THE TOWN OF SAN ANSELMO

525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Homeowner's Guide to Stormwater Management



Provided by the Town of San Anselmo Department of Public Works

For Compliance with the Town's Urban Runoff Pollution Prevention Ordinance

THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

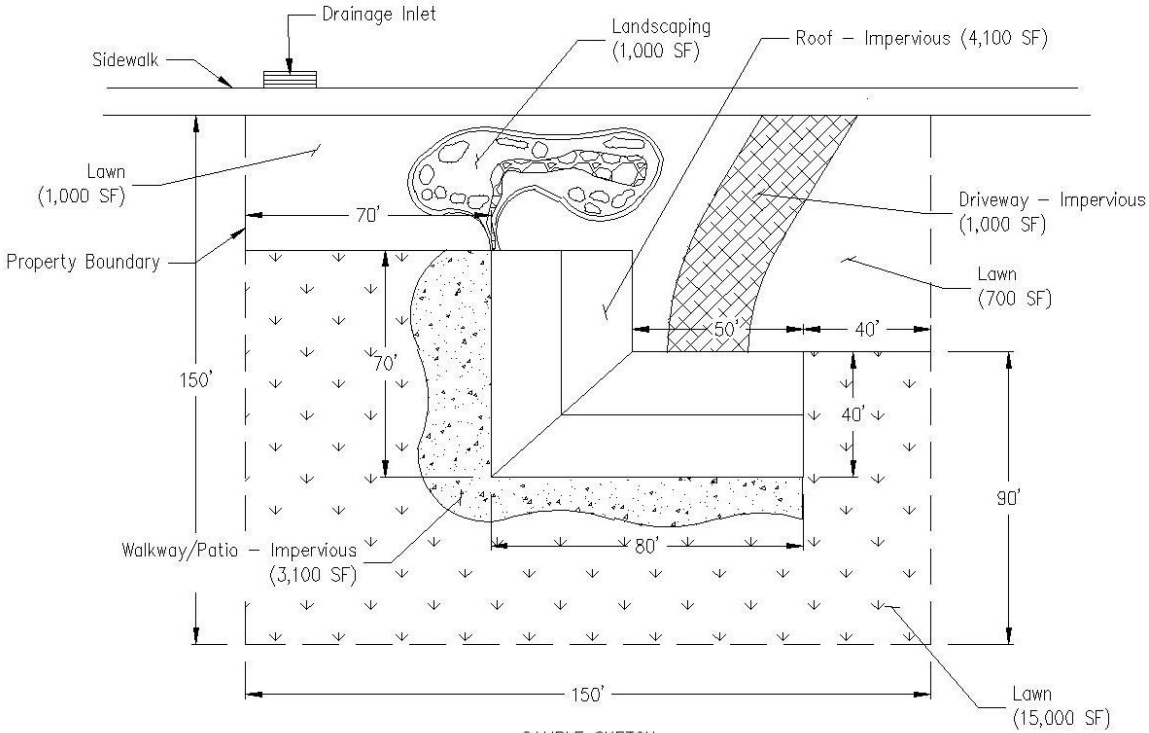
Introduction to Stormwater Management

Why is it necessary?

When hard surfaces, like roads, buildings, and driveways, replace natural landscape, rainwater (also called stormwater or runoff) is prevented from seeping into the ground and flows quickly off these surfaces, collecting pollutants along the way, like oil, grease, and dirt. The storm drain system and eventually local creeks receive this polluted water. The Ross Valley / Corte Madera Creek system is a valuable resource that provides both wildlife habitat and flood protection. Doing your part to detain and treat stormwater that is exposed to impervious surfaces will improve the health of local creeks by reducing pollutants, sedimentation, and erosion.

How to begin:

Make a simple sketch of your property like the one shown to the right. At a minimum, include dimensions and labels for the lot boundaries and any buildings or hard surfaces, like roofs, driveways, and patios (also called "impervious surfaces"). You will need the total area of your lot as well as new or replaced and existing impervious surface areas. Then, consult the pages following to start designing your stormwater management system.



SAMPLE SKETCH
EXISTING CONDITION

What are my options?

Negative stormwater impacts can be mitigated by: (1) constructing a rain garden/bioretention area which can treat and detain rainwater more effectively than regular landscaping, (2) directing impervious areas to drain to "self-retained" landscape areas, and/or (3) decreasing the impervious areas on your site, such as by replacing a concrete driveway with permeable pavers or replacing a brick patio with a vegetable garden. This handbook provides general guidelines for these options.

Note: The Town does not recommend the installations of rainwater cisterns to meet the requirements of the Flatwork Permit at this time, and asks that homeowners who are interested in using a rainwater cistern to capture stormwater from their roof discuss compliance options with the Town.

