SAN FRANCISCO

stormwater management requirements and design guidelines
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Glossary

**Best Management Practices (BMPs)**  Constructed facilities or measures to help protect receiving water quality and control stormwater quantity, also referred to as stormwater controls.

**Bioretention**  A BMP designed to retain stormwater runoff using vegetated depressions and soils to collect, store, treat, and infiltrate runoff.

**Capacity**  The flow volume or rate that a stormwater facility is designed to safely receive, manage, or convey to meet a specific performance standard.

**Catch Basin**  Underground concrete box structure with openings in curbs and gutters designed to collect runoff from streets and pavement.

**Check Dam**  A low structure or weir placed across an open channel to control water depth or velocity along steeper slopes, or to control channel erosion. Check dams can also be placed underground within BMPs to regulate subterranean stormwater flows.

**Clean Water Act (CWA)**  The Federal Water Pollution Control Act, commonly referred to as the CWA, was designed to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands. Requirements of the National Pollutant Discharge Elimination System program are defined under Sections 307, 402, 318 and 405 of the CWA.

**Combined Sewer System**  A sewer system designed to convey and treat both sanitary sewage and stormwater. Approximately ninety percent of San Francisco is served by a combined sewer system.

**Design Storm**  A hypothetical storm defined by a given return period (which refers to the frequency of a storm) and the storm duration. Together, these characteristics yield the storm's rainfall depth. The rainfall depth is applied to a prescribed hyetograph shape to create a rainfall distribution that is used in the analysis of existing drainage, design of new stormwater controls, or assessment of impacts of a proposed project on runoff flows and volumes.

**Detention**  The capture, temporary storage, and slow release of stormwater runoff from a BMP or stormwater facility.

**Development**  Any human-induced change to improved or unimproved real estate including but not limited to construction, installation, or expansion of a building or other structure; land division; street construction; drilling; and site alteration such as dredging, grading, paving, parking or storage facilities, excavation, filling, or clearing. Development encompasses both new development and redevelopment.

**Discharge**  A release or flow of stormwater or other substance from a conveyance system or storage container.
**Drainage Management Area (DMA)**  
A discrete area that drains to a single stormwater BMP, to a series of hydraulically-connected BMP, or directly to the sewer system. A BMP is sized to accommodate runoff from its associated DMA for selected design storm.

**Erosion**  
The wearing away of land surface by wind or water. Erosion occurs naturally from weatherization or runoff but can be intensified by land-clearing practices related to farming, an increase of impervious surfaces, redevelopment, road building, or timber cutting.

**Evapotranspiration**  
The loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues).

**Grading**  
The cutting or filling of the land surface to achieve a desired slope or elevation.

**Green Infrastructure (GI)**  
GI uses the natural processes of vegetation and soils to manage stormwater while providing a multitude of ancillary benefits such as carbon dioxide sequestration and neighborhood beautification. GI refers to stormwater management systems that mimic nature by soaking up and storing water.

**Filter Fabric**  
A water-permeable material, generally made of synthetic products such as polypropylene, used in stormwater management and erosion control applications to trap sediment or to prevent fine soil particles from clogging the aggregates.

**Freeboard**  
The vertical distance between the design water surface elevation (overflow elevation) and the elevation at which overtopping of the structure or facility that contains the water would occur.

**Impervious Surface**  
A surface that prevents the land’s natural ability to absorb and infiltrate rainfall or stormwater. Impervious surfaces include, but are not limited to; building or structures, roof tops, impervious concrete and asphalt, and any other continuous watertight pavement or covering. Landscaped soil and pervious pavement, including pavers with pervious openings and seams, underlain with pervious soil or pervious storage material, are not impervious surfaces.

**Infiltration**  
The process by which surface water enters the soil. Infiltration is often expressed as a rate (inches per hour), which is determined through an infiltration test.

