SAN MATEO COUNTY
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CONSERVATION
DISTRICT

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625 Miramontes Street, Ste.103, Half Moon Bay, CA 94019
www.sanmateoRCD.org

James V. Fitzgerald ASBS Pollution Reduction Program
Upland BMPs: Low Impact Development (LID) Projects
Pre- and Post-Construction Photo Documentation - January 20 th2016

LID Site #2 – Cooperator ID #202.0409.01

Site Information : 130 Wienke Way, Moss Beach, California

This property is on the west side of Highway 1, at the turn to the Fitzgerald Marine Reserve. This is property is on ~9,000 square foot parcel downslope of the highway where stormwater would flow from the highway through the property to a ditch draining to the ASBS.

Project Summary

This project was designed to capture, infiltrate and treat stormwater from two roof structures on the property through two rain gardens, two vegetated swales and a three-pooled rain garden system. Roof runoff on the back half of the eastern building is directed through rain chains and barrels that the landowner installed with overflow into a drain line which outlets at a gravel inlet riser to a 19 x 6 foot rain garden. The rain garden provides infiltration as primary treatment and overflows into a 60 foot treatment swale (no mow sod) that flows to the public road. Roof runoff on the front half of the western building is directed through new gutters and downspouts that drain directly to a 13 x 8 foot rain garden. The rain garden provides infiltration as primary treatment and overflows through a rock weir to the public road. A 100 foot treatment swale (no mow sod) across the back of the property collects runoff from the adjacent public highway and directs it to the three-pooled rain garden system. The rain garden system consists of three separate rain gardens (9x12 ft each) that drain in a series through a set of rock weirs. The rain garden provides infiltration as primary treatment. Perforated pipe was installed under the rain garden to provide an outlet for water filtered through the biofiltration media after the soil under the system is saturated. During a large storm event an outlet riser drains this rain garden to the rain garden in front of the western building.

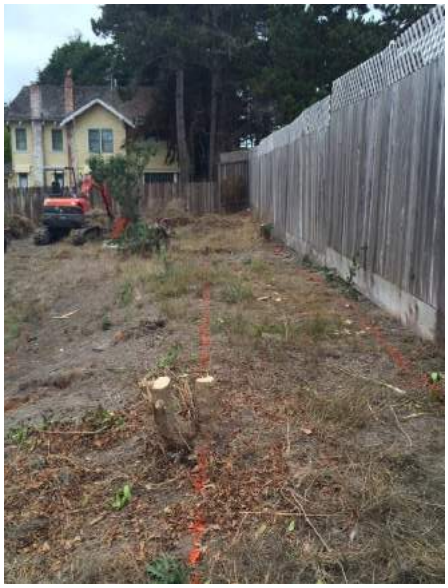
<u>BMP Photo Documentation</u>

Hedgerow/Swale

Pre-construction

Future site of bioswale alongside of property towards Highway 1

During construction



Marking and digging trench for bioswale

Filling in trench with biosoil mix

Post-construction

Bioswale of native no-mow grass to collect runoff from the adjacent public highway

Bioswale leading to three-tiered rain garden system

Three-tiered rain garden system

Pre-construction

Future site of three-tiered rain garden (along fence)

During Construction

Trenching for pipes beneath the three-tiered rain garden

Laying pipe alongside house from three-tiered rain garden towards west rain garden

Shaping the three basins of the three-tiered rain garden showing outlet riser and rock weirs

Post-construction

Native plants including grasses, sedges and natives within the three-pooled rain garden system

West Rain Garden

Pre-Construction

Future site of rain garden in front of western house

During Construction

Excavating and laying pipes for western rain garden

Piping for roof runoff and leading to western rain garden

Post-construction

Western rain garden

East Rain Garden and Swale

Pre-Construction

Future site of eastern rain garden and swale alongside of eastern house

During Construction

Marking site of eastern rain garden

Digging eastern rain garden

Post-Construction

East rain garden after big rain and no-mow sod laid in bioswale which accepts overflow from East Rain Garden

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LID Site #3 – Cooperator ID #202.0829.01

Site Information: **1120 Cedar St, Montara, California**
This property is located on the east side of Highway 1 in Montara and drains into Montara Creek. The residence is on ~6,000 square foot parcel with a 1,570 square foot roof structure. Stormwater from an uphill neighbor and runoff from large amounts of impervious surfaces discharges to a nearby drainage ditch.

