

Background / Regulatory Requirements

In this Chapter:

- ▶ *How stormwater problems result from development*
- ▶ *Post-construction requirements for development projects*

2.1 Stormwater Problems in Developed Areas

Throughout the country, stormwater runoff is a leading source of pollutants for water bodies that fail to meet water quality standards¹. In the San Francisco Bay watershed, urban and agricultural runoff is generally considered to be the **largest source of pollutants** to aquatic systems.² Although stormwater runoff is part of the natural hydrologic cycle, human activities can alter the natural drainage patterns, introduce pollutants and increase erosion, degrading the natural habitats.

2.1.1 Stormwater Runoff in a Natural Setting

The natural water cycle circulates the earth's water from sky, to land, to sea, to sky in a never-ending cycle. In a pristine setting, soil is covered with a complex matrix of mulch, roots and pores that absorb rainwater. As **rainwater infiltrates slowly into the soil**, natural biologic processes remove impurities. Because most rainstorms are not large

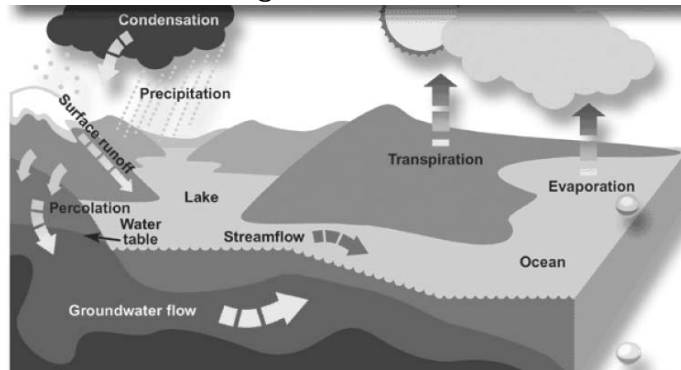


Figure 2-1: The Water Cycle (NGRDC/GDNR, 2005/06)

enough to fully saturate the soil, only a small percentage of annual rainwater flows over the surface as runoff. Natural vegetation tends to slow the runoff in a meandering fashion,

¹ USEPA, Stormwater Frequently Asked Questions, http://cfpub.epa.gov/npdes/faqs.cfm?program_id=6

² San Francisco Bay Regional Water Quality Control Board, Basin Plan, 2004, www.waterboards.ca.gov/sanfranciscobay/basinplan.htm

allowing suspended particles and sediments to settle. In the natural condition, the hydrologic cycle creates a stable supply of groundwater, and surface waters are naturally cleansed of impurities. Sediment is carried with the flow of stormwater runoff, but creeks typically find an equilibrium in which sediment is carried without impairing beneficial uses.

2.1.2 Stormwater Runoff in Urban or Urbanizing Areas

In developed areas, impervious surfaces – such as roads, parking lots and rooftops – prevent water from infiltrating into the soil. **Most of the rainfall runoff flows across the surface**, where it washes debris, dirt, vehicle fluids, chemicals, and other pollutants into the local storm drain systems. Once in the storm drain, polluted runoff flows directly into creeks and other natural bodies of water. Figure 2-2 contrasts the percentage of rainfall that becomes stormwater runoff in a natural and an urban setting.

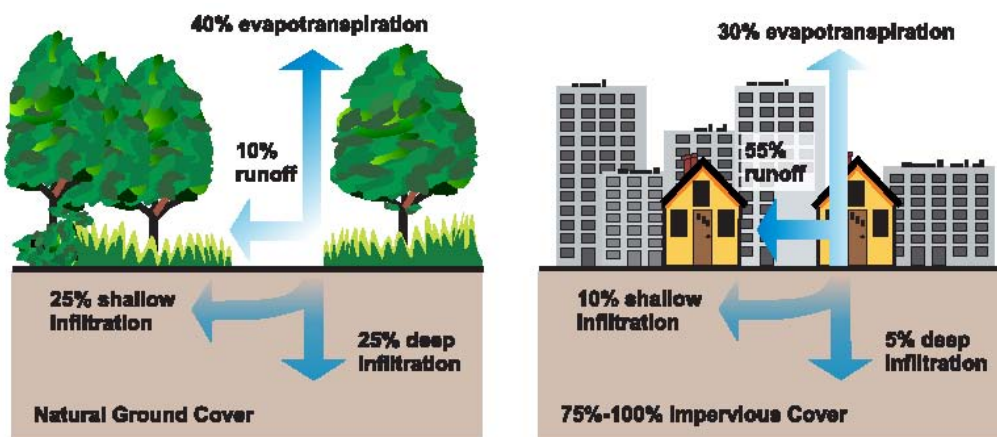


Figure 2-2: Change in volume of stormwater runoff after development. (USEPA, 2003)

