



**City of Carmel-by-the-Sea
Building Safety Division
Standard Operating Guidance**

17-07 Private Stormwater Drainage Systems

Background

The City of Carmel-by-the-Sea is situated uphill from Carmel Bay, a designated Area of Special Biological Significance which increases the need to manage stormwater discharges. The City, through its Environmental Compliance program, regulates stormwater discharges through the Carmel Municipal Code (CMC) in addition to regional, State and federal regulations.

CMC Chapter 15.08.230 states "Every person must take reasonable care in using her/his property to avoid injury or damage to adjacent property through the flow of surface water runoff or runoff from roof drainage systems. Roof water drainage shall drain into an approved drain system or drain to the public way via a noncorrosive device as approved by the Director of Public Works and/or the Building Official. Cross lot drainage should be avoided whenever possible as determined by the Building Official."

CMC Chapter 15.18.010 states "All site and roof runoff shall be directed onto private property of its origin and filtered through seepage pits, French drains, and/or leach fields where possible and may not cross lot lines to adjoining properties. Any runoff waters from the site that may be directed onto the public right-of-way or City storm drain system must be done with prior approval of the Building Official and/or Public Works Superintendent."

CMC Chapter 17.43.010 states "The purpose of this chapter is to protect and enhance coastal waters within the City of Carmel in accordance with the policies of the City's Local Coastal Plan (Sections O5-45 and O5-46), Sections 30230, 30231, 30232 and 30240 of the California Coastal Act, and the City's Phase II NPDES permit requirements. To implement the certified land use plan, application submittal requirements, development standards, and other measures are provided to ensure that permitted development shall be sited and designed to conserve natural drainage features and vegetation, minimize the introduction of pollutants into coastal waters to the maximum extent practicable, limit the discharge of stormwater runoff, and protect the overall quality of coastal waters and resources. All new development and redevelopment within the City shall comply with the requirements in this Chapter and in the City's Low Impact Development Guidance Manual (LID Guidance Manual) in Appendix I to this chapter. (See Chapter [17.42](#) CMC and CMC [17.42.020](#)(D)(1)(b).)"

In consideration of these requirements, and in an effort to define the permitting requirements for stormwater management systems on private property, the following guidance has been developed.

Citations

Carmel Municipal Code Chapter 15.08, Building Code

Carmel Municipal Code Chapter 15.18, Site Drainage

Carmel Municipal Code Chapter 17.43, Water Quality Protection Ordinance

Guidance

Permits are required for certain drainage systems installed on private property in accordance with the following:

Exempt Drainage Improvement Projects – No permit required if project meets ALL requirements below. – See drawings beginning Page 3 and Rain Garden resource that follows.

Site Requirements:

- The maximum impervious area handled by the system is 500 SF or less
- The site slopes less than 7%
- Site soils are well-drained; Hydrologic Soil Group A or B as determined by the USDA Web Soil Survey or by site-specific infiltration data (See soil type map on P. 10)

Drainage Requirements:

- Drainage from downspouts and paved areas is directed to landscaped areas.
- Downspouts drain via splash blocks or pop-up emitters
- Runoff is dispersed throughout the site rather than concentrated in one location
- The landscaped area size is at least 50% of the size of the contributing impervious surface
- Runoff is directed away from building foundations
- Swales and dry creeks are used to convey runoff to rain garden(s) for infiltration
- Rain gardens are designed in accordance with the Bay Area Stormwater Management Agencies Association (BASMAA) publication *Rain Gardens, Stormwater Control for Small Projects*.
- Swales and rain gardens shall be located a minimum of 6 feet away from neighboring property lines and a minimum of 3 feet away from the public right-of-way.
- No runoff may enter onto the street right-of-way.

Drainage Improvement Projects Requiring a Building Permit – See drawings beginning Page 3

Prescriptive Projects - Do not require engineered design if the project meets ALL requirements below.

