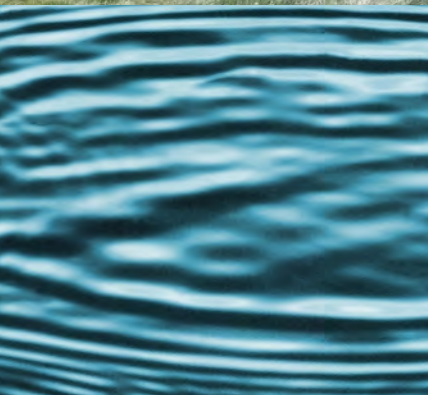


STORMWATER QUALITY DESIGN MANUAL



Integrated Design Solutions
for Urban Development

Protecting Our Water Quality



City of Citrus Heights
City of Elk Grove
City of Folsom
City of Galt

City of Rancho Cordova
City of Sacramento
County of Sacramento

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Disclaimer

The Stormwater Quality Design Manual for the Sacramento Region should be used as a general guidance document to aid with the selection, siting, design, operation and long-term maintenance of stormwater quality control measures. The control measures described herein are intended to serve as best management practices (BMPs) implemented to meet the standard of “reducing pollutants in urban runoff to the maximum extent practicable” set forth in the local agencies’ NPDES Municipal Stormwater Permits issued by the Central Valley Regional Water Quality Control Board.

The stormwater quality control measures should be designed using the criteria outlined in this manual and implemented at areas of new development and redevelopment in accordance with the policies and procedures of the local permitting agency. The control measures must be properly constructed and maintained to ensure long-term performance. Other measures not included in this manual may be allowed on a case-by-case basis, in consultation with the applicable permitting agency. In such cases, the applicant is encouraged to meet with permitting agency staff early in the planning process before proceeding with detailed design. Such projects may require additional time for agency review and approval.

The contributing agencies do not claim any responsibility for errors or omissions in this design manual, improper design, or ineffective maintenance practices that might contribute to non-performance of the stormwater quality control measures. The agencies will share the responsibility of verifying that publicly owned and maintained treatment controls are constructed properly; however, private controls are the owners’/applicants’ responsibility.

Most of the control measures described in this manual should be designed by, or under the supervision of, a California licensed professional engineer and/or other specialists as needed, depending on the type of control measure and site conditions. Check with the local permitting agency to verify the license requirement for the design project undertaken.

The science of stormwater quality management is evolving and new and innovative control measure technologies are constantly being introduced to design professionals. For this reason, this manual will need to be a dynamic document that will be reviewed and updated periodically. Manual users are responsible for ensuring that they are referencing the most current edition, by checking www.beriverfriendly.net (new development) or contacting their local permitting agency.

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Glossary

The following are the terms and acronyms used frequently in this Manual. This list is not intended to be exhaustive.

Alternative driveway – A low impact development design application that involves replacing all or a portion of a standard impervious driveway with pervious materials such as grass or pavers.

Best Management Practices (BMPs) - Methods, measures, or practices designed and selected to reduce or eliminate the discharge of pollutants to surface waters from point and non-point source discharges including stormwater. BMPs include structural and nonstructural controls, and operation and maintenance procedures, which can be applied before, during, and/or after pollution producing activities.

Bioretention Planter– Also referred to as Stormwater Planter. A BMP designed to detain or retain stormwater runoff from impervious surfaces using a vegetated surface depression and engineered soil section. Bioretention can reduce and treat stormwater runoff and associated pollutants through evapotranspiration, filtration, and infiltration.

California Stormwater Quality Association (CASQA) – Statewide association of stormwater quality managers and other interested parties. Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com. Successor to the Storm Water Quality Task Force (SWQTF).

Cluster Development – Incorporates grouping new homes onto part of a development parcel so that the remaining land can be preserved as open space. This approach can save a significant portion of the land and provide an attractive living environment for homeowners. Source: National Assoc. of Homebuilders www.nahb.org (search “cluster development”)

Commercial Development - Any development on private land that is not heavy industrial or residential. The category includes, but is not limited to hospitals, laboratories and other medical facilities, educational institutions, recreational facilities, plant nurseries, car wash facilities, mini-malls, business complexes, shopping malls, hotels, office buildings, public warehouses, and light industrial complexes.

Commercial/Industrial Facility - Any facility involved and/or used in the production, manufacture, storage, transportation, distribution, exchange or sale of goods and/or commodities, and any facility involved and/or used in providing professional and non-professional services. This category of

In the stormwater field, terms are frequently used interchangeably; therefore, it is important to understand the meaning of various terms as presented in this Manual.