Table 1-1. Requirements at a Glance (San Anselmo Only, Projects < 5,000 SF)

Type of Project	Requirements	Required Submittals, in addition to a San Anselmo Flatwork Permit
Small Projects Projects that create between 150 square feet (SF) and 500 SF of impervious surface, including Single-Family Homes*.	**Site Design Measures***:** 1. Limit clearing, grading, and soil compaction. 2. Minimize impervious surfaces. 3. Reduce runoff, for example by dispersing runoff to landscape or using pervious pavements. 4. Conserve natural areas of the site as much as possible consistent with local General Plan policies. If along a watercourse: 5. Comply with stream setback ordinances/requirements. 6. Protect slopes and channels against erosion.	Follow the instructions in the template: "Stormwater Control Plan for a Single-Family Home or Small Development Project" (BASMAA Post-Construction Manual, Appendix C) and submit completed SCP to Town of San Anselmo.
Medium Projects Projects that create or replace between 500 SF and 1,000 SF of impervious surface. **Regulated Projects and Large Single Family Home* Projects** Projects that create or replace 1,000 SF or more of impervious surface.	**Site Design Measures (above), plus:** 1. Route runoff to bioretention or other facilities sized and designed according to the criteria in Chapter 4 of the BASMAA Post-Construction Manual, as modified for use in San Anselmo** 2. Identify potential sources of pollutants and implement corresponding source control measures in Appendix A. 3. Provide for ongoing maintenance of bioretention facilities.	Follow the instructions in the BASMAA Post-Construction Manual and use the template: "Stormwater Control Plan for a Regulated Project" (Appendix D)

*Single-family homes (determined by planning department) that are not part of a larger plan of development.
** Where a project results in an increase of more than 50% of the impervious area of a previously existing development, runoff from new, replaced, and previously existing impervious surfaces must be included to the extent feasible.
***If the Public Works Director, or his representative, deems it necessary additional site design measures may be required.

Stormwater Management in San Anselmo

San Anselmo Flatwork Permit

All projects creating 150 square feet or more of impervious surface must adhere to the BASMAA Post-Construction Manual, as modified for use in San Anselmo, dated June 2015 and obtain a San Anselmo Flatwork Permit.

Piecemealing the work in order to reduce the stormwater management requirements for a project is not allowed. If a project receives multiple permits, the cumulative area of impervious surfaces shall not exceed the limits specified in the ordinance for a period of one year.

Additional Design Guidance

Information and checklists are adapted from the Bay Area Stormwater Management Agencies Association (BASMAA) Post-Construction Manual. For more design guidance, reference the BASMAA Post-Construction Manual, as modified for use in San Anselmo, dated June 2015.

Important Note Regarding Liability

The rainwater retention measures included in this guide are general guidelines and should not be used as professional engineered specifications. Prior to implementation of any measures, seek technical assistance from a qualified professional engineer or landscape architect. Certain site-specific measures may be necessary for implementation on your site.

Overflow and Discharge Considerations

Stormwater management measures retain runoff from small storms. In larger storms, runoff will overflow into an overflow structure. If this overflow structure is clogged, water will spill out the sides of your rain garden or self-retained area, possibly causing flood damage to adjacent properties. To lessen the potential for flood damage, properly maintain your stormwater management system by clearing overflow grates of debris and direct overflows away from buildings and other private property.