Site Requirements:

- The maximum impervious area managed by the proposed system is 1,200 square feet or less
- The site slopes less than 7%
- Site soils are well-drained; Hydrologic Soil Group A, or B as determined by the USDA web soil survey or by site-specific infiltration data (See soil type map on P. 10)
- The on-site groundwater level is greater than 5' below the finished grade

Drainage Requirements:

- Drainage from downspouts and paved areas is directed to landscaped areas, or collected in French drains or subgrade perforated pipe collectors, and conveyed to infiltration Best Management Practices (BMP) such as rain gardens or infiltration trenches.
- The landscaped area used for infiltration is at least 50% of the size of the contributing impervious surface

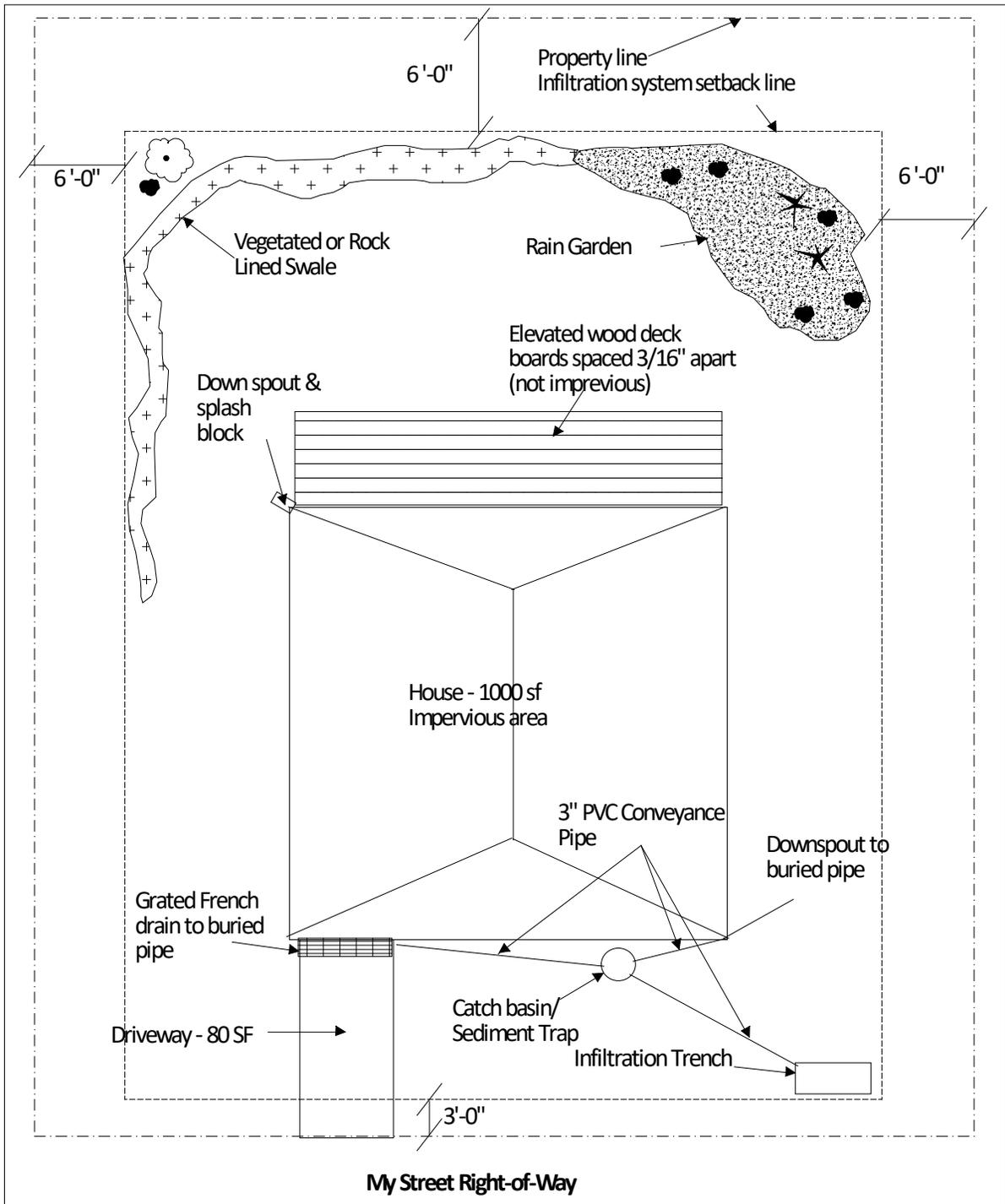
- Runoff is directed away from building foundations
- Runoff is dispersed throughout the site, or directed to two or more infiltration BMP's
- When not dispersed throughout the site, swales, dry creeks or piping systems with a minimum pipe diameter of 3" shall be used to convey runoff to an approved infiltration BMP
- Rain gardens are designed in accordance with the Bay Area Stormwater Management Agencies Association (BASMAA) publication *Rain Gardens, Stormwater Control for Small Projects*
- Infiltration trenches must have a sediment capture facility (sediment trap, vegetated swale) ahead of the trench
- Infiltration trenches shall be a minimum of 24 inches wide, 4' long and 3 to 5 feet deep and shall be designed in accordance with Attachment 2, Typical Infiltration Trench Design
- Trench aggregate shall have a minimum void volume of 30%
- The longitudinal slope of the trench shall not exceed 3%
- Drainage and infiltration features shall be located at least 6 feet away from neighboring properties and the top of steep slopes; and 3 feet away from any public street right-of-way.
- Overflow must be directed away from neighboring properties. Overflow to the street requires an Encroachment Permit approved by the Public Works Director

