

# ECO-FRIENDLY DRIVEWAY DEMONSTRATION SITE

735 Homer Avenue, Palo Alto

This site is one of two sites that comprise a San Francisquito Watershed Council project<sup>1</sup> to demonstration materials and techniques that reduce urban runoff. Urban runoff – the rainfall that flows off of rooftops, road, and parking lots – washes pollutants into creeks and increases creek bank erosion. The five techniques used at this site replace the 180-foot long asphalt driveway and a concrete patio with permeable materials and direct roof runoff to areas where it can sink into the ground. For more detailed information on the project and techniques used, see [www.sanfranciscuito.org/runoff](http://www.sanfranciscuito.org/runoff).

## SUMMARY OF TECHNIQUES USED

Technique	Dimensions	Total cost <sup>(a)</sup>	Unit cost	Average annual runoff reduction <sup>(b)</sup>
(1) Reused concrete	470 square feet	\$3,200	\$ 6.80 / sq. ft.	2930 gallons
(2) Unit pavers	845 square feet	\$19,600	\$23.20 / sq. ft.	5270 gallons
(3) Gravel trench	180 feet long	\$7,000	\$38.90 / lin. ft.	3620 gallons (from 580 sq. ft. roof runoff)
(4) Concrete pad (not permeable)	736 square feet	\$13,200	\$17.90 / sq. ft.	4590 gallons (runoff drains to Hollywood driveway)
(5) Hollywood driveway	720 square feet	\$12,600	\$17.50 / sq. ft.	4490 gallons
(6) Rain garden	78 square feet	\$2,100	\$26.90 / sq. ft.	3730 gallons (from 520 sq. ft. roof runoff + 78 sq. ft. asphalt removed)
<b>TOTAL</b>		<b>\$57,700</b>		<b>24,630 gallons</b>

Notes:

(a) Includes labor, materials, equipment rental, and dump fees – see DETAILED INFORMATION below for material costs.

(b) Based on estimated infiltration of at least 10 inches per year (average annual rainfall is 16 inches). Future monitoring data will refine this estimate.

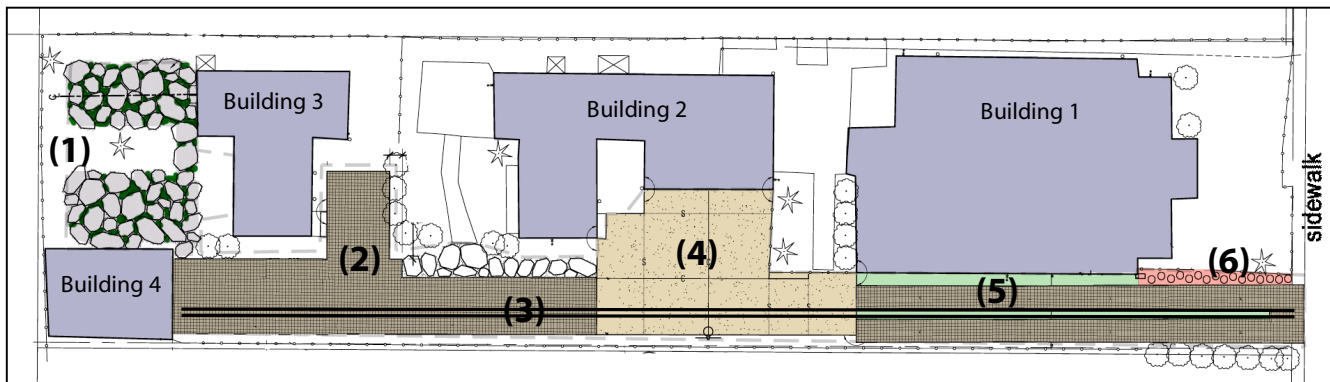


Figure 1. Site diagram (post-project)

## DETAILED INFORMATION BY TECHNIQUE

### (1) Patio made of reused concrete

**Materials:** Existing concrete patio broken into large pieces (approximately 2 – 2.5' in diameter) and relaid with rough surface facing up (for aesthetics) and gaps between pieces. Baby's tears planted in gaps.