State Drainage Law

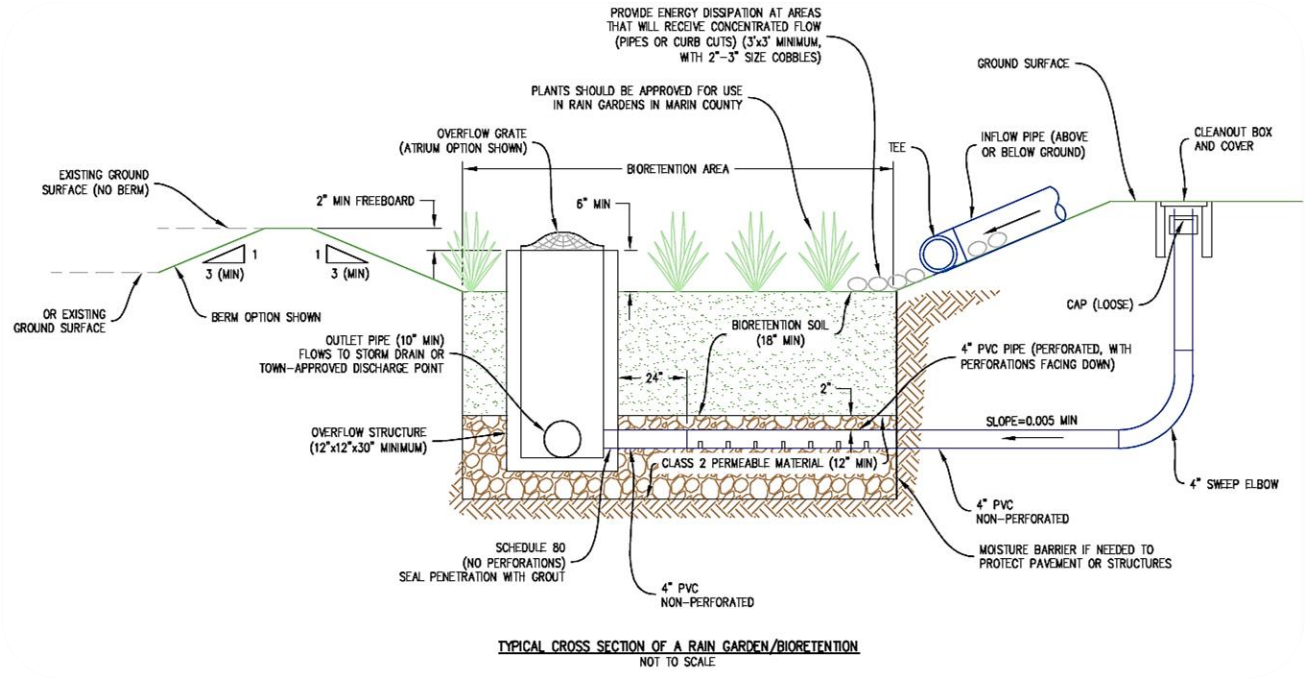
Protect yourself against liability for damages to adjacent property owners before making drainage alterations to your property by becoming familiar with State Drainage Law:

> A lower estate must take natural drainage from an upper estate, but the upper estate property owner must not **unreasonably** alter the natural drainage of their land. *LeBrun v. Richards* (Calif. Sup. Ct. 1930) 210 Cal. 308. **(Revised per *Keys v. Romley* (Calif. Sup. Ct. 1966) 64 Cal.2d 396.)**

THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Rain Garden (Bioretention) Design for Small Projects

Rain gardens, also known as bioretention areas, are landscaped areas that capture and store runoff, giving it time to filter through plant roots and an engineered bioretention soil before infiltrating into the ground. In San Anselmo, native soils are not highly permeable, so an underdrain system is necessary to carry excess water (i.e. water that has not infiltrated) into the storm drain system. Bioretention areas attenuate runoff to the storm drain system, reducing the possibility of a system overflow during a flash rainstorm. In addition, the bioretention filters the water, resulting in cleaner water entering local creaks.



TYPICAL CROSS SECTION OF A RAIN GARDEN/BIORETENTION
NOT TO SCALE

Design Checklist

- ❑ Sizing factor: minimum of 4% of tributary impervious area.
- ❑ Overflow designed to prevent clogging by debris.
- ❑ Minimum 18" deep soil mix with a minimum long-term infiltration rate of 5 inches per hour.
- ❑ Perforated pipe underdrain with cleanouts and adequately sloped piped connection to storm drain or approved discharge point. Bed perforated pipe in Class 2 permeable material.
- ❑ Do not use filter fabric, liner, or landscape cloth.
- ❑ Splash blocks or cobbles at inflow pipes.
- ❑ Plants selected for viability and to eliminate need for fertilizers and pesticides.
- ❑ Native soils protected against compaction during construction.
- ❑ Irrigation system with connection to water supply.
- ❑ Direct runoff away from building foundations and basements.
- ❑ Runoff does not create ponding around trees.
- ❑ Optionally, 3 inches maximum of mulch can be placed on top of the bioretention soil. If used, aged mulch is recommended, as wood chip or bark mulch tends to float.

Maintenance Checklist

- ❑ Inspect and clean grates and pipes regularly during rainy season.
- ❑ Control weeds by manual methods (not herbicides).
- ❑ If mulch is used, 1-2 inches should be reapplied once a year, in June.

