A.5 Flow-Through Planters

Location: 8th Ave & Mark Lane, San Diego, California.

Figure A.5-1. Flow-through planter.

A.5.1 Design

The design of a flow-through planter can be broken down to a nine-step process. Table A.5-1 summarizes the steps, which this chapter describes in greater detail.

Table A.5-1. Flow-through planter iterative design step process

Design step		Design component/ consideration	General specification
1	**Integrated Management Practice (IMP) Siting (A-58)**	Layout and site incorporation	Based on available space and maintenance access, incorporate along perimeter of buildings, along the road right-of-way, or near the outlet of a vegetated (green) roof or cistern.
2	**Determine IMP Function and Configuration (A-58)**	Impermeable liner	Flow-through planters are typically contained in a concrete vault (as described in Common Design Elements).
		Underdrain (required)	Schedule 40 PVC pipe with perforations (slots or holes) every 6 inches. The 4-inch diameter lateral pipes should join a 6-inch collector pipe, which conveys drainage to the downstream storm network. Provide cleanout ports/observation wells for each underdrain pipe (see Common Design Elements).
		Internal water storage (IWS)	With plant selection, the outlet can be slightly elevated to create a sump for additional moisture retention to promote plant survival and enhanced treatment. Top of IWS should be greater than 18 inches below surface.
3	**Determine IMP Sizing Approach (A-60)**	Flow-based (common SUSMP methodology)	Refer to Chapters 2 and 4 of the County SUSMP for appropriate sizing factors to determine surface area, ponding depth, and media depth. Step 4 of this design guidance section can be skipped when using this method.
		Volume-based (water quality methodology)	Per the County SUSMP, the volume of the 24-hour 85th percentile storm is required for the water quality treatment method.
4	**Size the System (A-60)**	Temporary ponding depth	6 to 18 inches (6 to 12 inches near schools or in residential areas); average ponding depth of 9 inches is recommended.
		Soil media depth	1.5 to 4 feet (deeper for better pollutant removal, hydrologic benefits, and deeper rooting depths).
		Surface Area (Volume-based Water Quality)	Find surface area required to store treatment volume within temporary ponding depth, soil media depth, and gravel drainage layer depth (media porosity ≈ 0.35 and gravel porosity ≈ 0.4).
5	**Specify Soil Media (A-60)**	Composition and texture	65 percent sand, 20 percent sandy loam, and 15 percent compost (from vegetation-based feedstock). Animal wastes or by-products should not be applied.
		Permeability	5 inches per hour (in/hr) infiltration rate for the flow-based SUSMP method (1–6 in/hr for alternative designs, as approved by local jurisdiction).
		Chemical composition	Total phosphorus < 15 parts per million (ppm); pH 6-8; cation exchange capacity > 5 milliequivalents per 100 grams (meq/100 g) of soil; organic matter content < 5 percent by weight.
		Drainage layer	Separate soil media from underdrain layer with 2 to 4 inches of washed sand, followed by 2 inches of choking stone (ASTM No. 8) over a 1.5-foot envelope of ASTM No. 57 stone.

Design step		Design component/ consideration	General specification
6	**Design Inlet and Pretreatment (A-60)**	Inlet	Provide stabilized inlets (see Common Design Elements).
		Pretreatment	Rooftop runoff: Minimal pretreatment is required. Paved surface runoff: Follow pretreatment recommendations in the Bioretention section.
7	**Select and Design Overflow/Bypass Method (A-60)**	Outlet configuration	Online: All runoff is routed through system; install an elevated overflow structure or weir at the elevation of maximum ponding. Offline: Only treated volume is diverted to system; install a diversion structure or allow bypass of high flows.
		Hydromodification control	Provide additional storage and size an appropriate nonclogging orifice or weir to dewater detention volume.
8	**Select Mulch and Vegetation (A-60)**	Mulch	Dimensional chipped hardwood or triple shredded, well-aged hardwood mulch 3 inches deep.
		Vegetation	See Plant Palette (Appendix E).
9	**Design for Multi-Use Benefits (A-60)**	Additional benefits	Include features to enhance habitat, aesthetics, public education, and shade.

A.5.1.1 Step 1. IMP Siting

Flow-through planters can be incorporated in many places to help meet more than one project-level or watershed-scale objective, including the following:

- Along building perimeters and downspouts
- In landscaped parking lot islands
- Between parking stalls in parking lots
- In rights-of-way along roads

A.5.1.2 Step 2. Determine IMP Function and Configuration

Because they have an impermeable base, flow-through planters are always required to have an underdrain. Using appropriate plants, a shallow internal water storage (IWS) zone can be installed to retain moisture. Figure A.5-2 and Figure A.5-3 show the profiles of the two configuration options.

