormwater quality treatment devices in Sacramento County. The protocols were established in the *Investigation of Structural Control Measures for New Development Final Report* (Larry Walker and Associates, 1999), which forms the basis for this **revised** protocol.

A manufacturer who wishes to have its technology considered for placement on the “Acceptable” list must submit a report that contains performance data from studies following the requirements outlined in this protocol. While it is preferred that the field studies be conducted in the Sacramento region, this is not a requirement. In addition, laboratory study data may be allowed for provisional pilot testing installations if the experiment is set up to reflect “real-life” examples. A real-life event would include a range of intensities, durations, and influent quality as specified for field testing. The pilot testing installations then require additional field testing to confirm their performance.

NUMBER AND TYPES OF SITES EVALUATED

- Studies are to be conducted at a minimum of **two** sites (does not include separate installations on the same site).
- Land uses: more than one of the following - retail commercial, non-retail commercial, medium density residential, high density or multi-density residential.

SAMPLING REQUIREMENTS

- **Number of storms per site:** 10 (may occur in multiple consecutive years as needed)
- **Storm depth:** from 0.15 to 1.50 inches (required only for non-Sacramento sites)
- **Runoff duration:** from 1 to 24 hours (required only for non-Sacramento sites)
- **Average storm intensity:** 0.05 to 0.25 inches/hour (required only for non-Sacramento sites)
- **Antecedent dry period:** 6 hours minimum with less than 0.04 inches of rain
- **Type of samples:** flow-weight composite samples, except where grab sampling is required by protocol.
- **Sampling procedure:** To the extent possible, sampling is to occur through the entire period of runoff. Sampling is to occur for a period that represents at least 75% of the volume of each storm with an overall average of all storms of at least 80%. A minimum of **10** aliquots must be taken during each sampled storm.
- **Analytes:** Influent and effluent Total Suspended Solids (TSS) or Suspended Sediment Concentration (SSC), pH, total recoverable filtered and unfiltered metals (zinc, copper,

and cadmium or nickel), oil/grease, and, Total Phosphorus (TP) and Total Kjeldahl Nitrogen (TKN).

- Chemical samples are to be collected, preserved, handled, and analyzed according to the applicable Standard Methods or USEPA methods. Analytical analysis is to be done by a certified laboratory.
- At the end of the test period, the sediment shall be removed, quantified, and analyzed. The sediment will be evaluated for the following: moisture content, particle size distribution, organic content, oil/grease, and zinc. To analyze particle size distribution, both the wet and dry sieve test procedures will be used, following ASTM.

Monitoring events should reasonably reflect the range of typically observed conditions for event rainfall depth, event duration, antecedent conditions, and rainfall intensities.

REQUIRED DOCUMENTATION PROTOCOL

For monitoring studies conducted in the Sacramento region, the following documentation is required:

Monitoring Work Plan

Prior to conducting any work, the manufacturer shall submit a monitoring work plan and quality assurance project plan (QAPP) for review and approval by the local agency. The monitoring plan shall describe, at a minimum:

- Anticipated start & completion date (site shall be stabilized before the start date);
- Description, installation and use of monitoring equipment;
- The sampling procedures, analytes to be tested, testing protocols, quality assurance procedures;
- Qualifications/names of personnel and laboratory to conduct the work.
- A description of the test site including total acreage, total impervious acreage, a description of landscaping if relevant, the acreage draining to the device if it differs from total acreage. Include a description of the drainage system.
- A description of the treatment device including the design peak capacity.
- Complete drainage calculations showing the calculations to size the treatment device for the test site.
- A Surface Water Ambient Monitoring Program (SWAMP) comparable QAPP (http://www.waterboards.ca.gov/water_issues/programs/swamp/tools.shtml) that can be written in coordination with the sampling plan, but that meets the appropriate SWAMP guidelines.

Interim Documentation

During the course of the pilot study, documentation shall be provided to the local agency upon request to provide interim results.