Glossary

facilities includes, but is not limited to, any facility defined by the SIC Code. Facility ownership (federal, state, municipal, private) and profit motive of the facility are not factors in this definition.

Construction - Clearing, grading, excavating, building and related activities that result in soil disturbance. Construction includes structure teardown. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility; emergency construction activities required to immediately protect public health and safety; interior remodeling with no outside exposure of construction material or construction waste to stormwater; mechanical permit work; or sign permit work.

Construction General Permit – The general NPDES permit adopted by the State Board, which authorizes the discharge of stormwater from construction activities under certain conditions.

Control - To minimize, reduce, eliminate, or prohibit by technological, legal, contractual or other means, the discharge of pollutants from an activity or activities.

Design Storm – A synthetic rainstorm defined by rainfall intensities and durations.

Detention – The practice of holding stormwater runoff in ponds, vaults, within berms, or in depressed areas and letting it discharge slowly to the storm drain system or receiving water. The detention process allows sediment and associated pollutants to settle out of the runoff.

Developable Area – Vacant or under-developed parcels that have not been developed to their current zoning as described in the regional land use map.

Development - Any construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail and other non-residential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

Development Standards - Standards that the Permittees must develop and implement for new development and significant redevelopment projects to control the discharge of stormwater pollutants in post-construction runoff.

Direct Discharge – A discharge that is routed directly to the receiving water by means of pipe, channel, or ditch (including municipal storm sewer systems), or through surface runoff.

Directly Connected Impervious Area (DCIA) or Surface – Any impervious surface which drains directly into the storm drain system without first allowing flow across a pervious area (e.g. lawn).

Disconnected Pavement (also known as disconnected impervious area, or surface, or not directly connected pavement) – An impervious area that drains across a pervious area prior to discharge to the storm drain system.

Drawdown Time – The time required for a stormwater detention or infiltration BMP to drain and return to the dry-weather condition. For detention BMPs, drawdown time is a function of basin volume and outlet orifice size. For infiltration BMPs, drawdown time is a function of basin volume and infiltration rate.

Flow-Based Treatment Control Measures – Stormwater quality treatment measures that rely on flow capacity to treat stormwater. These measures remove pollutants from a moving stream of water through filtration, infiltration, adsorption, and/or biological processes. Examples: vegetated swales, media cartridge systems, and filter strips.

Head (hydraulic head) – In hydraulics, energy represented as a difference in elevation. In slow-flowing open systems, the difference in water surface elevation, e.g., between an inlet and outlet.

Hydrograph – Runoff flow rate plotted as a function of time.

Hydrologic Soil Group –

TYPICAL INFILTRATION RATES

Soil Type (Hydrologic Soil Group)	Infiltration Rate (in/hr.)
A	1.00 – 8.3
B	0.5 – 1.00
C	0.17 – 0.27
D	0.02 – 0.10
<i>Infiltration rates shown represent the range covered by multiple sources, e.g., ASCE, BASMAA, etc.</i>	

Hydromodification – Change in runoff characteristics from a watershed caused by changes in land use conditions² (i.e., urbanization, dam construction, etc.). Hydromodification results in an artificially altered rate of natural channel erosion and sedimentation processes.

Illicit Connection - Any man-made conveyance that is connected to the storm drain system without a permit, excluding roof drains and other similar type connections. Examples include channels, pipelines, conduits, inlets, or outlets that are connected directly to the storm drain system.

Illicit Discharge - Any discharge to the storm drain system that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. The term illicit discharge includes all non stormwater discharges except discharges pursuant to an NPDES permit, discharges that are

² NPDES No. CAS082597, Order No. R5-2008-0142, Waste Discharge Requirements, Cities of Citrus Heights, Elk Grove, Folsom, Galt, Rancho Cordova, Sacramento, and County of Sacramento, Storm Water Discharges from Municipal Separate Storm Sewer System, Sacramento County

identified as "allowable" in NPDES Municipal Stormwater Permits, and discharges authorized by the State and/ or Regional Board.

Impervious Surface – Any material that prevents or substantially reduces infiltration of water into the soil as would occur under natural conditions before development. Common impervious surfaces include but are not limited to roofs, walkways, patios, driveways, parking lots, areas that are paved, or other surfaces that similarly impede the natural infiltration of surface water or stormwater.

Industrial General Permit – The general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from certain industrial activities under certain conditions.

Infiltration - The entry of water into the soil. Infiltration rate (or infiltration capacity) is the maximum rate at which a soil in a given condition will absorb water.