Complex projects (Engineered Design Required)

Drainage systems related to projects that involve the construction or alteration of building(s) and requiring a building permit; or other construction of site features that increase the impervious area on the site to exceed the limits specified above, shall be of engineered design.

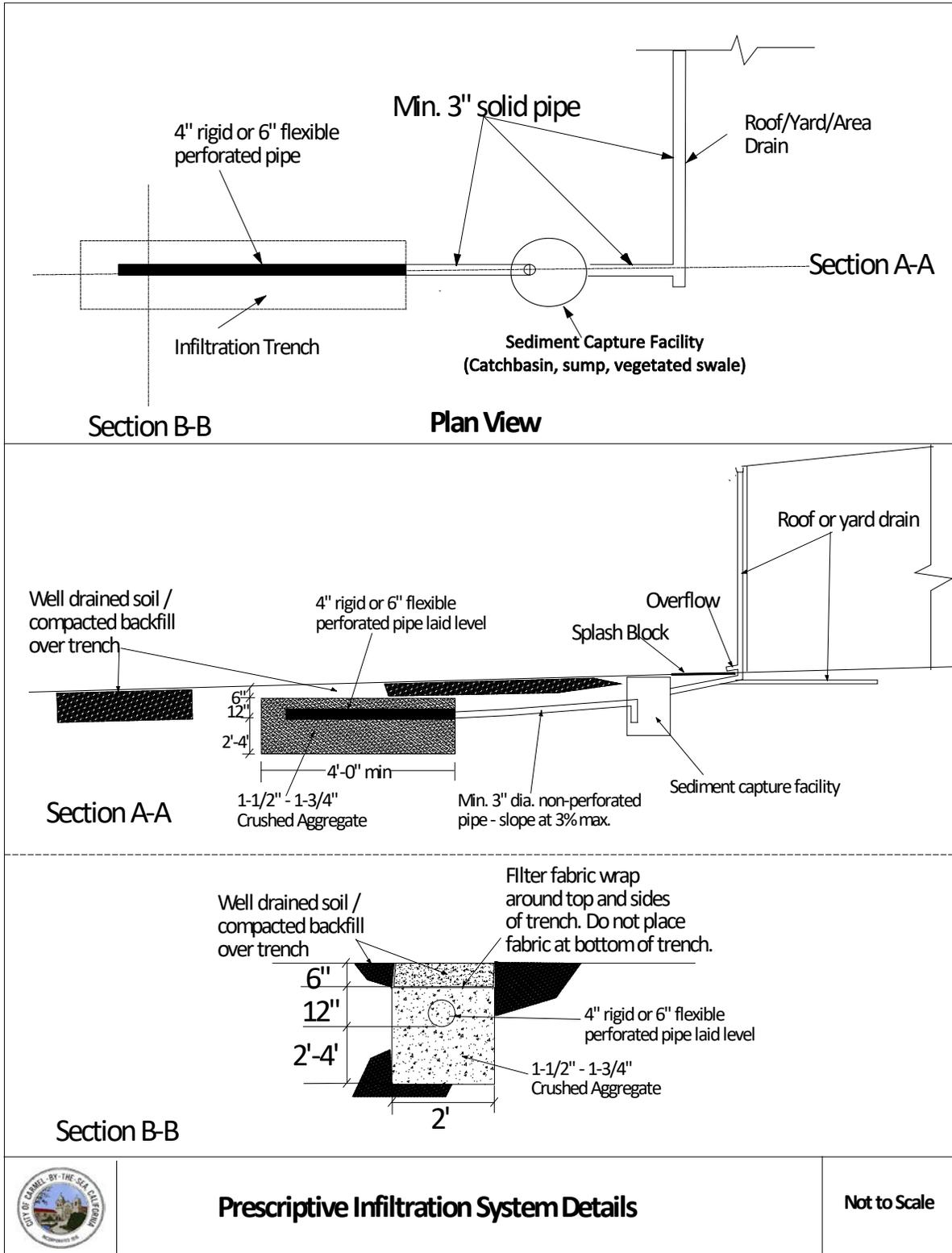
Projects that fail to meet ANY of the criteria described above for non-engineered systems shall be designed by a civil engineer licensed in the State of California.