Not only does urban stormwater runoff **wash pollutants into local waterways**, but it can also cause natural creek channels to erode. When impervious surfaces are built, rainwater runs off at **faster rates and in larger volumes** than in the natural condition. Natural creek channels must suddenly handle much greater volumes of water traveling at much faster rates, greatly increasing the duration of erosive forces on their bed and banks. In response to these changes, creek channels enlarge by downcutting and widening. This effect is called hydrograph modification or hydromodification. Figures 2-3 and 2-4 contrast creek channels in the natural condition and creek channels subject to hydromodification.

2.2 Low Impact Development Stormwater Controls

Key Point



Various permanent control measures have been developed in order to **reduce the long-term impacts** of development on stormwater quality and creek channels. These permanent control measures are often called post-construction stormwater controls/low impact development (LID) or post construction best management practices (BMPs) to distinguish them from the temporary construction BMPs that are used to control sedimentation and erosion while a project is being constructed. LID reduces water quality impacts by preserving and re-creating natural landscape features, minimizing imperviousness, and then infiltrating, storing, detaining, evapotranspiring (evaporating

stormwater into the air directly or through plant transpiration), and/or biotreating stormwater runoff close to its source, or onsite.



Figure 2-3: Creek with Natural Banks



Figure 2-4: Creek Subject to Hydromodification

Post-construction stormwater control measures can be divided into four categories: site design measures, source control measures, stormwater treatment measures, and hydromodification management measures. Each of these categories is described below.

2.2.1 Site Design Measures

Site design measures are **site planning techniques** for pollution prevention and reduction in flow rates and durations, by protecting existing natural resources and reducing impervious surfaces of development projects. Some examples of site design measures include:

- Minimize land disturbance and preserve high-quality open space;
- Minimize impervious surfaces by using narrow streets, driveways and sidewalks;
- Minimize impervious surfaces that are directly connected to the storm drain system (unless the connection includes a stormwater treatment measure). One example of “disconnecting” impervious surfaces is to direct roof downspouts to splash blocks or “bubble-ups” in landscaped areas;
- Cluster structures and paved surfaces; and
- Use landscaping as a drainage feature.

2.2.2 Source Control Measures

Source control measures consist of either structural project features or operational “good housekeeping” practices that **prevent pollutant discharge and runoff** at the source, such as by keeping pollutants from coming into contact with stormwater. Examples of structural source controls include:

- Roofed trash enclosures,
- Berms that control run-on to or runoff from a potential pollutant source, and
- Indoor mat/equipment washracks that are connected to the sanitary sewer. (Note that any sanitary sewer connections must be approved by the local permitting authority.)

Examples of operational source controls include:

- Street sweeping and
- Regular inspection and cleaning of storm drain inlets.

2.2.3 Stormwater Treatment

Effective **December 1, 2011**, the Municipal Regional Stormwater Permit (MRP) requires stormwater treatment requirements to be met by using evapotranspiration, infiltration, rainwater harvesting and reuse. Where this is infeasible, landscape-based biotreatment is allowed. In some Special Projects, media filters and high flow rate tree well filters are allowed. See Section 2.3.1 for more information on stormwater treatment requirements and Appendix J for information on Special Projects.

Stormwater treatment measures must be sized to comply with one of the hydraulic design criteria listed in the municipal regional stormwater permit's Provision C.3.d, which are described in Section 5.1 of this guidance document. Chapter 6 provides technical guidance specific to the following, commonly used treatment measures:

- Bioretention areas,
- Flow-through planter boxes,
- Tree well filters (effective December 1, 2011, high flow rate tree well filters are allowed only in Special Projects - see Appendix J),
- Vegetated buffer strips,
- Infiltration trenches,
- Extended detention basins,
- Green roofs,
- Pervious Paving, turf block and permeable joint paving,
- Rainwater harvesting and use, and
- Media filters (effective December 1, 2011, media filters are allowed only in Special Projects - see Appendix J).