Inspection - Entry and the conduct of an on-site review of a facility and its operations, at reasonable times, to determine compliance with specific municipal or other legal requirements.

Low Impact Development (LID) - A stormwater management strategy that emphasizes conservation and use of existing natural site features integrated with distributed, small-scale stormwater controls to more closely mimic natural hydrologic patterns in residential, commercial, and industrial settings.
- Source: Puget Sound Action Team 2005

Maximum Extent Practicable (MEP) – Section 402(p)(3)(B) of the Clean Water Act (CWA) directs the Regional Board to issue NPDES Municipal Stormwater Permits which require the dischargers to develop and implement programs with the goal of reducing the discharge of pollutants in stormwater runoff to the maximum extent practicable (MEP). Originally, the term was not clearly defined by the CWA or subsequent regulations, in order to allow dischargers the flexibility to design programs tailored to unique conditions and needs of the community. However, the SWRCB has since attempted to define the term. The State Board's Office of Chief Counsel (OCC) issued a memorandum interpreting the meaning of MEP to include *technical feasibility, cost, and benefit derived with the burden being on the municipality to demonstrate compliance with MEP by showing that a BMP is not technically feasible in the locality or that BMP costs would exceed any benefit to be derived* (dated 11 February 1993). For a more detailed discussion of this standard, see State Board Orders WQ 1000-11 and 91-03. Finding 38 of the Sacramento Areawide NPDES Stormwater Permit No. CAS082597 states: *Implementation of BMPs and compliance with performance standards in accordance with the Permittees' Stormwater Quality Improvement Plans and their schedules constitutes compliance with the MEP standard.*

Municipal Separate Storm Sewer System (MS4) - A conveyance or system of conveyances (including roads with drainage systems, municipal streets, alleys, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) owned by a State, city, county, town or other public body, that is designed or used for collecting or conveying stormwater, which is not a combined sewer, and which is not part of a publicly owned treatment works, and which discharges to Waters of the United States.

National Pollutant Discharge Elimination System (NPDES) - The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits under Clean Water Act §307, 402, 318, and 405.

Natural Drainage System - An unlined or unimproved (not engineered) creek, stream, river or similar waterway.

New Development - Land disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision.

Non-Stormwater Discharge - Any discharge to a storm drain that is not composed entirely of stormwater. Certain non-stormwater discharges are authorized per the NPDES Municipal Stormwater Permits.

NPDES Municipal Stormwater Permit – A permit issued by a Regional Water Quality Control Board to local government agencies (Dischargers) placing provisions on allowable discharges of municipal stormwater to Waters of the State.

Open Space - Pervious area within the project that is subtracted from the total project area to reduce the area used in sizing treatment and low impact development (LID) BMPs. For LID implementation, open space includes, but is not limited to, natural storage reservoirs, drainage corridors, buffer zones for natural water bodies, stream setbacks and buffers, and flood control detention basins.

Performance Standard - A narrative or measurable number specifying the minimum acceptable outcome for a pollution control practice.

Permittees - Agencies named in the NPDES Municipal Stormwater Permits as being responsible for permit conditions within their jurisdictions. For the Sacramento Areawide NPDES Municipal Stormwater Permit, the Permittees are the County of Sacramento and the Cities of Citrus Heights, Elk Grove, Folsom, Galt, Rancho Cordova and Sacramento.

Permitting Agency – The City or County responsible for issuing grading, building and encroachment permits for new and redevelopment projects. In this Manual, “permitting agency” does not refer to the regulatory agencies responsible for issuing environmental permits.

Pollutants - Those substances defined in CWA §502(6) (33.U.S.C. §1362(6)), and incorporated by reference into California Water Code §13373.

Porous Pavements (Pervious pavements) – Pavements for roadways, sidewalks, or plazas that are designed to infiltrate runoff, such as: pervious concrete, pervious asphalt, unit pavers- on-sand, and crushed gravel.

Post-Construction Stormwater Quality Plan – A plan specifying and documenting permanent site features and control measures that are designed to control pollutants for the life of the project. The plan should include sufficient design detail and calculations to demonstrate the adequacy of the

stormwater quality control measures to control pollution from the developed site. This plan may be required prior to issuance of certain development permits; check with your local permitting agency.

Priority Projects - New development and redevelopment projects that are required to incorporate appropriate post construction stormwater quality measures into the design plan for their respective project. See Table 3-2 and Table 3-3 (in Chapter 3) to determine if the project meets the size threshold that triggers the requirements, and to see which specific requirements apply.