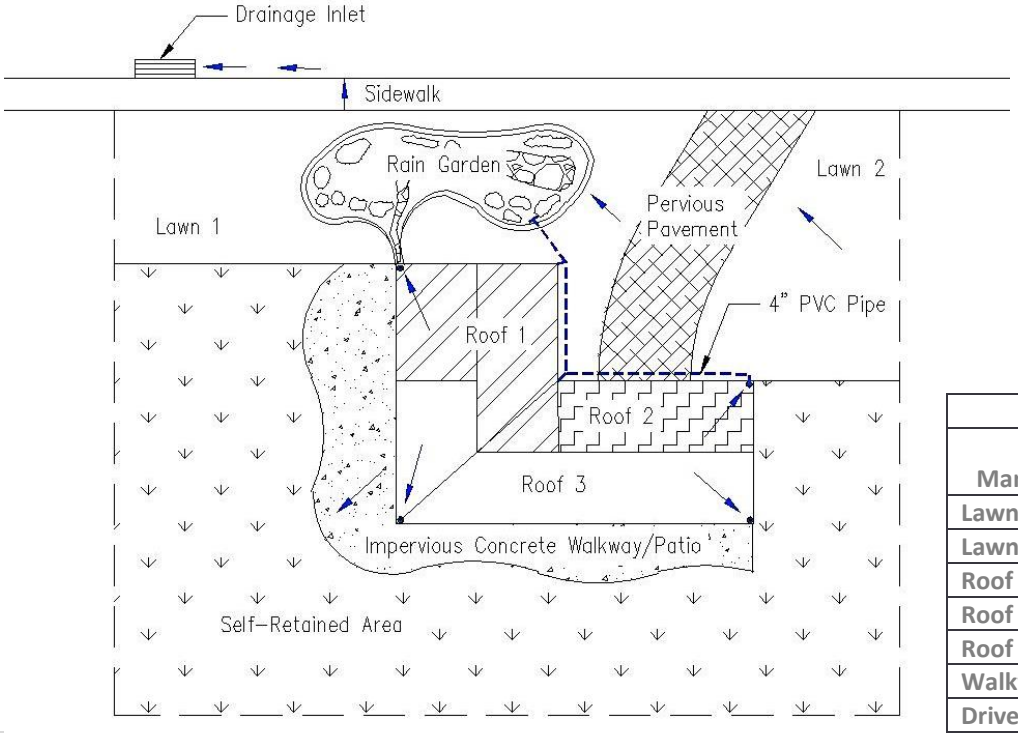
THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Rain Garden Sizing

Ordinance Compliance Note: Treat at least an equivalent amount of impervious area as you are creating or replacing on your site. For projects > 5,000 SF, refer to the BASMAA Post-Construction Manual.

Sizing Your Rain Garden

Before sizing your rain garden, determine how much impervious area on your site will be draining to it. To do this, make a simple sketch of your site and separate it into subareas (drainage management areas), then draw arrows to represent where the water from each subarea is flowing. Once you determine how much impervious area on your site is flowing to the rain garden, use the table on the right to determine the required area.



SAMPLE SKETCH
PROPOSED CONDITION

RAIN GARDEN SIZING CHART	
Impervious Area Draining to Rain Garden (SF)	Minimum Rain Garden Area (SF)
150 - 200	8
201 - 300	12
301 - 400	16
401 - 500	20
501 - 600	24
601 - 700	28
701 - 800	32
801 - 900	36
901 - 1000	40
1001 - 1500	60
1501 - 2000	80
2001 - 2500	100
2501 - 3000	120
3001 - 3500	140
3501 - 4000	160
4001 - 4500	180
4501 - 5000	200
For larger areas, consult a licensed civil engineer, architect, or landscape architect.	

Drainage Management Area Delineation Example		
Drainage Management Area	**Type of Surface**	**Drains to:**
Lawn 1	Pervious	Rain Garden
Lawn 2	Pervious	Pervious Pavement
Roof 1	Impervious	Rain Garden
Roof 2	Impervious	Rain Garden
Roof 3	Impervious	Self-Retained Area
Walkway/Patio	Impervious	Self-Retained Area
Driveway	Pervious	n/a

THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Specifications for Rain Garden Materials[1]

Gradation Specifications

Bioretention soil shall:

- Be comprised of 60-70% sand and 30-40% compost (by volume).
- Achieve a long-term, in-place infiltration rate of at least 5 inches per hour.
- Have sufficient moisture retention to support vigorous plant growth.

Gradation Requirements			
Sieve Size	**Percent Passing (by weight)**		
	Sand Component	Compost Component	Class 2 Permeable Material[2]
1"	-	99-100	100
1/2"	-	90-100	-
3/4"	-	-	90-100
3/8"	100	-	40-100
1/4"	-	40-90	-
No. 4	90-100	-	25-40
No. 8	70-100	-	18-33
No. 16	40-95	-	-
No. 30	15-70	-	5-15
No. 40	5-55	-	-
No. 50	-	-	0-7
No. 100	0-15	-	-
No. 200	0-5	2-10	0-3

Testing Requirements

Bioretention planting soil must be analyzed by an accredited geotechnical lab.