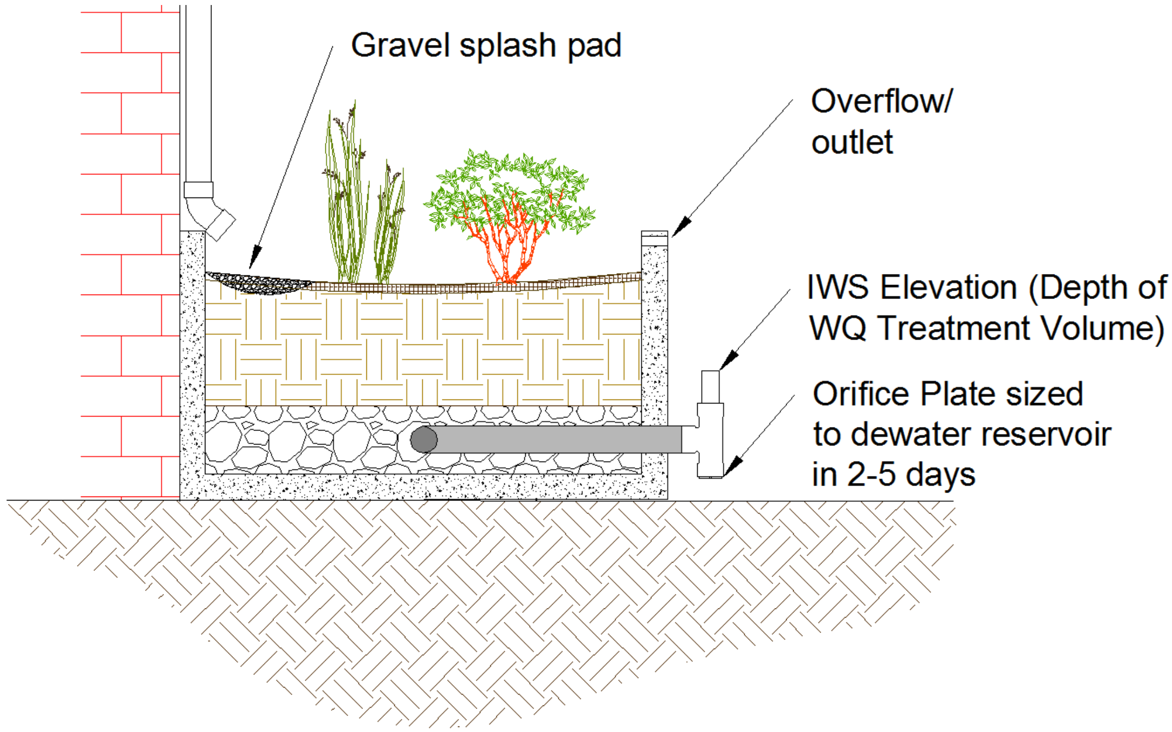

Figure A.5-2. Configuration 1 – Filtration flow-through planter with upturned underdrain for IWS.

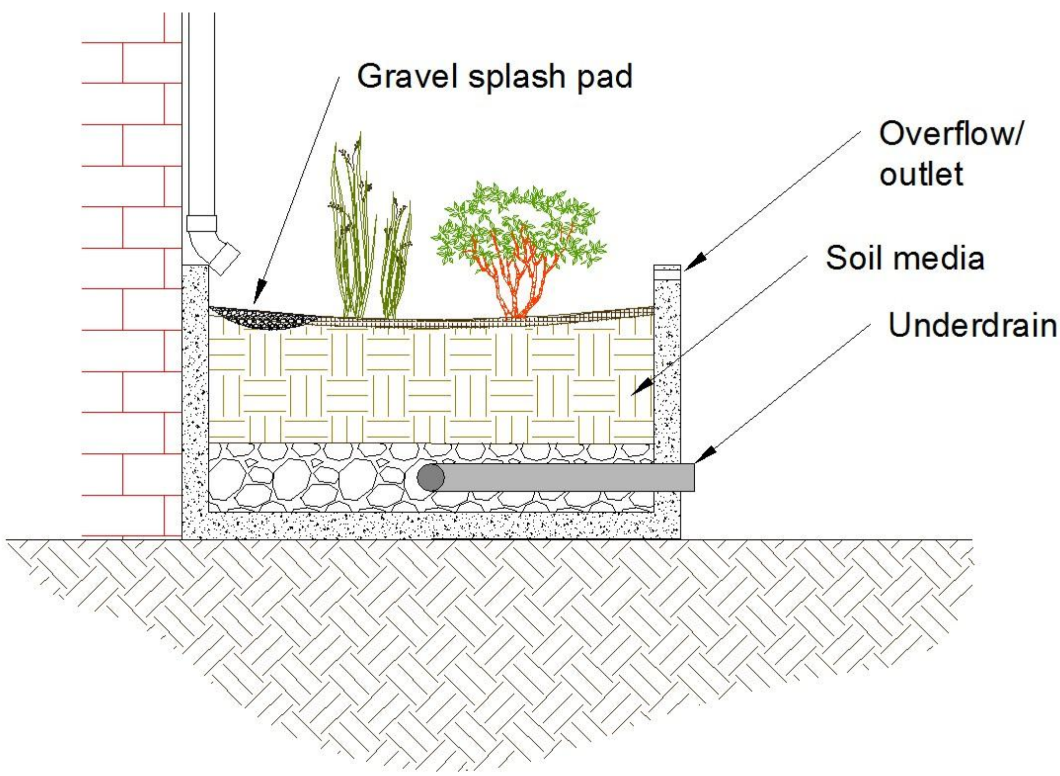

Figure A.5-3. Configuration 2 – Filtration flow-through planter with underdrain on the subgrade.