Maintaining drainage on private property is strongly encouraged. New flows into the public right-of-way (where the existing condition does not flow into the public right-of-way) may be approved by the Public Works Director only when it can be sufficiently demonstrated that maintaining drainage on private property creates a significant hardship to the property owner. In order to determine whether a 10-year storm can be properly conveyed through the City's storm drain system, the Public Works Director may require a drainage report identifying anticipated runoff volumes from the property.



	<h2 style="margin: 0;">Sample Infiltration System Site Plan</h2>	 Not to Scale
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This Sample Infiltration System Site Plan provides an example of a complete drainage system site plan. It illustrates a variety of systems and components. Not all components are used in every system. Your system and plans may vary however must provide equivalent detail for your project



These Prescriptive Infiltration System Details specifically apply to the prescriptive path systems addressed on Page 2 of this document. Prescriptive systems are required to contain these features. Engineered systems may differ.

RAIN GARDENS

Stormwater Control for Small Projects



Bay Area Stormwater
Management Agencies
Association



Large Residential Rain Garden

Rain gardens are landscaped areas designed to capture and treat rainwater that runs off roof and paved surfaces. Runoff is directed toward a depression in the ground, which is planted with flood and drought-resistant plants. As the water nourishes the plants, the garden stores, evaporates, and infiltrates rainwater into the soil. The soil absorbs runoff pollutants, which are broken down over time by microorganisms and plant roots.

Rain gardens are a relatively low-cost, effective, and aesthetically pleasing way to reduce the amount of stormwater that runs off your property and washes pollutants into storm drains, local streams, and the San Francisco Bay. While protecting water quality, rain gardens also provide attractive landscaping and habitat for birds, butterflies, and other animals, especially when planted with native plants.

Is a Rain Garden Feasible for My Project?

Rain gardens are appropriate where the following site characteristics are present:

- Rain gardens should be installed at least 10 feet from building foundations. The ground adjacent to the building should slope away at a 2% minimum slope. A downspout extension or "swale" (landscaped channel) can be used to convey rain from a roof directly into a rain garden. Rain gardens can also be located downstream from a rain barrel overflow path.
- Rain gardens should be at least 3 feet from public sidewalks (or have an appropriate impermeable barrier installed), 5 feet from property lines, and in an area where potential overflow will not run onto neighboring properties.
- The site should have well-drained soil and be relatively flat. Soil amendments can improve infiltration in areas with poor drainage. Add about 3 inches of compost to any soil type and till it in to a depth of about 12 inches.
- A front or backyard can work well for a rain garden, especially in areas where the slope naturally takes the stormwater.

