CALIFORNIA STATE UNIVERSITY

Guidance Document
Post Construction BMPs

MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s)
Phase II MS4 Permit

NOVEMBER 14, 2014

GUIDANCE

For Design and Development of Phase II Small Municipal Separate Storm Sewer System (MS4) Post Construction Best Management Practices (BMP) Requirements for California State University Campuses

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I. EXECUTIVE SUMMARY

A. Adoption and Designations

In February, 2013 the State Water Resources Board adopted a renewed Phase II General Permit for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). Phase II Small MS4s are not regulated under the municipal Phase I regulations. The permit became effective on July 1, 2013. The permit designates most California State University campuses as "Non-Traditional" MS4s. These designations can be found in Attachment B of the permit. Traditional MS4s are cities, counties and drainage and flood control districts that own and operate surface and sub-surface storm drain systems. Non-traditional MS4s are operators of substantial storm drain systems that are owned by state or federal government entities. Requirements specific to Non-traditional MS4s are contained in Sections A, B, C, D and F of the permit order.

For CSU campuses the permit is self-governing. It is the responsibility of the campus to report compliance efforts and certify compliance using the State Water Board's Stormwater Multi-Application Reporting and Tracking System (SMARTS). Compliance can also be monitored by the public at large.

B. Requirements for Non-Traditional MS4s

Requirements in the permit order are phased in by year over the term of the permit, which is five years. During Year 2 of the permit Non-Traditional MS4s are required to implement a Post Construction Storm Water Management Program (SWMP). Post-Construction Storm Water Management Programming is a combination of structural and non-structural Best Management Practices (BMPs).

C. Structural Post Construction Best Management Practices

Structural BMPs function by storing or detaining runoff so that storm-water constituents settle out or are filtered and trapped by underlying soil or media. Basic mechanisms for removal of constituents are gravity settling, infiltration of soluble nutrients through the soil profile or filter media, or biological and chemical processes. Structural BMPs might use one or more of these mechanisms to achieve constituent removal from storm-water. Structural BMPs also retain runoff to reduce peak flows, which decreases hydro-modification downstream. Structural BMPs are permanent improvements and are designed integrally with a project, such as bio-swales, catch basin filters and permeable paving.

D. Non-Structural Post Construction Best Management Practices

Non-structural BMPs are typically "source control" measures, designed to reduce the level of contaminants and their concentrations in stormwater runoff. Non-structural BMPs are such measures as literature and signage that encourage facility users to eliminate non-stormwater discharges into the storm drain system and include maintenance programs, spill prevention plans and street sweeping.

E. Goals

This document is intended to provide California State University campuses with system-wide guidance for design, implementation, operation and maintenance of post-construction BMP elements. This document offers guidance to campus design and planning staff and maintenance staff to:

- Comply with the permit requirements,
- Develop campus design practices and principles that optimizes project costs and site impacts of

structural BMPs,

- Develop principles for development of non-structural BMPs that use existing campus programs and materials to the maximum extent applicable.

- Establish consistency across the CSU system for MS4 permit compliance.

II. PRINCIPLES FOR DESIGN OF POST CONSTRUCTION STRUCTURAL BMPS

A. Permit Requirements

Section F.5.g of the permit divides requirements into four categories. They are:

1) Site Design Measures (Section F.5.g.1) for projects that create or replace between 2,500 square feet and 5,000 square feet of impervious surface,

2) Low Impact Development (LID) Design Standards (Section F.5.g.2) for projects that create or replace more than 5,000 square feet of impervious surface.

3) Alternative Post-Construction Storm Water Management Programs (Section F.5.g.3) for multi-benefit projects, which include water supply, flood control and drainage, habitat, open space preservation recreation and climate change.

4) Operation and Maintenance (O&M) of Post-Construction Storm Water Management Measures for new development projects, which requires a verification program to ensure BMPs are properly operated and maintained.

There are additional requirements, conditions and exclusions for road projects that create 5,000 square feet or more of new impervious surface. These are discussed in more detail in following paragraphs.

B. Compliance Options

Understanding the requirements of the permit is critical to designing economical structural BMPs that meet the requirements of the permit.