Project Summary
This project was designed to capture, infiltrate and treat stormwater from the house roof through rain water tanks and a rain garden, and reduce runoff by replacing the concrete driveway and patio with permeable surfaces. A first flush system was installed at the outlet of the existing west house gutter. Three 205 gallon rain water tanks were installed on the south side of the house to accept filtered water from the first flush system. The rain barrels overflow into an existing drain line which outlets at a gravel inlet riser to a 12x22 ft rain garden. The rain garden provides infiltration as primary treatment. Perforated pipe was installed under the rain garden to provide an outlet for water filtered through the biofiltration media after the soil under the system becomes saturated. An outlet riser in the rain garden was installed to drain the feature during a large storm event to a gravel drainage outlet near the road armored with riprap. An irrigation connection was installed at the rain water tanks allowing stored water to be used for irrigation and to reduce water levels in the tanks before storm events.

The existing concrete and asphalt driveway in addition to a large tree stump were removed and replaced with a traditional asphalt driveway (380 sq ft) in the right of way and a permeable asphalt driveway (480 sq ft) on the property. Overflow in the gravel reservoir base under the permeable asphalt flows into a perforated pipe underdrain that outlets to the rain garden overflow outlet pipe. The concrete patio on the west side of the property was replaced with pavers in one section (230 sq ft) and an earthen swale with drain rock in another section (230 sq ft) to increase infiltration. Perforated pipe was installed underneath these features to allow for drainage after the soil is saturated. Perforated pipe was installed along the north edge of the property and the top of the driveway to route water from the back and north side yard to the rain garden. The asphalt on the north side of the driveway was preserved for access while asphalt and concrete were removed on the west side of the driveway and replaced with vegetation to improve infiltration. A clear roof (50 sq ft) was installed in the existing chicken coop on the west side of the property to keep feces separated from rain water.

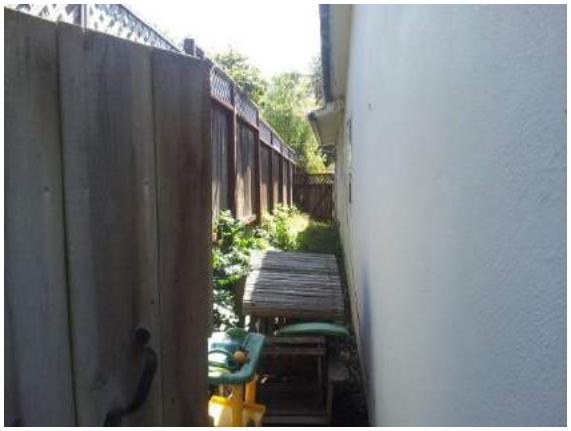
BMP Photo Documentation
Pre-construction

Concrete driveway before permeable asphalt installed Side of driveway to be removed and vegetated

Large stump to be removed from driveway (left) and future rain garden area (right)

Future site of rain water tanks

Chicken coop roof without plastic roof



Backyard patio/future site of pavers and swale (left) and drainage area on north side of property (right)

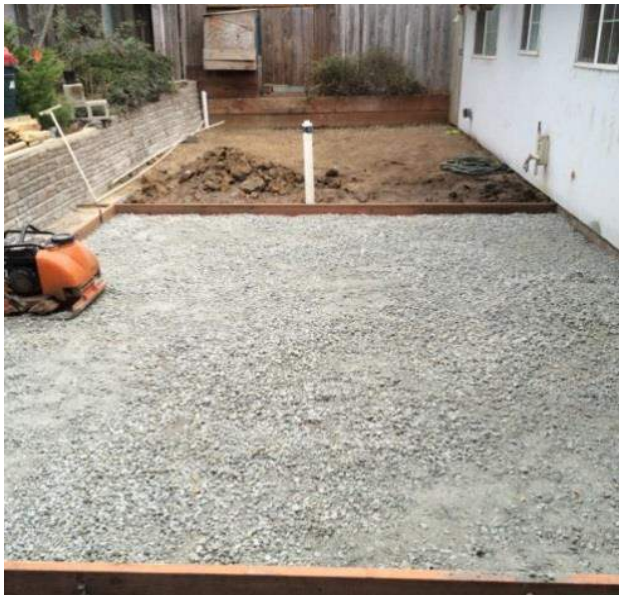
During construction

Stump removal from driveway

Removal of concrete driveway and installation of base layers

Installation of asphalt driveway with permeable section on top and regular asphalt on bottom