How Large Does My Rain Garden Need to Be?

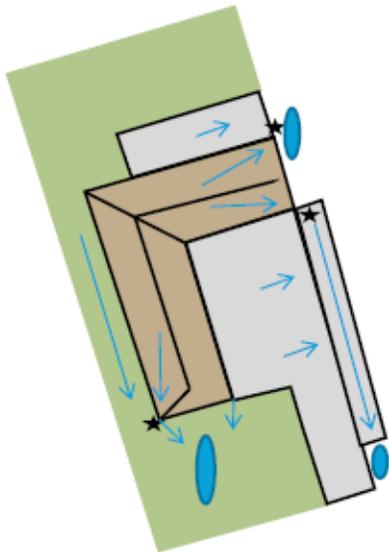
A general recommendation for a garden with a 6-inch ponding depth is to size the rain garden to approximately 4% of the contributing impervious area. Your soil type will affect how the rain garden should be sized because the water infiltration rate depends on the soil type; rain gardens should be larger in areas with slower infiltration. The following table can be used as general guidance.

Contributing Area (sq. ft.)	Rain Garden Area (sq. ft.)
500 – 700	24
701 – 900	32
901 – 1,100	40
1,101 – 1,300	48
1,301 – 1,500	56
1,501 – 2000*	70

*Projects adding roof or other impervious areas in excess of 2,000 sq. ft. should add 20 sq. ft. of rain garden surface area per every 500 sq. ft. of additional area.

How to Plan and Install a Rain Garden

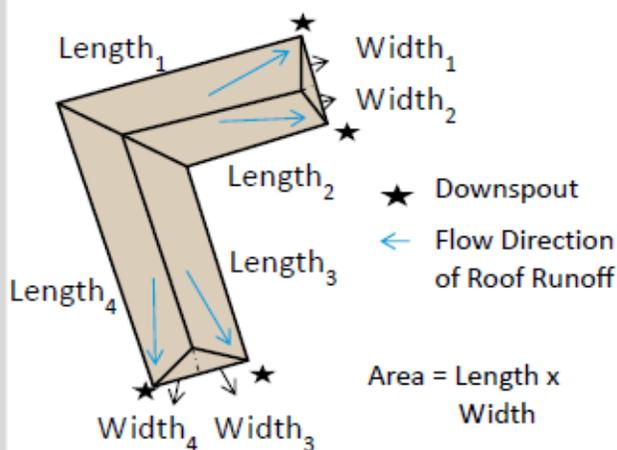
Select a Location and Plan for Overflow



- Vegetated Surface
- Paved Surface
- ★ Downspout
- ← Runoff Direction
- Potential Rain Garden Locations
- Roof Surface

- Before choosing the location of your rain garden, observe how rainwater is distributed across your home and yard. The ideal rain garden location is a flat or gently sloped area and is down slope from a runoff source.
- Site your garden at least 10 feet away from any structures (unless an impermeable barrier is used) and 5 feet from property lines.
- Avoid siting your garden over underground utilities and septic systems, near large trees, or next to a creek, stream or other water body.
- Your rain garden will overflow in large storms. Therefore, all garden designs should include an overflow system. One option is to build the perimeter of the garden so that it is perfectly level and to allow water to gently spill over the top during large storms. Another option is to build in a spillway that connects to another landscaped area, or the storm drain system.

Plan the Size of Your Rain Garden

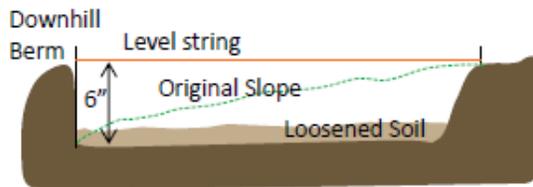


- Once you have determined where your garden will be sited, look at the surrounding area and identify which surfaces will contribute runoff to the garden. Is it all or just a part of the roof, patio, or driveway?
- Estimate the roof area by measuring the length and width of the building foundation and adding a few inches for the overhang. Multiply the length times the width to determine the contributing area. Once you have calculated the area of each contributing surface, add them up to obtain the total contributing area.
- Refer to the chart on page 1 to identify the size of the rain garden you will need to manage runoff from the contributing area.