Rain Event or Storm Event - Any rain event greater than 0.1 inch in 24 hours except where specifically stated otherwise.

Rational Method – A method of calculating runoff flows based on rainfall intensity, and contributing drainage area, and a factor representing the proportion of rainfall that runs off.

Receiving Waters - All surface water bodies in the Central Valley Region that are identified in the Basin Plan.

Regional Stormwater Quality Treatment Facility (Regional Facility) – A facility that treats runoff from more than one project or parcel (typically a large drainage catchment of 100 acres or more). A regional facility may be in lieu of on-site treatment controls to treat urban runoff prior to discharge to Waters of the State, subject to the approval of the applicable permitting agency.

Regional Water Quality Control Board (RWQCB) – California RWQCBs are responsible for implementing pollution control provisions of the Clean Water Act and California Water Code within their jurisdiction. There are nine California RWQCBs. Sacramento County areas are under the jurisdiction of the Central Valley RWQCB (Region 5; a.k.a. the Regional Water Board).

Restaurant - A facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC Code 5812).

Retail Gasoline Outlet - Any facility engaged in selling motor vehicle fuels and lubricating oils.

Retention – The practice of holding stormwater in ponds or basins and allowing it to slowly infiltrate to groundwater. Some portion will evaporate. Also see infiltration.

Sacramento Stormwater Quality Partnership – A collaborative of public agencies in Sacramento County that protects and improves water quality in local waterways for the benefit of the community and the environment. Participating agencies include the County of Sacramento and the Cities of Citrus Heights, Elk Grove, Folsom, Galt, Rancho Cordova and Sacramento.

Significant Redevelopment - Land-disturbing activities on an already developed site (see Table 3-3). Includes, but is not limited to: expansion of a building footprint; replacement of a structure; replacement of impervious surface that is not part of routine maintenance activity; and land-disturbing activities related to structural or impervious surfaces. Replacement of impervious surfaces includes any activity where impervious materials are removed, exposing underlying soil during

construction. For redevelopment projects subject to this manual, the applicable design standards apply only to the redeveloped area, and not to the entire site, except in cases where untreated drainage from the existing developed portion is allowed to enter/flow through the redeveloped portion. In such cases, any new required treatment control measures must be designed for the entire contributing drainage area. Redevelopment and infill project applicants should check with the local permitting agency at the start of project design to verify whether or not the manual requirements apply.

Source Control Measure - Any schedules of activities, prohibitions of practices, maintenance procedures, managerial practices or operational practices that aim to prevent stormwater pollution by reducing the potential for contamination at the source of pollution.

Stormwater - Stormwater runoff, snowmelt runoff, and surface runoff and drainage.

Structural Control Measure - Any structural facility designed and constructed to mitigate the adverse impacts of stormwater and urban runoff pollution (e.g. canopy, structural enclosure). The category may include both source and treatment control measures.

Target Pollutants – Pollutants identified by the Permittees as most likely to impair local receiving waters, based on evaluation of available monitoring data and other information.

Treatment - The application of engineered systems that use physical, chemical, or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media absorption, biodegradation, biological uptake, chemical oxidation, and UV radiation.

Treatment Control Measure - Any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media absorption or any other physical, biological, or chemical process.

Urban Runoff - Any runoff from urbanized areas that enters the MS4 including stormwater and dry weather flows from a drainage area that reaches a receiving water body or subsurface. During dry weather, urban runoff may be comprised of groundwater base flow and/or nuisance flows, such as excess irrigation water.

Volume-Based Treatment Control Measures – Stormwater quality treatment measures that rely on volume capacity to treat stormwater. These measures detain or retain runoff and treat it primarily through settling or infiltration. Examples: detention and infiltration basins, porous pavement and bioretention planters.

Water Board(s) – Generic reference to the State Water Resources Control Board (SWRCB) and/or the nine Regional Water Quality Control Boards (RWQCBs).

Water Quality Volume (WQV) – For stormwater treatment BMPs that depend on detention to work, the volume of water that must be detained to achieve maximum extent practicable pollutant removal. This volume of water must be detained for a specified drawdown time.

Glossary

Watershed – That geographical area that drains to a specified point on a water course, usually a confluence of streams or rivers (also known as drainage area, catchment, or river basin).

Wet Season (Rainy Season) – For the Sacramento region, the calendar period beginning October 1 and ending April 15. *Note: This differs from the CA Dept. of Fish and Wildlife wet weather definition, which is October 15 – April 15.*