

DEVELOPMENT AND REMODELING PROJECTS

Storm Water Best Management Practices for Single-Family Homes on Small Lots

Chapter 6A of the Best Management Practices Manual for the
City's Storm Water Management Program



Planning Department

Public Works Department

809 Center Street, Santa Cruz, CA 95060

Revised March 2014

Initial Publication: March 8, 2004

Authorized by Municipal Code Chapter 16.19

TABLE OF CONTENTS

CHAPTER 1 WHY LOW IMPACT DEVELOPMENT?	1
CHAPTER 2 MANDATORY BMP REQUIREMENTS	3
2.1. APPLICABILITY	3
2.2. REQUIREMENT: SITE DESIGN AND RUNOFF REDUCTION.....	3
2.3. LID DESIGN GUIDE.....	4

APPENDICES

Appendix A	Single-Family Home Site Design Checklist
Appendix B	LID Plant Guidance

DEFINITIONS

Best Management Practice (BMP) - Any program, technology, process, operational methods or measures, or engineered systems, which when implemented prevent, control, remove, or reduce pollution.

Impervious Surface - A hard, non-vegetated surface area that prevents or significantly limits the entry of water into the soil mantle, as would occur under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.

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 practices that are integrated into a project design.

New Development - Land disturbing activities that include the construction or installation of buildings, roads, driveways and other impervious surfaces. Development projects with pre-existing impervious surfaces are not considered New Development.

Permeable or Pervious Surface - A surface that allows varying amounts of stormwater to infiltrate into the ground. Examples include pasture, native vegetation areas, landscape areas, and permeable pavements.

Redevelopment/Remodel - On a site that has already been developed, construction or installation of a building or other structure subject to planning and building authority including: 1) the creation or addition of impervious surfaces; 2) the expansion of a building footprint or addition or replacement of a structure; or 3) structural development including construction, installation or expansion of a building or other structure. It does not include routine road maintenance, nor does it include emergency construction activities required to immediately protect public health and safety.

Replaced Impervious Surface - The removal of existing impervious surfaces down to bare soil or base course, and replacement with new impervious surface. Replacement of impervious surfaces that are part of routine road maintenance activities are not considered replaced impervious surfaces.

CHAPTER 1.

Why Low-Impact Development?



Pre-urban Conditions

Before urban development in the Central Coast, as much as 50% of rainwater was infiltrated into the soil, replenishing groundwater supplies, contributing to stream flows and sustaining vegetation; another 40% was released into the atmosphere through evapotranspiration. Only about 10% of rainwater contributed to stormwater runoff (rainwater that flows over the land surface).

Urban Development Impacts

Today, our urban landscape has more impervious surfaces (hard surfaces that do not allow water to pass through) such as roofs, streets, sidewalks and parking areas. The increase in impervious surface areas has significantly increased the amount and rate of storm water runoff. These increased storm water flows can cause flooding and increase soil and stream channel erosion. Additionally, runoff from urban areas also carries other pollutants such as pesticides, bacteria, oils, metals, and trash that can impact aquatic habitats and make waters unsafe for recreational use and wildlife.



Low-Impact Development Goals: Reduced Storm Water Flows, Improved Water quality and Ecosystem Health

The use of Low Impact Development (LID) strategies can help to protect and enhance the environmental quality of our rivers, creeks and watersheds. LID is a site design approach that uses techniques to slow and infiltrate storm water, mimicking the natural, pre-development hydrology. LID design strategies can be applied to most new or redevelopment projects to meet storm water regulations reduce downstream flooding and protect natural resources.

How does LID Work?

In low-impact development, the management of rain water is considered and incorporated in the initial design of a project. Hydrology, existing site topography, and natural features that influence water movement on the site are considered in the layout of structures on the property so as to slow, store, and infiltrate rain water onsite.