**Jurisdiction**  
The territory over which the legal authority of an institution extends. There are two stormwater management jurisdictions in San Francisco: Port of San Francisco land is subject to Port requirements while other areas are subject to San Francisco Public Utilities Commission requirements.
Leadership in Energy & Environmental Design (LEED)  A green building certification program created by the U.S. Green Building Council (USGBC) that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification.

Low Impact Development (LID)  A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management facilities (such as green infrastructure) that are integrated into a project design.

Maximum Extent Practicable (MEP)  A standard which involves applying BMPs that reduce the discharge of pollutants in stormwater runoff. MEP is the result of the cumulative effect of implementing, continuously evaluating, and making corresponding changes to a variety of technically and economically feasible BMPs that ensure the most appropriate controls are implemented in the most effective manner.

Municipal Separate Sewer System (MS4)  A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) designed or used for collecting or conveying stormwater; (ii) which is not a combined sewer; and (iii) which is not part of a Publicly Owned Treatment Works (POTW) as defined at Title 40 of the Code of Federal Regulations (CFR) 122.2. A “Small MS4” is defined as an MS4 that is not a permitted MS4 under the Phase I regulations. This definition of a Small MS4 applies to MS4s operated within cities and counties as well as governmental facilities that have a system of storm sewers. Most of San Francisco is served by combined sewers; only about ten percent of the city uses a municipal separate sewer system.

National Pollutant Discharge Elimination System (NPDES)  The national program for administering and regulating Sections 307, 318, 402, and 405 of the Clean Water Act (CWA).

Overflow  Excess volume of stormwater or wastewater that exceeds the storage or conveyance capacity of a facility or system component and causes a release of flow to another facility or system component or to the environment.

Pervious (Permeable) Surface  A surface that allows stormwater to infiltrate into the ground. Examples include pasture, native vegetation areas, landscape areas, and permeable pavement.

Post-Construction Stormwater Management  Implementation of permanent GI facilities that will capture and treat stormwater throughout the life of a project after construction is complete.

Potable Water  Water that is safe for drinking and cooking.

Pretreatment  Treatment of stormwater before it is discharged to a BMP or to the collection system.
Retention  The removal of stormwater runoff from the sewer system via infiltration, evapotranspiration, or rainwater harvesting, which prevent it from leaving the development site.

Right of Way (ROW)  A path on a property owner’s land which other people have a legal right to use.

Runoff  Water originating from rainfall, melted snow, and other sources (e.g., sprinkler irrigation) that flows over the land surface to drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands.

Run-on  Stormwater surface flow from a contributing area that enters a specific area such as a BMP (e.g. run-on to permeable pavement).

Safety Factor  A sizing multiplier that evaluates the risks and values of specific conditions, including the failure mode of the construction material, unexpected construction deficiencies, and potential cost of system failure. The safety factor is applied to the maximum performance limit to calculate a risk-based design value used for sizing facilities. A safety factor must be used to provide reasonable assurance of acceptable long-term system performance.

San Francisco Stormwater Management Ordinance (SMO)  In 2010, the San Francisco Board of Supervisors passed San Francisco’s first SMO, which requires the installation and maintenance of stormwater management controls for development and redevelopment projects meeting specific area and project type criteria. The SMO provides the SFPUC and Port with the legal authority to implement the post-construction program outlined in the SMR.

Source Control  The technique of stopping and/ or reducing pollutants at their point of generation so that they do not come into contact with stormwater. “Source Controls” or “Source Control BMPs” refer to the operational practices and structural BMPs that capture potential pollutants at the source.

Stormwater  Runoff during and following precipitation and snowmelt events, including surface runoff, drainage, and interflow.

Stormwater Multiple Application and Report Tracking System (SMARTS)  SMARTS has been developed to provide an online tool to assist dischargers in submitting required reports and documentation, viewing/printing Receipt Letters, monitoring the status of submitted documents, and viewing their application/renewal fee statements. The system will also allow the Regional Board and State Board staff to process and track the discharger submitted documents.
Stormwater Control Plan (SCP)  A required submittal for projects creating and/or replacing 5,000 square feet or more of impervious surface that demonstrates they have met all applicable stormwater performance requirements. The SCP allows the SFPUC and the Port to review projects that are subject to the SMR and evaluate compliance. A Preliminary SCP is submitted at the design development phase of the project and must be approved by the SFPUC or the Port before a Site or Building Permit will be issued. A Final SCP is typically submitted at the 100 percent construction document phase of the project. The components of an SCP are described in Chapter 9: Stormwater Control Plan Requirements.

