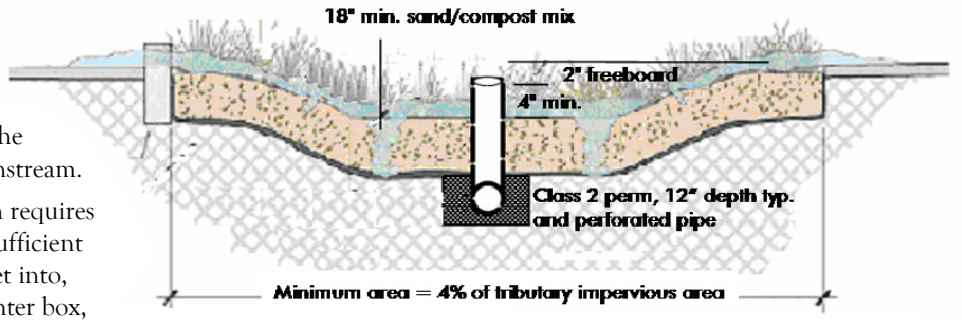
Using bioretention on residential lots

What is bioretention? Runoff from roofs and paved areas is routed to rain gardens or planter boxes (bioretention facilities), where it is detained and filtered through an engineered soil. Where possible, some treated runoff may be allowed to seep into native soils. The remaining runoff is captured in a subsurface drain and routed to off-site drainage pipes or dispersed over land.

Why use bioretention? Pollutants from air deposition, windblown dust, and vehicles become adsorbed to soil, where they can be broken down or safely entrained rather than flowing to streams or the Bay. Bioretention also captures runoff from small storms and delays the first runoff pulse from larger storms, reducing the risk of erosion and damage to habitat downstream.

Basic requirements: Bioretention design requires enough **space** for properly sized facilities, sufficient **head** (elevation difference) so runoff can get into, through, and out of the rain garden or planter box, and **access** so the facilities can be maintained.



Drawing adapted from the Portland Stormwater Manual, 2002

How to incorporate bioretention into your project:

Plan ahead. Discuss requirements for your project with staff at your local planning or community development department. Plan your project to minimize roof and pavement area. Identify suitable locations for bioretention facilities and, where possible, arrange buildings, driveways, and parking so runoff can flow toward them.

Divide the entire site into Drainage Management Areas (DMAs). This step is necessary to ensure your facilities are properly sized. Delineate landscaped, turf, and natural areas separately from impervious areas. Where possible, retain the natural drainage pattern for pervious portions of the site.

Lay out locations for rain gardens and planter boxes. Drainage from each impervious DMA must be routed to a rain garden or planter box. More than one impervious DMA can be routed to the same facility. The surface area of the facilities must be at least 4% of the total impervious surface area draining to them (more bioretention area is better).

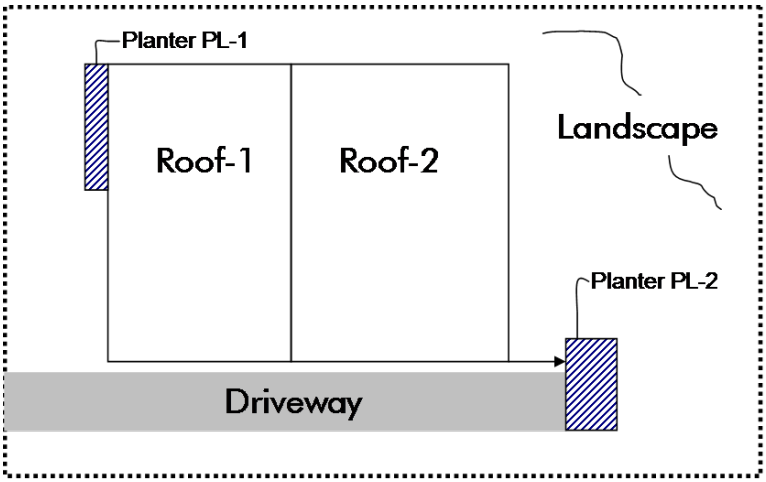
Check sizing and head. Sketch or explain how runoff will be routed from each DMA to a suitably sized rain garden or planter box. Check that there is sufficient elevation drop to route drainage to each facility, provide 3'-4' elevation drop through the facility, and then safely route drainage away from the facility. Make sure the facilities fit into your site plan and landscaping plan.