If you do not have the space, budget, or interest in building a garden of this size, you may consider capturing some of your roof runoff in rain barrels to reduce the amount of runoff, or discharge the overflow to another landscaped area.

How to Plan and Install a Rain Garden

Install your Rain Garden



- Once you have selected a site and planned the size of your rain garden, lay out the shape using a string or tape to define the outline of where you will dig.
- If the yard is level, dig to a depth of 6-inches and slope the sides. If the site is sloped, you may need to dig out soil on the uphill side of the area and use the soil to construct a small berm (a compacted wall of soil) along the down slope side of the garden.
- Use a string level to help level the top of the garden and maintain an even 6-inch depth.
- Once the garden is excavated, loosen the soil on the bottom of the area so you have about 12 inches of soft soil for plants to root in. Mix in about 3 inches of compost to help the plants get established and improve the water-holding capacity of the soil.
- If water enters the garden quickly, include a layer of gravel or river rock at the entry points to prevent erosion.

Select Appropriate Plants



California Fuchsia



Common Rush



White Sage



Douglas Iris

You can design your rain garden to be as beautiful as any other type of garden. Select plants that are appropriate for your location and the extremes of living in a rain garden

Site Considerations:

- How much light will your garden receive?
- Is your property near the coast or located in an inland area (this affects sun and temperature)?
- Are there high winds near your home?

Recommended plant characteristics:

- Native plants adapted to local soil and climate,
- Drought tolerant,
- Flood tolerant,
- Not invasive weedy plants,
- Non-aggressive root systems to avoid damaging water pipes,
- Attracts birds and beneficial insects.

*Contact municipal staff to obtain a full list of recommended plants, provided in the countywide stormwater guidance.

Design Checklist

When installing a rain garden, the following design considerations are recommended.

- ❑ Locate the rain garden at least 10 feet from home foundation, 3 feet from public sidewalks, and 5 feet from private property lines. If rain gardens need to be located closer to buildings and infrastructure, use an impermeable barrier.
- ❑ Locate the rain garden to intercept and collect runoff from a roof downspout or adjacent impervious area.
- ❑ Size the rain garden appropriately based on the soil type and drainage area (see Page 1).
- ❑ Do not locate the rain garden over septic systems or shallow utilities. Locate utilities before digging by calling Dig Alert at (888) 376-3314.
- ❑ Locate the rain garden on a relatively flat area, away from steep slopes. If you plan on moving a large quantity of soil, you may need a grading permit. Contact your local municipality for further assistance.
- ❑ Consider installing an underdrain to enhance infiltration in very clayey soils. Contact municipal staff for guidance on how to properly install an underdrain.
- ❑ An overflow should be incorporated in the rain garden to move water that does not infiltrate to another pervious area and away from the home's foundation or neighboring property.
- ❑ Drought and flood resistant native plants are highly recommended and a variety of species should be planted. Avoid invasive plants. Contact municipal staff for a list of plants appropriate for rain gardens from the applicable countywide stormwater guidance. A list of invasive species may be found at the California Invasive Plant Council website (www.cal-ipc.org).

Maintenance Considerations

Once a rain garden is installed, the following steps will help the garden function effectively.

- ❑ Rain gardens should be irrigated periodically (as needed) during dry months, especially while plants are being established. Plants should be inspected for health and weeds should be removed as often as necessary.
- ❑ Apply about 2 inches of mulch and replace as needed. Mulch with a material that will not float away such as compost or a larger sized hardwood mulch (avoid microbark, for example).
- ❑ Areas of erosion should be repaired. Further erosion can be prevented by stabilizing the eroding soil with ground cover or using energy dispersion techniques (e.g., splashblock or cobbles) below downspouts.
- ❑ Avoid using synthetic fertilizers or herbicides in your rain garden because these chemicals are water pollutants.
- ❑ Standing water should not remain in a rain garden for more than 3 days. Extended periods of flooding will not only kill vegetation, but may result in the breeding of mosquitos or other vectors.



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