Side driveway area with asphalt removed and erosion control mats installed for vegetation



Backyard patio concrete removal and installation of drainage features

Installation of rain garden

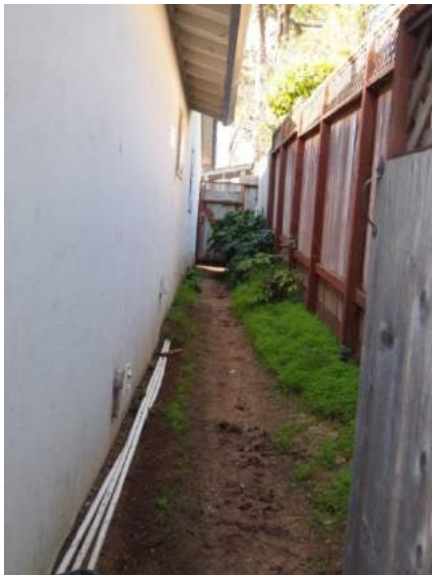
Post-construction

Permeable and impermeable asphalt driveway

Revegetated side driveway with rain garden drainage outlet and riprap

Backyard patio area

Chicken coop with roof structure



North side drainage area

Rain water tanks with overflow to the rain garden

Rain garden with overflow from tanks, and drainage from backyard, north side yard, and driveway

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LID Site #4; Cooperator ID # 202.0619.01

Site Information: 1339 Ivy Street, Montara, California
This property is on ~44,000 square foot parcel with a residence and 1,720 square foot asphalt roof. This property has a long gravel driveway and stormwater currently erodes the driveway and flows across the road and pasture onto the downhill neighbor's property. Stormwater drains to Sunshine/Dean creek near the drainage divide with Montara Creek.

Project Summary
This project was designed to capture, infiltrate and treat stormwater from the garage roof and driveway through rain barrels, rain gardens and a vegetated swale. New gutters were installed with first flush systems on the existing garage. Two sets of three 205 gallon rain barrels were installed on the northeast side of the garage which accepts filtered water from the first flush system. The rain barrels overflow into a drain line which outlets at a gravel inlet riser to a 20x30 ft rain garden. The rain garden provides infiltration as primary treatment. Perforated pipe was installed under the rain garden to provide an outlet for water filtered through the biofiltration media after the soil under the system is saturated. An outlet riser in the rain garden was installed to drain the feature during a large storm event to a stabilized rock outlet on the other side of the driveway. This drain line also collects water from the driveway for treatment and to reduce flow rate and erosion downstream on the driveway. A swale with native grass seed and a turf reinforcement mat was installed after the stabilized rock outlet to convey water to another swale with the native grasses and a reinforcement mat at the bottom of the slope to provide filtration in smaller storm events. The lower swale provides infiltration as primary treatment. Two ten foot long concrete masonry unit weirs were installed as an overflow for large storm events and spread the flow to reduce erosion. An irrigation connection was installed at the rain barrel system allowing stored water to be used for irrigation and the reduction of water levels in the tanks before storm events.