Projects 2,500 Square Feet to 5,000 Square Feet (F.5.g.1 - Site Design Measures)

The first level of projects that are required to include post construction BMPs are projects covering areas of at least 2,500 square feet and not more than 5,000 square feet. These projects are required to comply with the State Water Board SMARTS Post-Construction Calculator (*http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/wqo_2009_0009_app_21.xls*), or equivalent, to quantify the runoff reduction resulting from implementation of site design measures.

The Post Construction Calculator is an Excel® spreadsheet that accepts input of project data and returns options for measures that will re-create the pre-project hydrologic site conditions. The goal is to achieve no increase in runoff from the project site. The options provided by the calculator can be extensive and costly and the calculator ignores specific site conditions, and off-site conditions, that may provide mitigation that satisfies the permit requirements. For these reasons the Calculator is not always the best tool for permit compliance for projects of this size.

The permit allows the use of an "equivalent" method to quantify runoff reduction. This equivalent can be a simple hydrologic calculation based on an 85th percentile storm (the storm frequency that includes 85% of all storm events) and using basic runoff coefficients. For physical plant and facilities managers and directors who are responsible for maintenance work, this calculation can be done once and then applied to future projects with adjustments for project size and other factors.

Projects 5,000 Square Feet & Larger (F.5.g.2 - Low Impact Development Design Standards)

For projects that create or replace 5,000 square feet or more of impervious surface the permit allows four specific numeric sizing criteria – two volume based and two flow based – from which to choose. They are as follows:

(1) Volumetric Criteria:

a) The maximized capture storm water volume for the tributary area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998) pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event); or

b) The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology in Section 5 of CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003), using local rainfall data.

(2) Flow-based Criteria

a) The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; or

b) The flow of runoff produced from a rain event equal to at least 2 times the 85th percentile hourly rainfall intensity as determined from local rainfall records.

The most direct method above is Option a) under 2) Flow-based Criteria. This method requires no further research and no references. It is also unlikely any of the other options will produce significant cost savings because the numerical differences will be small and there will be no discernable size reductions in BMPs.

Volume based solutions require dedication of land for storage of storm water. Flow based solutions can be integrated into landscaped areas, parking surface with permeable material and other site elements.

Projects larger than 5,000 square feet are sub-divided into two categories. They are:

1) Projects that increase impervious surfaces by 50% or more of the project site.

   For these projects, runoff and pollutant reduction is required for all impervious surfaces within the project site "to the extent feasible" from all impervious surfaces.*

2) Projects that increase impervious surfaces by less than 50% of the project site.

For these projects, runoff and pollutant reduction is required only from new and/or replaced impervious surfaces.

* A pollutant is broadly defined as any agent that may cause or contribute to the degradation of water quality such that a condition of pollution or contamination is created or aggravated.

"To the extent feasible" is not defined in the permit and it is difficult to find a definition on the State Water Board's web site or the federal EPA's web site. In most cases, the closest matches found are variations of the phrase, such as "maximum extent practicable," "maximum extent feasible," and "technically feasible." In general, to the extent feasible should consider all factors, including technical feasibility, fiscal feasibility, public health risks, societal concerns, and social benefits. The criteria and factors used to determine this should be consistent and reasonable.

Alternative Post Construction Storm Water Management Program

The permit allows provides for compliance using projects having multiple benefits (see Permit Section F.5.g.3). This general option allows the campus to mitigate storm water quality effects on another part of campus and to combine mitigation requirements from multiple projects into one or more mitigation efforts.

In practice, this means that multiple small projects on a campus can be mitigated with a project on another part of the campus. For example, a recreation field or garden created in one part of a campus can be used to mitigate a project in another part of the campus. New building projects that include landscaping and that exceed their own mitigation requirements can be used for mitigation for other projects.

This will require advanced planning by the campus, but this work can be integrated into project planning and master planning. Non-traditional Phase II MS4 permittees are not required to create a campus-wide water quality management plan; however, mitigation must be tracked and recorded to show compliance and effectiveness.

Taken as a whole, the above narrative describes and the tool box provided in the permit for compliance for large and small projects. To take advantage of this tool box some basics during planning and design to be considered are:

- Begin site planning early. Site planning participants should include the architect/ designer, landscape architect and the designer of the site storm-water BMPs, which is usually a civil engineer. Ideally, the BMP designer should have experience in hydrology and hydraulics. This will facilitate comparison of the options, alternatives, adjustments and exceptions to the requirements.