**Benefits:** 470 square feet concrete removed, all rainfall infiltrates into ground (based on observations from 10/06 to 3/07)

<sup>1</sup> "Funding for this project has been provided in full or in part through an Agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use."

## (2) Unit pavers

Material	Dimensions, description	Unit cost
Unit pavers	845 sq. ft., paver style: San Francisco Rima made by Basalite*	\$3.35/sq. ft.
Bedding material	1/4" crushed (angular) rock, 1" deep (under pavers)	\$55/ton
Permeable base	3/4" crushed (angular) rock, 6" deep (under bedding material)	\$52/ton

**Benefits:** 845 square feet asphalt removed, all rainfall infiltrates into ground (based on observations from 10/06 to 3/07)

**Additional notes:** Pavers placed on gradual slope away from buildings; California fescue seeded in gaps.

**Lessons learned:**

- **Problem:** Originally used Grasspave2 (plastic matrix with grass growing through it) for half of area between concrete pad and Building 4, and unit pavers for other half where cars park overnight. However, the grass did not survive the four car trips per day (in and out for two cars). **Solution:** Replaced Grasspave2 areas with unit pavers.

## (3) Rooftop runoff to gravel trench

Material	Dimensions, description	Unit cost
Trench	180' long, 16" wide, 18" deep	Excavation costs
Perforated drain pipe	180' long, 4" diameter, 1/2" perforations	\$8.99/10' section
Filter fabric	180' long, 6' wide, wrapped around crushed rock to prevent surrounding soil from clogging void spaces	\$1.00/ft (roll 6' wide)
Crushed rock	3/4" crushed (angular) rock, 12" deep	\$52/ton

**Benefits:** absorbs runoff from 580 square feet of roof, all rainfall infiltrates into ground (no overflow from 10/06 to 3/07)

**Additional notes:** Standard PVC pipe conveys water from downspouts to perforated pipe in trench. Pop-up emitter at end of trench serves as overflow outlet for when trench is fully saturated.

**(4) Concrete pad:** Detailed information not given for concrete pad because it is not a runoff reduction technique.

## (5) Hollywood driveway (wheel tracks)

Material	Dimensions, description	Unit cost
Unit pavers	72' long, each track 34" wide (408 sq. ft.), 27" between tracks, paver style: San Francisco Rima made by Basalite*	\$3.35/sq. ft.
Bedding material	1/4" crushed (angular) rock, 1" deep (under pavers)	\$55/ton
Permeable base	3/4" crushed (angular) rock, 6" deep (under bedding material)	\$52/ton
Grasspave2	72' long, 27" wide (seeded with an extra hearty fescue variety)	\$2.85/sq. ft.

**Benefits:** 700 square feet asphalt removed, all rainfall infiltrates into ground (based on observations from 10/06 to 3/07)

**Lessons learned:**

- **Problem:** Original 20"-wide tracks too narrow for long driveway where backing out required. Rutting occurred in grass along edges of tracks. The worst rutting occurred at beginning of driveway due to turning in from street. Also, irrigation runoff flowed down concrete tracks to street. **Solution:** Replaced with wider tracks made of unit pavers. Also, used pavers across full width for first 3' of driveway.

## (6) Rain garden

Material	Dimensions, description	Unit cost
Plants	Pacific rush, woodland strawberry, monkey flower	varies
Soil mix	26' long, 3' wide, 12" deep, 50% construction sand, 25% topsoil, 25% organic leaf compost	\$34/yard
Drain rock	26' long, 3' wide, 12" deep	\$52/ton

**Benefits:** 78 square feet of asphalt removed, absorbs runoff from 520 square feet of roof, all rainfall infiltrates into ground (based on observations from 10/06 to 3/07)

\* We gratefully acknowledge Basalite's donation of 11 pallets of San Francisco Rima pavers.