2.2.4 Hydromodification Management Measures

Hydromodification management (HM) measures include site design and source control measures that promote infiltration or otherwise **minimize the change in the rate and flow of runoff**, when compared to the pre-development condition. HM measures also include constructed facilities (such as basins, ponds, or vaults) that manage the flow rates of stormwater leaving a site, and under some conditions can also include re-engineering of at-risk channels downstream from the site. In some cases a single stormwater treatment measure may be used to meet both the treatment and HM objectives for a project. A dual-use measure of this type is sometimes called an "integrated management practice," or IMP.

2.3 Municipal Stormwater Permit Requirements

The development or redevelopment of property represents an opportunity to incorporate post-construction controls that can reduce water quality impacts over the life of the project. The Municipal Regional Stormwater Permit (MRP), adopted by the Water Board in October 2009, includes more prescriptive requirements for incorporating post-construction stormwater control/LID measures into new development and redevelopment projects than

the previous countywide stormwater permit. These requirements are known as Provision C.3 requirements. Download Provision C.3 and the full MRP at www.flowstobay.org (click on “Municipalities,” then “NPDES Permit R-2-2009-0074 Oct142009”).

Provision C.3.c establishes thresholds for which new development and redevelopment projects must comply with Provision C.3, although it also states that “all projects regardless of size should consider incorporating appropriate source control and site design measures that minimize stormwater pollutant discharges to the maximum extent practicable [MEP]...”. Regardless of a project’s need to comply with Provision C.3, municipalities apply the MEP standard, including standard **stormwater conditions of approval** for projects that receive development permits. These conditions of approval require appropriate site design, source control measures, and, in some cases, treatment measures.

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PROVISION C.3 THRESHOLDS



Thresholds for determining whether Provision C.3 applies to a project (in which case the project is a “C.3 Regulated Project”) are based on the amount of impervious surface that is created and/or replaced by a project, as described below.

- Since 2006, private or public projects that create and/or replace **10,000 or more or impervious surface** have been C.3 Regulated Projects.
- Effective **December 1, 2011**, the threshold for requiring stormwater treatment is reduced from 10,000 to 5,000 square feet of impervious surface for the following project categories: uncovered parking areas (stand-alone or part of another use), restaurants, auto service facilities¹ and retail gasoline outlets.

“DEEMED COMPLETE” EXCLUSIONS

- Development applications that were “deemed complete” for review by the planning department on or after December 1, 2009, but receive final discretionary approval before **December 1, 2011**, are not affected by the new, additional requirements.
- Development applications that were “deemed complete” for review by the planning department on or after December 1, 2009, but receive final discretionary approval before **December 1, 2011** are not affected by the additional, new requirements.

CALCULATING IMPERVIOUS SURFACE

An “impervious surface” is any material that prevents or substantially **reduces infiltration of water into the soil**. This includes building roofs, driveways, patios, parking lots,

¹ Auto service facilities include the specific Standard Industrial Classification Codes, as follows:
 5013: Wholesale distribution of motor vehicle supplies, accessories, tools, equipment, and parts.
 5014: Wholesale distribution of tires and tubes for passenger and commercial vehicles.
 7532: Repair of automotive tops, bodies, and interiors, or automotive painting and refinishing.
 7533: Installation, repair, or sale and installation of automotive exhaust systems.
 7534: Repairing and retreading automotive tires.
 7536: Installation, repair, or sales and installation of automotive glass.
 7537: Installation, repair, or sales and installation of automotive transmissions.

impervious decking, streets, sidewalks, and any other continuous watertight pavement or covering. Impervious surface is calculated in terms of square feet or acres. When calculating the area of building roofs, be sure to include not only the footprint of the main building or structure, but also any garages, carports, sheds, or other miscellaneous structures.

Pervious paving is not considered an impervious surface, as long as it is underlain with a pervious storage material that holds at least the Provision C.3.d amount of rainfall runoff.

Pervious paving is not considered an impervious surface, as long as it is underlain with a pervious storage material (such as gravel) that holds at least the Provision C.3.d volume of rainfall runoff. Open, uncovered retention/detention facilities are not considered impervious surfaces for purposes of determining whether a project is a Regulated Project, but they are considered impervious surfaces for purposes of runoff modeling and meeting the Hydromodification standard. The municipalities use an "Impervious Surface Form" to help applicants with these calculations. **Contact your local jurisdiction** for its impervious surface form.



EXCLUSIONS FROM PROVISION C.3

Provision C.3.c of the MRP excludes specific types of projects from the C.3 requirements (see Table 2-1), even if they meet the threshold limits explained above.