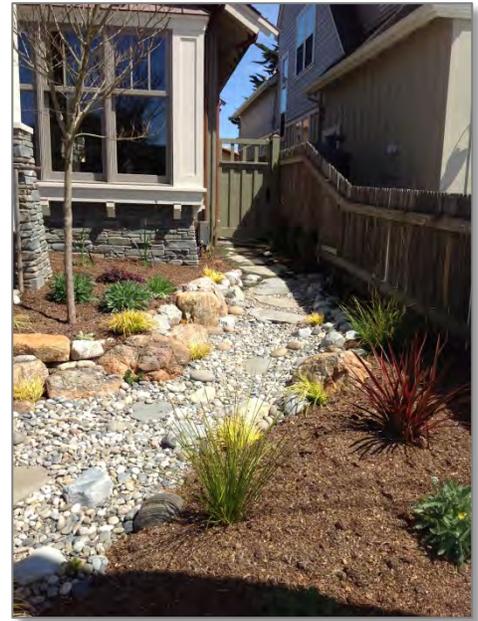
LID strategies focus on intercepting, evaporating, and infiltrating stormwater onsite through areas of native vegetation and soils, and through practices such as directing runoff to landscaped areas, bioswales and raingardens, using rain barrels, or installing pervious pavement or green roofs.

Benefits of LID for the Home-owner

- Reduced irrigation water use
- Low maintenance and attractive landscaping that uses native plants able to survive in wet and dry soils
- Increased aesthetics of neighborhoods

Benefits of LID for the Community

- Reduced pollution in storm water runoff to our rivers and the Monterey Bay
- Reduced amount of trash washed into drainage systems and into our rivers and the Bay
- Reduced flooding and erosion in creeks



CHAPTER 2.

Mandatory BMP Requirements

State and federal storm water regulations require new development and remodeling projects in the City to incorporate design standards and Best Management Practices (BMPs) in order to ensure that pollutant discharges are reduced to the Maximum Extent Practicable and storm water discharges are prevented from causing or contributing to a violation of receiving water quality standards. The City developed these mandatory BMPs for single-family home projects on small lots based on the Post-Construction Storm Water Management Requirements for Development Projects in the Central Coast Region adopted by the Regional Water Quality Control Board in Resolution No. R3-2013-0032.

This document also provides guidance on how to meet the mandatory BMP requirements through site planning and Low-Impact Development (LID) design.

Please contact the Public Works Environmental Project Analyst at **420-5160** if you have questions on how to meet these requirements.

2.1. APPLICABILITY

These mandatory BMPs apply to all single-family home development and remodeling projects that create or replace less than 15,000 square feet of impervious area. Single-family home projects that create or replace over 15,000 square feet of impervious area and other development or redevelopment projects are covered under Chapter 6B, BMP Requirements for Private and Public Development Projects.

2.2. REQUIREMENT: SITE DESIGN AND RUNOFF REDUCTION

A. Site Planning

LID design principles must be incorporated in the site planning and design process from the beginning and should include the steps below:

- 1) Conserve natural areas and preserve riparian areas and wetlands. All development and remodeling projects adjacent to a river, creek or wetland shall comply with the requirements specified in the [City-wide Creeks and Wetlands Management Plan](#).
- 2) Concentrate improvements on the least-sensitive portions of the site, while leaving the remaining land in a natural undisturbed state.
- 3) Minimize storm water runoff. One or more of the following site design measures may be used to minimize storm water runoff where appropriate:
 - a) Direct roof runoff into cisterns or rain barrels for reuse.
 - b) Use pervious pavements such as crushed aggregate, turf block, unit pavers, pervious concrete or pervious asphalt in place of impervious concrete or asphalt paving. Pervious pavements may be used to construct driveways, uncovered parking areas, walkways, and patios.

B. Disperse and Infiltrate Runoff

Disperse runoff to adjacent pervious areas to the extent slopes, soils, and available area allow.

Generally the impervious: pervious ratio should not exceed 2:1.