- Identify common site elements that can be developed as BMPs for storm water treatment or retention system. These may include landscape buffers, seating areas, tree wells, pedestrian plazas and other elements.

- Use landscaping as structural BMPs. In most cases, projects will already include landscaping as site features.

- Keep runoff on the surface to the maximum extent possible. Surface drainage is slower and will increase time of concentration, which will decrease peak flows.

- Combine storm site drains with water quality management BMPs.

- Use small footprint BMPs when possible. Examples of this are:
  - Catch basin filters
    - Permeable pavers arranged in strips, such as walkways that are perpendicular to surface flow
  - Individual tree wells with functioning filter and infiltration systems.

- Use small changes in building/improvement locations to create spaces to increase BMP effectiveness. Examples of this are:
  - Shifting a building a few feet in one direction to create a flow path into which roof drainage can be conducted to allow surface flow
  - Raising a finish floor by small increments (inches) to create flow paths

- Avoid increasing site improvements footprint solely for BMP components.

- Use self-treating and self-retaining areas.

- Consult with campus maintenance as part of planning and design process.

- The permit does not require that every drop of rainfall be treated and/or retained and it does not require treatment of the entire site if the increase in impervious area is less than 50%.

- Control runoff at the source when possible. Drainage system and control or treatment structure costs increase with distance from the source.

- Avoid underground treatment and storage systems. These usually have large footprints, have high construction costs and are expensive and inconvenient to maintain.

- Avoid one-size-fits-all design concepts, such as retaining the first three-quarters inch of runoff.

- Avoid "standard" or "typical" structural BMP details. Many of these have been developed by cities and counties and are included in their SUSMP criteria, but are not necessary to develop effective BMPs under the Phase II MS4 permit.

III. PRINCIPLES FOR DEVELOPMENT OF POST CONSTRUCTION NON-STRUCTURAL BMPS

Non-structural BMPs consist of processes, prohibitions, procedures, schedules of activities, etc., that prevent pollutants from contacting storm water discharges and authorized non–storm water discharges. They are generally considered low technology, but cost-effective measures.

Post Construction Non-structural BMPs fall into broad general categories. These include:

- Good Housekeeping
- Preventive Maintenance
- Spill Response (for any pollutant)
- Material Handling and Storage Procedures
- Employee Training
- Waste Handling and Recycling Procedures

- Record Keeping and Reporting
- Erosion Control and Site Stabilization Requirements
- Inspections
- Quality Assurance
- Public Outreach and Education

These categories apply across campuses for all facilities.

For many of the categories listed above, BMPs are already in place on California State University campuses. These include:

- Street Sweeping Schedules
- Storm Drain Maintenance Programs
- Sanitary Sewer Maintenance Programs
- Spill Prevention, Control and Counter-Measure (SPCC) Plans
- Equipment Maintenance Manuals and Programs
- Public Education and Outreach Efforts

These documents and plans can be adapted to the Post Construction Storm Water Management Program, which, in some case, can be as simple as changing the title of documents. In some cases, the only effort necessary is reporting or uploading plans and procedures to the State's SMARTS web site during prior to reporting deadlines.

The most efficient effort for producing non-structural BMPs is to use existing items as described above. Using BMP material common to other campuses leverages efforts across the CSU system. This can be new material produced by collaboration among campuses, or existing material that one or more campuses may already be using. For new projects, maintenance and operation manuals and materials may be produced by product suppliers or contractors. This effort can be added to construction contract document packages in either specifications or drawings.

The following are some general guidelines for developing post-construction BMPs that apply across all types of projects:

- Use Existing Campus-Created Content
- Adapt Content from other Recently Completed Projects
- Use Existing BMP Literature and Materials Created by Other Campuses
- Use Public Domain Material
- Use Materials Created by Phase I and other Phase II MS4s
- Adapt Content/Text from Equipment Operating and Maintenance Manuals

Using the guidelines each campus can minimize efforts to produce structural and post-construction BMPs and fully comply with the requirements of the MS4 permit.

IV. Resources and Links

More information, as well as some content, can be found at the following:

www.casqa.org

www.waterboards.ca.gov/water_issues/programs/stormwater/phase_ii_municipal.shtml