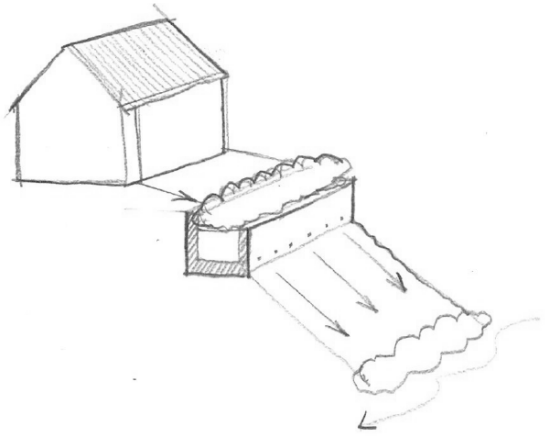
Develop design details. Adapt the details shown here to the needs of your project. Critical design criteria are:

- ❑ Surface area is at least 4% of tributary impervious area.
- ❑ Surface reservoir is minimum 4" plus 2" freeboard. Design the facility to pond water over the entire surface area.
- ❑ Minimum 18" deep engineered soil mix with a minimum sustained infiltration rate of 5" per hour.
- ❑ Gravel drainage layer (Class 2 permeable, Caltrans spec 68-1.025 recommended.) Do not use filter fabric.
- ❑ Underdrain or weep holes disperse treated drainage or convey it offsite.
- ❑ Overflow conveys high flows safely offsite.

Integrate with your site and landscaping drawings. Ensure planter boxes and bioretention areas are accounted for in elevations, renderings, and planting plans. Use plant species adapted to dry climates and a well-drained soil. Irrigation of these facilities should be on a separate timer.

Example calculation of bioretention area



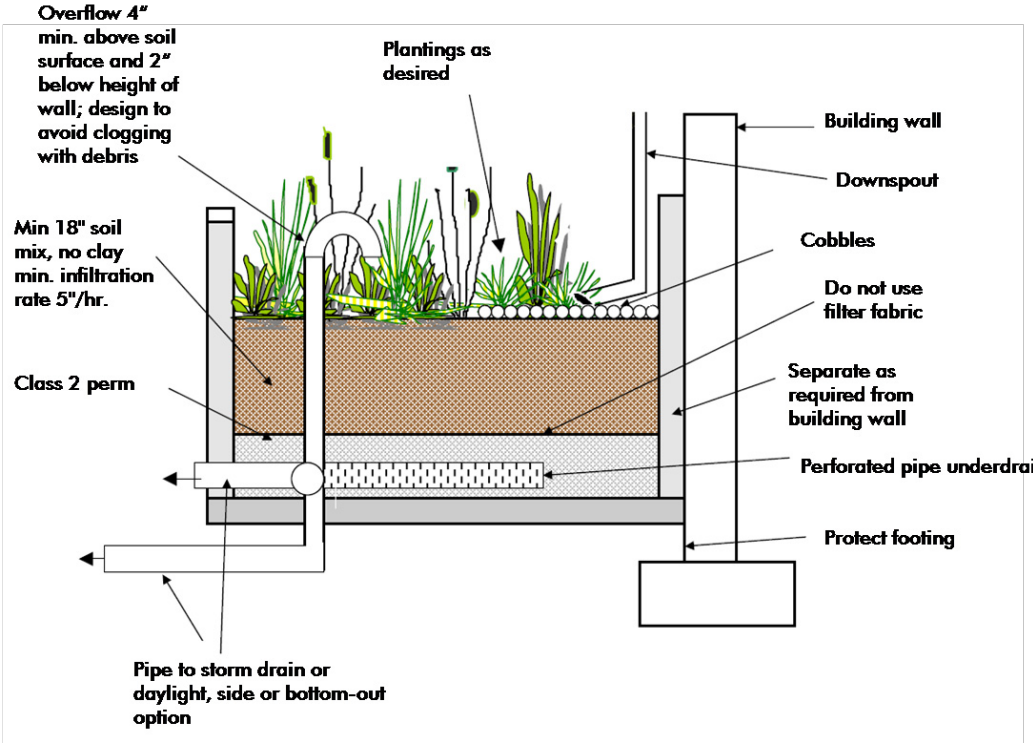


A simplified conceptual example. Ask your project reviewer about submittal requirements specific to your project.

The site is divided into Drainage Management Areas (DMAs). Drainage from the landscaped area is routed offsite separately. Drainage from roofs and pavement is routed to the two planter boxes. The square footage of each impervious DMA is tabulated. The total square footage tributary to each bioretention facility is multiplied by 0.04 to obtain the minimum area for that facility.

Runoff from Roof-1 is routed to Planter PL-1 via gutters and downspouts. Planter PL-2 receives runoff from Roof-2 as well as sheet flow from the driveway. Weep holes disperse seepage from the planter to the slope below. For more detailed instructions on calculation procedures and design, see *Guidance for Applicants: Stormwater Quality Manual for Development Applications*–available at www.mcstoppp.org

	DMA Square Feet	Tributary Drainage Area (SF)	Sizing Factor	Minimum Bioretention Area (SF)
Roof-1	1800			
Planter PL-1		1800	0.04	72
Roof-2	1800			
Driveway	950			
Planter PL-2		2750	0.04	110



Planter boxes can be constructed adjacent to buildings or set into slopes. They are most effective when open-bottomed, but can also be built to eliminate seepage to native soils if necessary to protect foundations or slopes.