- 1) Use drainage as a design element. Vegetated buffers and rain gardens can serve as both effective LID measures and attractive site amenities or focal points. Direct roof downspouts to landscaped areas or rain gardens in lieu of hard piping to the street or storm drain system. Downspouts should be directed onto vegetated areas safely away from building foundations and footings, consistent with California building code.
- 2) Grade paved areas to sheet flow to adjacent landscaped areas or rain gardens where appropriate.

C. Drainage and Landscape Planning

- 1) Maintain existing topography to encourage dispersed flow.
- 2) Convey runoff safely from the tops of slopes and stabilize disturbed slopes.
- 3) Plant slopes with native or drought tolerant vegetation, as appropriate.
- 4) Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, or conduits that enter unlined channels to minimize erosion

D. Low-Impact Development Checklist

Sites creating or replacing over 2,500 SF of impervious surface are required to fill out and submit the Site Design Checklist in **Appendix A** with Building Permit applications.

2.3. LID DESIGN GUIDE

The "[Slow it. Spread it. Sink it! A Homeowner's Guide to Greening Stormwater Runoff](#)" booklet published by the Resource Conservation District of Santa Cruz County has been designed to provide information on practical and eco-friendly ways to

protect homeowners' property and the environment from the effects of storm water runoff.

Specific design guidance for pervious pavement and rain gardens is also provided on the following pages.



PERVIOUS PAVEMENTS

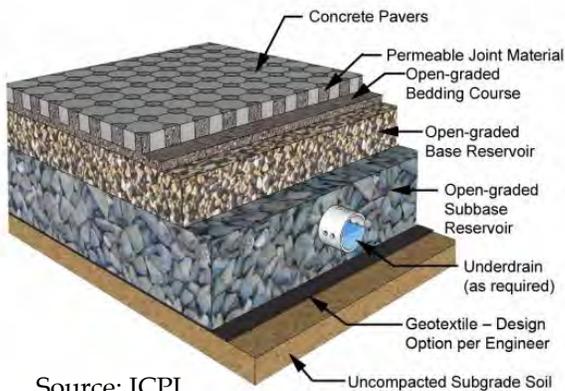
Purpose and Applications:

Impervious roadways, driveways, and parking lots account for much of the hydrologic impact of land development. In contrast, pervious pavements allow rainfall to collect in a gravel or sand base course and infiltrate into native soil. Pervious pavements include pervious asphalt/concrete, porous pavers, open pavers, or crushed aggregate.

Permeable pavements are best used on grades from flat to approximately 2%. Permeable pavements can be used in clay soils; however, special design considerations, including an increased depth of base course, typically apply and will increase the cost of this option.

Design Checklist for pervious pavements:

- No erodible areas drain on to pavement.
- Subgrade is uniform. Compaction is minimal.



Source: ICPI

- Reservoir base course is of open-graded crushed stone. Base depth is adequate to retain rainfall and support design loads.
- If a subdrain is provided, outlet elevation is a minimum of 3 inches above bottom of base course.
- Use on grades from flat to 2% to the extent possible.
- Rigid edge is provided to retain granular pavements and unit pavers.
- Joints between solid unit pavers are filled with an open-graded aggregate free of fines.
- Permeable pavements are installed by industry-certified professionals according to vendor's recommendations.

STORM WATER BENEFITS:

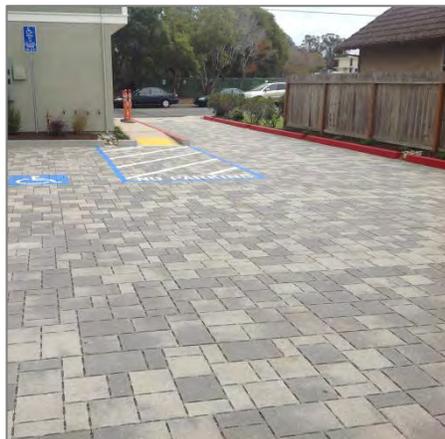
- ✓ Runoff Reduction
- ✓ Runoff Retention

ADVANTAGES:

- Can be used in areas with limited landscaping

LIMITATIONS:

- Potential geotechnical concerns in clay soils
- Pavement strength and surface integrity considerations



RAIN GARDENS

Purpose and Applications:

Rain gardens detain runoff in a surface reservoir, filter it through 6 to 12 inches of amended soil and plant roots, and then infiltrate it into the ground.