Time of Concentration  The amount of time it takes stormwater runoff to travel from the most distant point (measured by travel time) on a particular site or DMA to a particular point of interest.
Hickory Street in San Francisco, CA is lined with bioretention on each side. Photo: Krystal Zamora
Summary of Changes in the 2016 SMR

This document is an update of the 2010 San Francisco Stormwater Design Guidelines (Guidelines). In addition to updating performance requirements and compliance processes, the 2016 SMR better delineates requirements versus guidelines and allows for easier access to information with modular chapters that can be downloaded from the internet and read separately. To facilitate the transition from the 2010 Guidelines to the 2016 SMR, a short description of each chapter of the SMR and the significant changes from the 2010 Guidelines is provided below.

1 **Introduction** Provides a broad overview of the SMR, significance, and purpose.

2 **Regulatory Context** Describes how the SMR fits in with federal, state, and local stormwater requirements.
   
   **Chapter 2 Changes:**
   
   - A number of local codes, regulations, and guidance documents that influence the implementation of GI have been added to Chapter 2. These regulations and guidance documents were developed over the past five years; most notable is the Stormwater Management Ordinance, which provides the SFPUC and Port with the legal authority to implement the post-construction program outlined in the SMR.

3 **Low Impact Design in San Francisco** Contextualizes the use of LID and stormwater management in San Francisco.
   
   **Chapter 3 Changes:**
   
   - Two chapters in the 2010 Guidelines (San Francisco Context and Multi-Purpose Design) were integrated in Chapter 3 to provide a succinct description of the opportunities for and benefits of LID in San Francisco.

4 **Green Infrastructure Design Approach** Guides design teams through a six-step process for incorporating GI into a project’s site design.
   
   **Chapter 4 Changes:**
   
   - Previously titled The Stormwater Control Plan, this chapter was a combination of design guidelines and requirements focused on the creation of a SCP. The intent of this updated chapter is to provide general design guidance for any project interested in incorporating green infrastructure and other stormwater management strategies. Information required for completion of a SCP can be found in the new Chapter 7: Stormwater Control Plan Requirements.
5 **Combined Sewer Area Performance Requirements** Describes performance requirements specific to projects in the combined sewer areas.

Chapter 5 Changes:

- *The threshold at which projects must comply with the SMR has been redefined. In the 2010 Guidelines, projects disturbing 5,000 square feet or more of the ground surface were subject to the requirements. In the revision, the threshold has been revised to projects creating and/or replacing 5,000 square feet or more of impervious surface.*

- *The 2016 version includes an option for eligible projects to comply with Modified Compliance requirements. This option was not available in the 2010 SMR.*

6 **Separate Sewer Area Performance Requirements** Describes performance requirements specific to projects in the separate sewer areas.

Chapter 6 Changes:

- *Small Projects are regulated under the 2016 SMR. Small Projects (those creating and/or replacing 2,500-5,000 square feet of impervious surface) must implement one or more Site Design Measure(s). Projects of this size were not regulated in the 2010 Guidelines.*

- *The threshold at which Large Projects must comply with the SMR has been redefined. In the 2010 Guidelines, projects disturbing 5,000 square feet or more of the ground surface were subject to the requirements. In the revision, the threshold for Large Projects has been revised to projects creating and/or replacing 5,000 square feet or more of impervious surface.*

- *The 2016 SMR require use of preferred BMPs to the maximum extent practicable before consideration of remaining BMPs. The 2010 Guidelines did not include a required BMP Hierarchy. The required BMP Hierarchy prioritizes infiltration-based BMPs, rainwater harvesting, and vegetated roofs followed by lined bioretention (commonly known as a “flow-through planter”). Detention-based controls that do not include biofiltration (e.g., detention tanks) do not meet Large Project performance requirements under the 2016 SMR. Large Projects in the separate sewer areas may be able to incorporate high-rate filtration BMPs (i.e. tree-box filters and media filters) into their site design pending approval by the SFPUC or Port. (See Figure 8: Separate Sewer Area BMP Hierarchy for more information).*

7 **Stormwater Management in the Streets** Outlines when right-of-way projects are required to comply with the SMR.