A.5.1.3 Step 3. Determine IMP Sizing Approach

The flow-through planter must be sized according to the methods outlined in the County SUSMP. The SUSMP allows a flow-based sizing and volume-based sizing methodology. If sizing using the flow-based methodology, chapters 2 and 4 of the County SUSMP present relevant sizing regulatory requirements, and step 4 of this design guidance section can be bypassed. If sizing using the volume-based methodology, step 4 of this section presents relevant sizing requirements.

A.5.1.4 Step 4. Size the System (Volume-Based)

Flow-through planters should be sized following the methods outlined in the Bioretention section (A.1.1.4).

A.5.1.5 Step 5. Specify Soil Media

Soil media specifications should meet the requirements outlined in the Bioretention section (A.1.1.5).

A.5.1.6 Step 6. Design Inlet and Pretreatment

For flow-through planters located within a right-of-way, inlet and pretreatment specifications should meet the requirements outlined in the Bioretention section (A.1.1.6).

When flow-through planters are located adjacent to a building, downspouts can be directed to drain into the flow-through planter. Care should be taken to protect the material at the inlet by ensuring a maximum flow rate of 3 cubic feet per second or by installing stone, splash block, or other erosion protection measures for higher flows. Downspouts can also be upturned to allow the water to bubble up into the flow-through planter in a diffuse manner. Figure A.5-4 shows a typical downspout inlet configuration.

A.5.1.7 Step 7. Select and Design Overflow/Bypass Method

Overflow/bypass methods should follow the guidance given in the Bioretention section (A.1.1.7).

A.5.1.8 Step 8. Select Mulch and Vegetation

Mulch and vegetation specifications should meet the requirements outlined in the Bioretention section (A.1.1.8).

A.5.1.9 Step 9. Design for Multi-Use Benefits

Multi-use benefits are the same as those outlined in the Bioretention section (A.1.1.9).

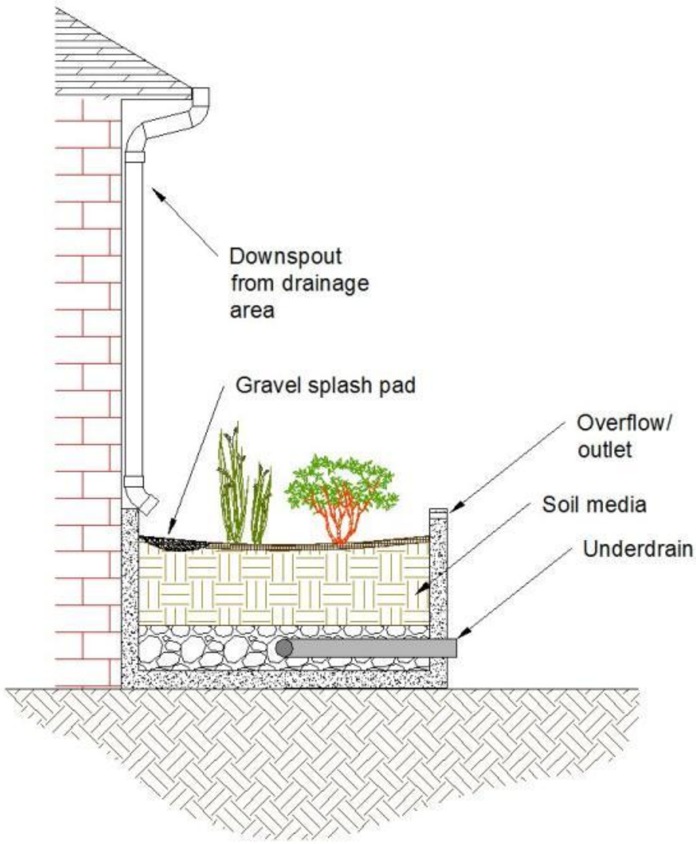

Figure A.5-4. Flow-through planter inlet configuration.

A.5.2 Critical Construction Considerations

Construction technique and sequencing should follow the Bioretention section (A.1.2) and chapter 4.

A.5.3 Operations and Maintenance

Operation and maintenance tasks follow those outlined in the Bioretention section (A.1.3).

A.5.4 References

County of San Diego. 2012. *County of San Diego SUSMP: Standard Urban Stormwater Mitigation Plan Requirements for Development Applications*. http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmppdf/susmp_manual_2012.pdf.