Rain gardens can be placed in a variety of landscape configurations, including front yard and side yard setbacks. On slopes, rain gardens require check dams or stair-stepping.

Design Checklist for Rain Gardens:

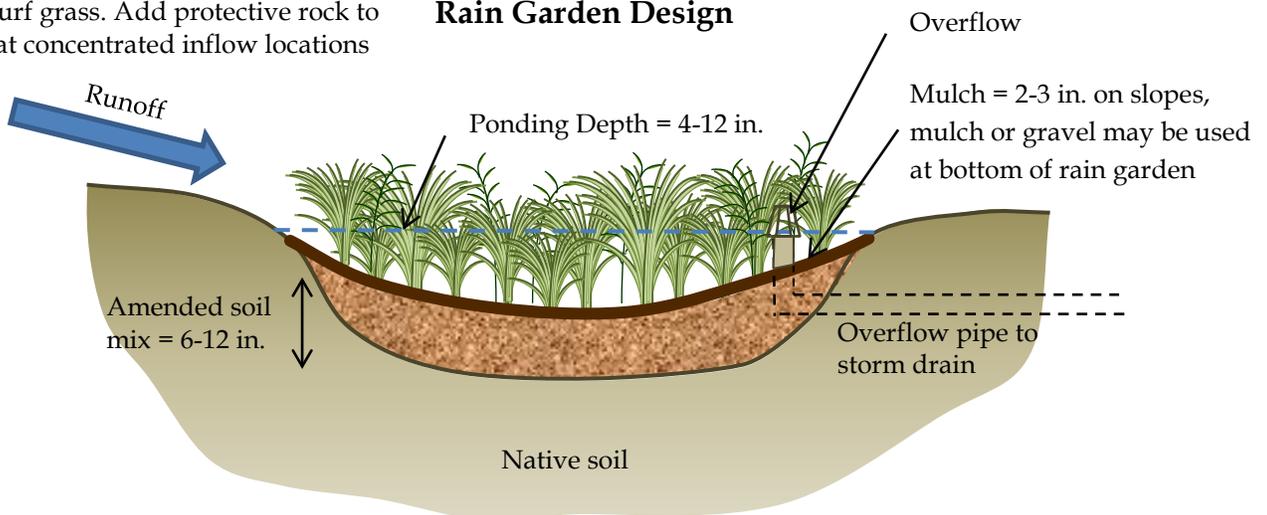
- Amended soil mix depth: minimum 6 inches, preferred 12 inches. For additional storm water storage, a subsurface gravel layer may be placed beneath the soil mix.
- Design facility to prevent erosion, scour and channeling within the rain garden
- Ponding depth – Minimum 6 inches, maximum 12 inches
- Longitudinal slope – Maximum 6% longitudinal slope of bottom. Use stair-stepping planters on a slope to provide flat bottomed cells separated by check dam/weir overflows.



- See Appendix B for recommended plants for rain gardens.
- Side slope - 4:1 preferred. Maximum 3:1 allowed.
- No compaction of soils beneath the rain garden (ripping/loosening of soils required if compacted)
- No liners or other barriers interfering with infiltration.
- Sizing guidance: minimum 4% of tributary impervious area.
- Provide overflow to the curb or approved discharge point.

Rain water runoff from an impervious surface (e.g. roof or driveway) can be routed to the rain garden via a vegetated or rock swale, through a pipe, or across turf grass. Add protective rock to dissipate flows at concentrated inflow locations as needed

Rain Garden Design



STORM WATER BENEFITS:

- ✓ Water Quality Treatment
- ✓ Runoff Retention

ADVANTAGES:

- Various shapes and sizes possible
- Can be incorporated in landscape design