Table 2-1: Projects Excluded from Provision C.3 Requirements	
Project Category	Excluded Projects
Commercial, industrial, residential or other development	Detached single-family home projects that are not part of a larger plan of development.
Road Projects	Widening of roadways that does NOT add one or more new lanes of travel; impervious trails with a width of 10 feet or less and located more than 50 ft from top of creek banks; sidewalks, bicycle lanes and trails that are NOT built as part of new roadways or are constructed with permeable surfaces; bicycle lanes hydraulically separated from the roadway and sidewalks and impermeable trails that drain runoff to adjacent vegetated areas.
Redevelopment projects (including pavement resurfacing)	Interior remodels and routine maintenance or repair, such as roof or exterior wall surface replacement; or pavement resurfacing within the existing footprint.
Source: San Francisco Bay Regional Water Quality Control Board, October 2009	

2.3.1 What is Required by Provision C.3?



Projects that are subject to Provision C.3 (C.3 Regulated Projects) must implement:

- Site design measures,
- Source control measures, and
- Low impact development (LID) treatment measures.

What Are C.3 Regulated Projects? Except for the excluded projects listed in Table 2-1, projects that create and/or replace 10,000 square feet or more of impervious surface are C.3 Regulated Projects. Effective **December 1, 2011**, projects that consist of restaurants,

auto service facilities, retail gasoline outlets, and surface parking areas (stand-alone or part of another use) that create and/or replace 5,000 square feet or more of impervious surface are also C.3 Regulated Projects.

What Are LID Treatment Measures? The MRP identifies two tiers of LID treatment. The preferred tier of LID treatment consists of approaches that retain stormwater on the site, instead of releasing treated water to the storm drain. The top tier of LID treatment consists of evapotranspiration, infiltration, and/or rainwater harvesting and use. C.3 Regulated Projects must evapotranspire, infiltrate or harvest and use amount of stormwater runoff specified in MRP Provision C.3.d, unless this is infeasible as defined by criteria and procedures in Appendix I. When the three preferred types of LID treatment are infeasible, biotreatment is allowed (see below). In some limited cases, LID treatment reduction is allowed for certain smart growth, high density or transit-oriented development Special Projects, described below. Treatment measures must be hydraulically sized as specified in MRP Provision C.3.d.

Biotreatment – Second Tier LID. Biotreatment is the second tier of LID treatment. Biotreatment measures are designed to filter stormwater through soil and then release some or all of the treated water to the storm drain system. In locations where infiltration should be avoided (steep slopes, high groundwater table, etc.) the biotreatment measure should be lined with an impermeable liner, or placed in a concrete planter box. In all other locations, infiltration should be maximized as illustrated in Figure 2.5. Soils in biotreatment measures must have a long-term infiltration rate of 5 to 10 inches per hour, in accordance with the soil specifications approved by the Regional Water Board in Appendix K. Biotreatment systems must also have a surface area no smaller than what is required to accommodate a 5 inches per hour stormwater runoff surface loading rate. Biotreatment systems include an underdrain in a rock layer below the engineered soil.

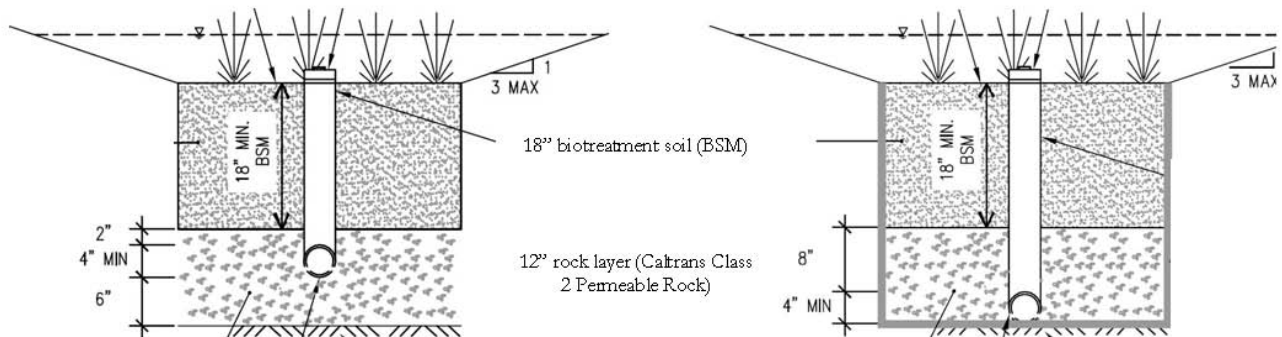


Figure 2.5: Bioretention Areas Designed to Maximize or Prevent Infiltration.