- Bioretention soil texture (ASTM D422)

Gradation for Blended Bioretention Soil	
Sieve Size	Percent Passing *(by weight)*
½"	97-100
No. 200	2-5

- Bioretention soil permeability
  - Moisture-density relationships (compaction tests): Bioretention soil for the permeability test shall be compacted to 85 to 90 percent of the maximum dry density (ASTM D1557).
  - Constant head permeability testing (ASTM D2434) on a minimum of two samples with a 6" mold and vacuum saturation.

Fertilization

- Do not add fertilizer to bioretention facilities, as nutrients conveyed to storm drains can be harmful to creeks.
- Compost tea can be used in lieu of fertilizer (applied at a rate of 5 gallons mixed with 15 gallons of water per acre). Apply compost tea in accordance with supplier guidelines.

Placement and Compaction

- Bioretention soil is placed in 8" to 12" lifts. Lifts are not to be compacted but are placed to reduce the possibility of excessive settlement.
- Allow time for natural compaction and settlement prior to planting.

[1]Municipal Regional Stormwater Permit, Order No. R2-2009-0074, Attachment L.
[2]2010 Caltrans Standard Specifications, Section 68-2.02F(3).

THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Recommended Planting List for Rain Gardens in Marin County

Note: Avoid the use of pesticides, herbicides, and fertilizers, especially in a rain garden, as these will flow directly into the storm drain system and have harmful effects on local creeks.

Trees	Shrubs	Herbaceous Perennials and Groundcovers	Grasses and Grass-Like Plants
Acer negundo , box elder*	*Physocarpus capitatus,* pacific ninebark*	*Achillea millefolium*, common yarrow*	*Agrostis exerata,* Spike bentgrass
Fraxinus latifolia , Oregon ash*	*Rhamnus californica,* California coffeeberry*	*Artemisia douglasiana,* mugwort*	*Bouteloua gracilis,* blue grama
Fraxinus velutina , velvet ash	*Rhamnus crocea,* redberry*	*Artemisia ludoviciana,* white sagebrush*	*Bromus carinatus,* California brome*
Pittosporum eugenioides , tarata	*Rhododendron occidentale,* western azalea*	*Asclepias fascicularis,* narrowleaf milkweed*	*Carex barbarea,* Santa Barbara sedge*
Platanus acerifolia, London plane tree	*Ribes aureum gracillimum,* golden current*	*Darmera peltata,* Indian rhubarb*	*Carex divulsa,* grassland sedge
Platanus racemosa, California sycamore*	*Ribes divericatum,* coast black gooseberry*	*Epilobium canum*, California fuchsia*	*Carex nudata,* California black sedge*
Populus fremontii, cottonwood*	*Ribes sanguineum*, red flowering currant*	*Epipactis gigantea,* stream orchid*	*Carex obnupta,* slough sedge*
Quercus agrifolia, coast live oak*	*Ribes speciosum,* fuchsia-flowered gooseberry*	*Fragaria chiloensis,* beach strawberry*	*Carex pansa,* dune sedge*
Acer circinatum, vine maple (S)*	*Rosa californica,* California wild rose*	*Heuchera micrantha,* alum root*	*Carex praegracilis,* clustered field sedge*
Baccharis viminea, seep-willow (S)*	*Rosa gymnocarpa,* wood rose*	*Heuchera pilosissima,* hairy alum root*	*Chondropetalum tectorum*, small cape rush
Chilopsis linearis, desert-willow (S)*	*Rubus parviflorus,* thimbleberry*	*Iris douglasiana,* Douglas iris*	*Danthonia californica,* California oat grass*
Corylus cornuta v. california, California hazel (S)*	*Rubus spectabilis,* salmonberry*	*Lilium pardalinum*, leopard lily*	*Distichlis spicata,* salt grass*
Fraxinus dipetala, California ash (S)*	*Rubus ursinus,* California blackberry*	*Lobelia cardinalis,* cardinal flower	*Festuca californica,* California fescue*
Garrya elliptica, coast silktassel (S)*	*Symphoricarpos albus,* common snowberry*	*Lotus scoparius*, deerweed*	*Festuca idahoensis,* Idaho fescue*
Heteromeles arbutifolia, toyon (S)*	*Whipplea modesta,* whipplevine*	*Mimulus aurantiacus,* common monkeyflower*	*Festuca rubra,* red fescue*
Laurus nobilis 'Saratoga', Grecian bay (S)	*Alyogyne huegelil,* blue hibiscus	*Mimulus cardinalis,* scarlet monkeyflower*	*Festuca rubra 'molate',* molate fescue*
Myrica californica, Pacific wax myrtle (S)*	*Baccharis pilularis consanguinea,* bush baccharis*	*Mimulus guttatus,* seep monkeyflower*	*Juncus effusus,* common rush*
Sambucus mexicana, elderberry (S)*	*Calycanthus occidentalis,* western spicebush*	*Mirabilis multiflora,* Giant four o'clock*	*Juncus pallidus,* giant rush
	Carpenteria californica, bush anemone*	*Oenethera hookeri,* Hooker's evening primrose*	*Juncus patens,* blue rush*
	Cornus sericera, redtwig dogwood*	*Polypodium californicum*, California Polypody fern	*Leymus triticoides,* creeping wildrye*
Vine	*Erigeron glaucus,* seaside daisy*	*Prunella vulgaris,* self heal*	*Muhlenbergia rigens,* deergrass*
Vitis californica, California grape*	*Lonicera hispidula,* California honeysuckle*	*Rudebeckia californica,* California coneflower*	*Sisyrinchium bellum*, blue eyed grass*
	Lonicera involucrata, twinberry honeysuckle*	*Scaevola 'mauve clusters',* fan flower	
	Mahonia pinnata, California holly grape*	*Scutellaria austinae,* skullcap*	
		Sisyrinchium californicum, yellow eyed grass*	
		Verbena lasiostachys, Western vervain*	
		Verbena lilacina, Cedros Island verbena	