Chapter 7 Changes:

- *This chapter was added to the 2016 SMR.*
8 **Green Building Certification Credits** Describes how the SMR requirements can apply to Leadership in Energy and Environmental Design (LEED) and GreenPoint Rated systems.

Chapter 8 Changes:

- This chapter was added to the 2016 SMR.

9 **Stormwater Control Plan Requirements** Describes the components required for a complete SCP submittal, applicable to all projects that create and/or replace 5,000 square feet or more of impervious surface.

Chapter 9 Changes:

- This chapter was added to the 2016 SMR.

10 **Inspection and Enforcement Requirements** Describes the SFPUC and Port inspection and enforcement protocols applicable to all projects that submit an SCP.

Chapter 10 Changes:

- No significant changes were made in this chapter.

11 **References and Resources** Contains all content, photo, and figure references for the SMR.

Chapter 11 Changes:

- This chapter was added to the 2016 SMR.
The SMR also contains the following appendices with supplemental information:

**Appendix A. BMP Fact Sheets** Detailed information about each stormwater control BMP, including siting requirements, design considerations, and sizing procedures.

Appendix A Changes:

- **BMPs have been grouped by scale** (small-scale BMPs for small, single-parcel sites vs. large-scale BMPs for large, multi-parcel sites), and listed approximately in order of the preferred BMP Hierarchy from Chapter 6: Separate Sewer Area Performance Requirements.

- **Conveyance swales, vegetated buffer strips, swirl separators, drain inserts and water quality inlets are classified as pre-treatment devices that may only be used as part of a larger “treatment train” of two or more BMPs in series.**

- **Limitations of infiltration-based BMPs, including set-back distances and depth to groundwater, were updated, and references to the new Appendix C: Criteria for Infiltration-Based BMPs were added.**

- **BMPs shown in Appendix B: Green Infrastructure Typical Details and Specifications were updated for consistency with the details.**

- **New case studies and example installations were added to several BMPs.**

- **Dry wells were renamed as “subsurface infiltration systems” and detention vaults as “subsurface detention systems.”**

- **One BMP, the vegetated rock filter, was removed from the BMP Fact Sheets as it is rarely used in San Francisco nor is its use encouraged by the SFPUC or the Port.**

**Appendix B. Green Infrastructure Typical Details and Specifications** Show typical configurations, rather than required standard configurations, of GI. Licensed professionals can and should modify facility configurations, materials, or notes based on specific project conditions.

Appendix B Changes:

- **This appendix was added to the 2016 SMR.**
Appendix C. Criteria for Infiltration-Based BMPs Siting requirements for infiltration-based BMPs as well as guidance on soil classification and infiltration rate testing.

Appendix C Changes:
- This appendix was added to the 2016 SMR.

Appendix D. Vegetation Palette for Bioretention BMPs A list of plants appropriate for bioretention-based GI based on plant needs such as shade or sun, irrigation, maintenance, and other factors.

Appendix D Changes:
- This appendix was revised to describe important considerations regarding plant selection for bioretention-based GI and includes a palette of locally available climate-appropriate plants that can tolerate periodic inundation and soil saturation.

Appendix E. Illustrative Green Infrastructure Examples These illustrations demonstrate how LID and GI can be integrated into San Francisco’s diverse landscape.

Appendix E Changes:
- This appendix was added to the 2016 SMR.
An impervious gutter directs roof runoff to a rain garden. Photo: Ken Kortkamp