- The bioretention area on the left is designed to maximize infiltration. There is no liner at the bottom of the 12" rock layer, and the underdrain is positioned 6" above the bottom of the rock layer.
- The bioretention area on the right is designed to prevent infiltration. An impermeable liner is placed at the base and sides, and the underdrain is at the bottom of the rock layer.

When Do Bioretention Areas Provide Preferred-Tier Treatment? Bioretention areas function as preferred-tier treatment measures in locations where the soil hydraulic conductivity rate is 1.6 inches per hour or higher, because in these soil conditions, the amount of runoff specified in Provision C.3.d is fully treated by evapotranspiration and

infiltration. In other locations, bioretention areas function as biotreatment measures, since only some of the C.3.d amount of runoff is treated with evapotranspiration and infiltration.

Special Projects. LID treatment requirements are reduced for certain smart growth, high density, or transit-oriented development Special Projects. If a project meets the Special Projects criteria provided in Appendix J, specific non-LID treatment measures may be used to treat a percentage of the total C.3.d amount of stormwater runoff that requires treatment. Two types of non-LID treatment measures are allowed in Special Projects: high flow rate tree well filters and high flow rate media filters. See Appendix J for criteria and procedures for identifying Special Projects and calculating the LID treatment reduction.

“DEEMED COMPLETE” EXCLUSIONS

- Development applications “deemed complete” for review by the planning department before December 1, 2009, and “diligently pursued²” by the project applicant are not affected by the requirements that are effective December 1, 2011.
- Development applications that were “deemed complete” for review by the planning department on or after December 1, 2009, but receive final discretionary approval before **December 1, 2011** are not affected by the additional, new requirements.

HYDROMODIFICATION MANAGEMENT REQUIREMENTS

Projects that create and/or replace **one acre or more** of impervious surface must incorporate hydromodification management measures, if the project is located in an area susceptible to hydromodification (shown in a map in Appendix H), and if the amount of impervious surface area is increased above pre-project conditions.

REDEVELOPMENT PROJECTS

If your project is located on a previously developed site and will result in the **replacement of impervious surface**, then it is considered a redevelopment project and the following special provisions apply to it:

- **“50 Percent Rule:”** Redevelopment projects that replace 50 percent or less of existing impervious surface need to treat stormwater runoff only from the portion of the site that is redeveloped. Redevelopment projects that replace more than 50 percent of the existing impervious surface are required to treat runoff from the entire site.
- A project that does not increase impervious surface over the pre-project condition is not an HM project.

ALTERNATIVE COMPLIANCE

The municipal stormwater permit allows projects to use “alternative compliance,” to meet stormwater treatment requirements offsite. See Chapter 9 for more information.

How Do Projects Meet the C.3 Requirements?

The project’s development permit application submittals must include detailed information showing how the Provision C.3 stormwater requirements will be met.

See Chapter 3 for **step-by-step instructions** on incorporating C.3 stormwater submittals into your permit applications.

² Diligent pursuance may be demonstrated by the project applicant’s submittal of supplemental information to the original application, plans, or other documents required for any necessary approvals of the project.

Chapter 3 provides ***step-by-step instructions*** for incorporating C.3 stormwater submittals into your permit applications.

2.3.2 Upcoming C.3 Requirements

Upcoming stormwater requirements for development projects are described below. The schedule of implementation is shown in Figure 2-6. Beginning ***December 1, 2012***, all projects which create and/or replace 2,500 sq. ft. or 10,000 sq. ft., including detached single-family residences that are not part of a larger plan of development, must implement one or more of the following:

- Direct roof runoff into cisterns or rain barrels for reuse.
- Direct roof runoff onto vegetated areas.
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
- Construct sidewalks, walkways, and/or patios with permeable surfaces.
- Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.

The Countywide Program is participating in regional collaboration to prepare standard specifications for stormwater controls for projects that create and/or replace 2,500 to 10,000 square feet of impervious surface, and individual single family homes that create and/or replace 2,500 square feet or more of impervious surface.