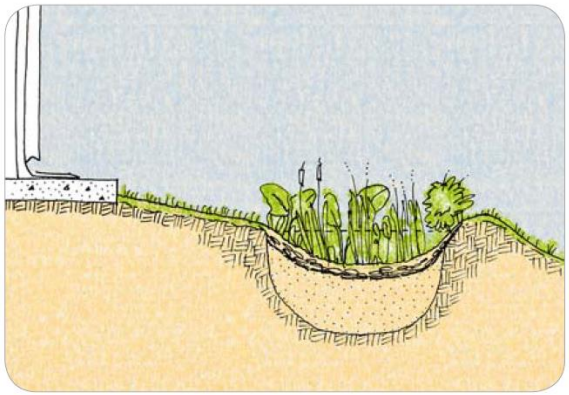
* native to California

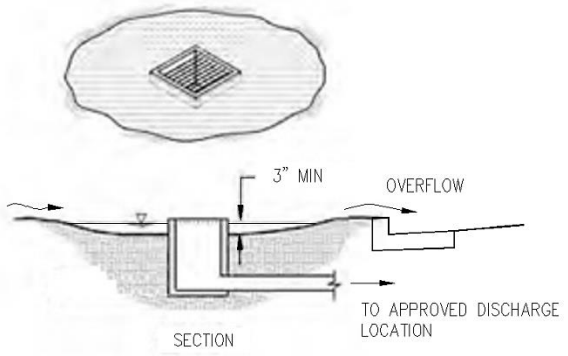
(S) - small tree

THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Disperse Runoff to Landscape Areas

A self-retained area is a landscaped area which retains (or holds) a certain volume of water during a rainstorm so that it allows runoff to infiltrate rather than flowing directly into the storm drain system. A good way to think of a self-retaining area is that it acts like a bathtub – during a storm, it fills up before spilling out the sides or into the tub overflow drain.





Design Checklist

- The self-retained area is at least half the area of the impervious area draining to it (i.e. 2:1 ratio of impervious area to landscape).
- Roof areas collect runoff and route it to the receiving pervious area via gutters or downspouts.
- Paved areas are sloped so drainage is routes to the receiving pervious area.
- Runoff is dispersed across the vegetated area (for example, with a splash block), to avoid erosion and promote infiltration.
- Vegetated area has amended soils, vegetation, and irrigation as required to maintain soil stability and permeability.
- Any drain inlets within the vegetated area are at least 3 inches above surrounding grade.

SELF-RETAINED AREA SIZING CHART	
Impervious Area Draining to Self-Retained Area (SF)	Minimum Self-Retained Area (SF)
150 - 200	100
201 - 300	150
301 - 400	200
401 - 500	250
501 - 600	300
601 - 700	350
701 - 800	400
801 - 900	450
901 - 1000	500
1001 - 1500	750
1501 - 2000	1000
2001 - 2500	1250
2501 - 3000	1500
3001 – 3500	1750
3501- 4000	2000
For larger areas, consult a qualified professional engineer.	

Ordinance Compliance Note: Treat at least an equivalent amount of impervious area as you are creating or replacing on your site. For projects > 5,000 SF, refer to the BASMAA Post-Construction Manual.

Figure source (top): San Francisco Stormwater Design Guidelines (November 2009).
Figure source (bottom): adapted from the Stormwater C.3 Guidebook 6th Edition (Contra Costa Clean Water Program, 2012).