Final Monitoring Report

Within 90 days of the conclusion of the study, the manufacturer shall submit to the local agency a report documenting results of the study. The final report shall include at a minimum:

- Start and end times of the runoff period of each sampled storm
- Start and end times of the sampling period of each sampled storm
- Total rainfall depth
- Rainfall depth during the sampling period
- Total runoff volume
- Runoff volume that occurred during the sampling period
- Description of the test site, including: total acreage, total impervious acreage, a description of landscaping if relevant, and the acreage draining to the device (if it differs from total acreage)
- Description of the drainage system
- Description of the installed treatment device
- Complete drainage calculations showing the calculations to size the treatment device for the test site
- All raw data including laboratory reports. All data is to be reported including rejected data with an explanation for the rejection
- Statement from the analytical laboratory certifying the specified analytical procedures were followed in the analysis of the samples and that the appropriate preservation methods were followed
- Calculation of efficiency of each storm by comparing the influent and effluent concentrations of each storm
- Calculation of the efficiency for all storms by comparing the total aggregate inflow loading of all storms to the total aggregate outflow loading for all storms
- Present a plot of influent concentration versus efficiency for TSS for each storm sampled. All data is to be plotted including rejected data with an explanation for the rejection.
- Start and end times of the precipitation period
- Statement of certification signed by an officer or Professional Engineer of the company performing the monitoring that the protocol was followed

Non- Sacramento Sites:

Proprietary stormwater treatment devices that have already conducted field monitoring tests in sites outside the Sacramento region may submit qualified field monitoring data for review. The data shall be submitted per the performance and documentation requirements outlined in this document and include the reporting items listed in the previous section. In addition, the data must demonstrate similarity to the Sacramento region:

- Storm event parameters (intensity, duration, antecedent dry period, etc.) reasonably match Sacramento area conditions as required by the sampling requirements above or demonstrated by comparison to historical parameter data from Sacramento.
- The design operating rate would be consistent with the Sacramento Area

- If the device relies on infiltration or the surface soil interface, testing condition soils must be specified (types, infiltration rate test data, etc.) so as to limit the potential application areas to locations where similar infiltration conditions are present.

POLLUTANT PERFORMANCE REQUIREMENTS

The data is required to meet the Technology Assessment Protocol – Ecology (TAPE) performance evaluation criteria for TSS. The TAPE program is based on a 20-mg/L concentration limit for influent TSS concentrations at or below 100 mg/L. At influent TSS concentrations between 100 mg/L and 200 mg/L, a constant 80 percent removal efficiency is applied. The resulting performance criteria, reported both in terms of removal efficiency and equivalent effluent limits, are reported in Table 1.

**TABLE 1
TAPE PROGRAM PERFORMANCE CRITERIA**

| Influent TSS or SSC (mg/L) | Removal Efficiency (%) | Equivalent Effluent Limit (mg/L) |
|----------------------------------|---------------------------|-------------------------------------|
| 20 | 0 | 20 |
| 25 | 20 | 20 |
| 50 | 60 | 20 |
| 75 | 73.3 | 20 |
| 100 | 80 | 20 |
| 125 | 80 | 25 |
| 150 | 80 | 30 |
| 175 | 80 | 35 |
| 200 | 80 | 40 |

COMPLETION OF MONITORING

The pilot study monitoring requirements will be met when either of the following is satisfied:

- The monitoring requirements (number of monitoring events and specific protocol) listed above have been completed and reports submitted to the local agency for review, verification, and approval.

OR

- Based on the results of its ongoing study of proprietary devices, the Sacramento Stormwater Quality Partnership accepts the selected proprietary device for general use as a stormwater quality treatment option in the Sacramento area. If this happens during the course of the pilot study, the manufacturer may submit a written request to the local

agency where the study is conducted to discontinue the study. Monitoring data collected up to that point shall still be submitted to the local agency for its use.