2.4 Regulatory Authority

The Countywide Program's municipalities derive their authority to regulate stormwater quality and hydrograph modification impacts from their stormwater ordinances. Each municipal stormwater ordinance may have unique elements, but they provide the municipalities the authority to implement the municipal regional stormwater permit, including the requirements of Provision C.3 as described above. ***Violations of a municipal stormwater ordinance*** may be subject to civil actions such as:

- Temporary and/or permanent injunction;
- Assessing costs of any investigation or inspection to establish the violation and bring legal action;
- Costs incurred in removing, correcting, or terminating adverse effects of the violation;
- Compensatory damages for loss or destruction to water quality, wildlife, fish and aquatic life;
- Order to cease and desist a violation;
- Notice to remove waste or other material that may result in an increase in pollutants entering the stormwater drainage system; and
- Arrest or citation of persons violating the stormwater ordinance.



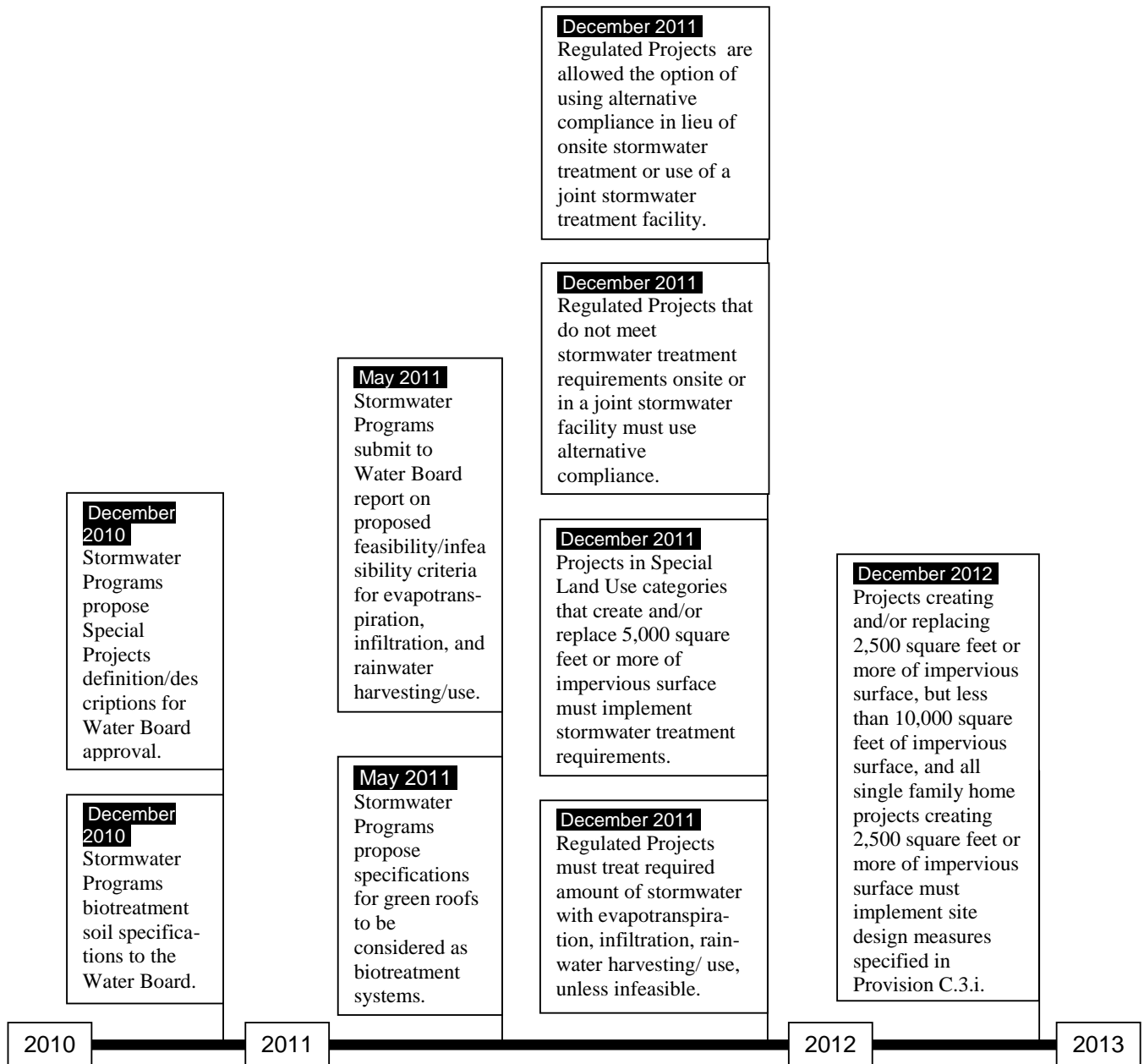


Figure 2-6: Timeline for Implementing New Provision C.3 Requirements