THE TOWN OF SAN ANSELMO
525 San Anselmo Avenue
San Anselmo, CA 94960
Ph: (415) 258-4600

Permeable Pavement Design for Small Projects

The use of permeable pavement in lieu of a conventional impervious driveway or sidewalks allows water to percolate (either between pavers or through voids in the porous pavement) and collect in a gravel storage layer before entering the storm drain system. This has the effect of detaining runoff during storms and even helps to treat that runoff by filtering it. Permeable pavement can promote infiltration if the natural soil on the site is permeable. Permeable pavement can also be an attractive addition to your home if properly maintained.

Mitigate for improvements by reducing the impervious surfaces on your site through the use of permeable pavement.

Design Checklist

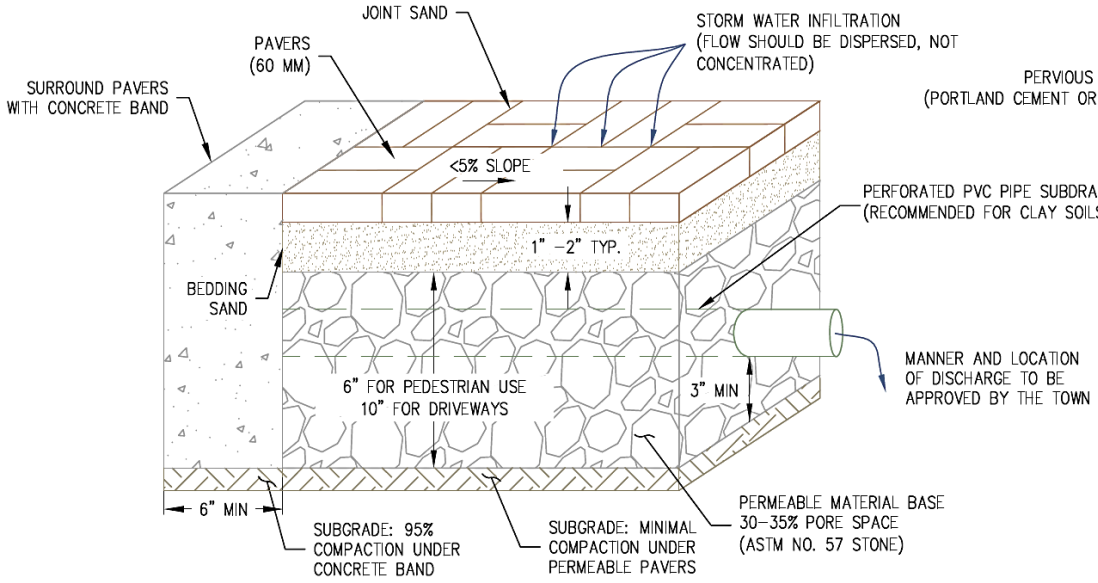
- ASTM No. 57 Stone, which has 30-35% pore space, is installed below the surface pavement. The recommended base thickness is 6" for pedestrian use and 10" for driveways to provide adequate structural strength.
- Slope of the pervious pavement is flat or nearly flat (<5%). For steep applications, seek guidance from a licensed civil engineer.
- Flow directed to pervious pavement is dispersed so as not to be concentrated at a small area of pavement.
- Show the location, extent, and type of pervious pavement on your site plan.
- No erodible areas drain to the permeable pavement.
- The subgrade is uniform and compaction is the minimum required for structural stability.
- Provide a subdrain with an outlet elevation is a minimum of 3" above the bottom of the base course.
- A rigid edge is provided to retain granular pavements and unit pavers.
- If paving is close to a building, a barrier or impermeable liner may be required to keep water away from the building foundation.
- Solid unit pavers are set in sand or gravel with minimum 3/8"gaps between pavers. The joints are filled with an open-graded aggregate free of fines.
- Permeable concrete, porous asphalt, and proprietary products are installed by industry-certified professionals according to the vendor's recommendations.
- Selection and location of permeable pavements incorporate Americans with Disabilities Act (ADA) requirements (if applicable), site aesthetics, and uses.
- Project complies with applicable sections of the current municipal code, including site drainage requirements if applicable.
- Permeable pavement systems require regular maintenance, including vacuuming to prevent clogging, refilling joints between pavers with sand, and weeding. The use of herbicides is strongly discouraged, as this will contaminate water entering the groundwater and storm drain system.



Picture source: Calstone Permeable Interlocking Concrete Pavements (PICP) brochure. (http://www.calstone.com)

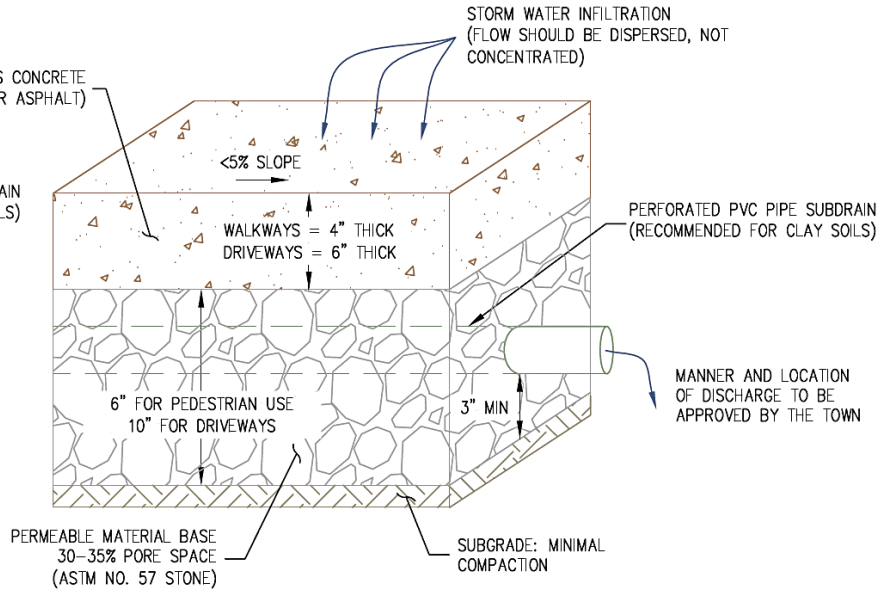
Permeable Pavement Typical Details

TYPICAL PERMEABLE PAVER DETAIL



NOTE: EXACT PAVEMENT SECTIONS AND MATERIAL SPECIFICATIONS WILL DEPEND ON MANUFACTURER RECOMMENDATIONS.

TYPICAL PERVIOUS PAVEMENT DETAIL



Permeable Pavement Gradation Suggestions

Gradation suggestions adapted from the Interlocking Concrete Pavement Institute (ICPI) Technical Specifications No. 2 & 15 (August 2011 & September 2012, respectively). Depending upon the type of paver used, the manufacturer, and the site conditions, the gradation of these materials may change.

Gradation for Bedding Sand (ASTM No. 8)	
Sieve Size	Percent Passing *(by weight)*
½"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 100	0-10
No. 200	0-1

Gradation for Joint Sand	
Sieve Size	Percent Passing *(by weight)*
No. 4	100
No. 8	95-100
No. 16	70-100
No. 30	40-75
No. 50	10-35
No. 100	2-15
No. 200	0-5

Gradation for Permeable Base (ASTM No. 57 Stone)	
Sieve Size	Percent Passing *(by weight)*
1½"	100
1"	95-100
½"	25-60
No. 4	18-33
No. 8	0-5

PERMEABLE PAVEMENT SELECTION MATRIX [3]		**DESIGN METHOD** ☐=unacceptable, ☒=acceptable, ■=best						
PARAMETER	**SITE CONDITION**	Pervious Concrete (Asphalt Concrete or Portland Cement)	Porous Asphalt	Turf Block	Brick	Natural Stone	Concrete Unit Pavers	Crushed Aggregate
SOIL TYPE	Clay	☐	☐	☒	☒	☒	☒	■
	Loam	☒	☒	☒	☒	☒	☒	■
	Shallow Bedrock	■	■	■	■	■	■	■
SLOPE	0% to 3%	☒	☒	■	■	■	■	■
	4% to 7 %	■	■	■	■	■	☒	☒
	8% to 12%	■	■	☒	☒	☒	☒	☐
	>12%	■	■	☐	☐	☐	☒	☐
CLIMATE	SE Marin County	■	☒	■	☒	■	■	■
PROXIMITY TO WATER/STORM DRAIN	>1,000 ft *(usually rural areas)*	■	■	■	■	■	■	■
	500 ft to 1,000 ft *(usually rural, some urban areas)*	■	■	■	■	■	■	■
	100 ft to 500 ft *(usually urban, some rural areas)*	☒	☒	■	☒	■	■	■
	50 ft to 100 ft *(usually urban areas)*	☒	☒	■	☒	☒	■	☒
COST *H=High M=Moderate L = Low*	Initial	H	H	M	H	H	H	L
	Maintenance	H	H	H	M	M	M	M
Effectiveness for reducing runoff		■	■	■	☒	☒	☒	■
Durability/Life Span		☒	☒	☒	■	■	■	☐

[3]Adapted from the "Condensed Planning & Design Guide for Surface Water Pollution Control Planning and Permanent Best Management Practices", Marin County Stormwater Pollution Prevention Program (no date).