<u>BMP Photo Documentation</u>

Rain barrels

Pre-construction

Future site of rain barrels and downspouts and gutters

During construction

Installations of rain barrels with overflow drain line leading to rain garden

Post-construction

Rain barrels with first flush system

Rain Garden

Pre-construction

Future site of rain garden

During construction

Grading of rain garden and piping installation

Post-construction

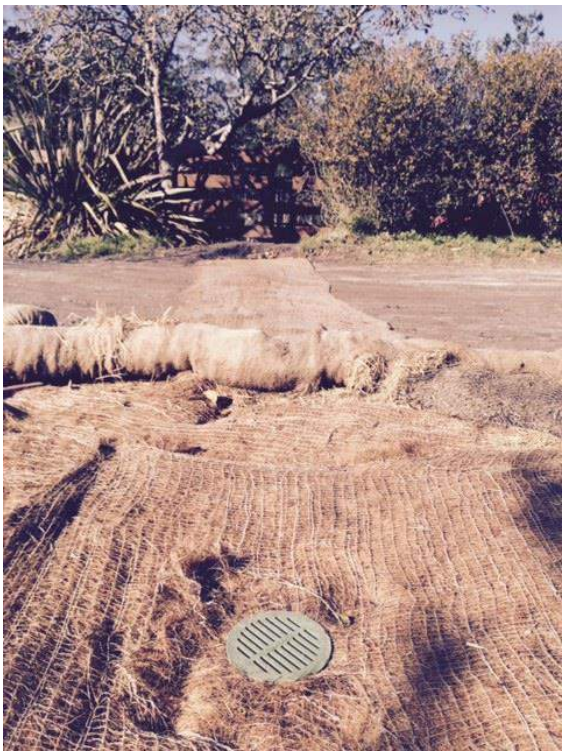
Rain garden

Driveway

Pre-construction

Long gravel driveway that stormwater currently erodes

During construction



Installing drainage road inlet with temporary erosion control mats leading to the bioswale

Bioswale

Pre-construction

Location of bioswale

During construction

Marking of bioswale

Post-construction

Turf reinforcement mat placed in graded swale area and temporary erosion control mats

Gravel drainage outlet

Weirs

Pre-construction

Location of weir placement

During construction

Installation of overflow weirs

Post-construction

Overflow weirs located at the bottom of the bioswale

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LID Site #5 – Cooperator ID #202.0815.01

Site Information: 871 San Ramon Avenue, Moss Beach, California
The property is located west of Highway 1 in Moss Beach in the bluff-top community above the Fitzgerald Marine Reserve. The property is ~ 8,000 square feet with a house with an asphalt roof (460 square feet). Stormwater would flow to a roadside ditch and discharge to the ASBS. Erosion would also occur on the west side of the house near the driveway.

Project Summary
This project was designed to capture, infiltrate, and treat stormwater from the house roof through rain storage tanks and a rain garden/bioswale system. Pressurized downspout systems were installed at the downspouts on the north side of the house and connected with a feed line to two 900 gallon rain storage tanks. The rain storage tanks overflow into a drain line which outlets at a gravel inlet riser to a rain garden/bioswale system along the northeast side of the property. The system consists of a 40 foot vegetated swale north of the house that collects site drainage and tank overflow and outlets to a 18x9 foot rain garden. This rain garden overflows to another 40 foot long vegetated swale on the southwest side of the property.

The rain garden and swales provide primary treatment through infiltration. Perforated pipe was installed under the rain garden and downstream swale to provide an outlet for water filtered through the biofiltration media after the soil under the system is saturated. An outlet riser at the end of the downstream swale was installed to drain the feature during a large storm event to the southwest side of the property. An irrigation riser was installed and connected to the rain storage tanks allowing stored water to be used for irrigation and the reduction of water levels in the tanks before storm events. Two additional courses were added to the brick wall on the west side of the house to reduce erosion of the earth slope uphill from the wall.

BMP Photo Documentation

Pre-construction

Future location of rain water tanks (left) and upstream section of rain garden/bioswale system (right)

Future location of rain garden and downstream section of bioswale system

West side of property showing previous brick wall

During construction

Northeast side of property showing location of rain water tanks and piping for downspouts/swale

Upstream section of the bioswale/rain garden system

Downstream section of bioswale/rain garden system

Post-construction

Rainwater tanks on north side of the property


Bioswale/rain garden system

West side of property showing new brick wall/erosion control structure

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LID Site #6 – Cooperator ID #202.0814.03

Site Information: 854 San Ramon Avenue, Moss Beach, California
This property is located west of Highway 1in Moss Beach in the bluff-top community above the Fitzgerald Marine Reserve. The residence is on a ~5,000 square foot parcel and stormwater runoff would flow onto the adjacent neighbor's property and into a drainage ditch on the east side of the property that discharges to the ASBS.

Project Summary
This project was designed to infiltrate stormwater from the house roof through a rain garden and bioswale system and reduce runoff by replacing the concrete driveway with permeable asphalt. Drainage inlets were installed at the downspouts on the north side of the house and flow into a drain line which outlets at a gravel inlet riser to the 8 x 15 ft rain garden. The rain garden provides treatment and infiltration of captured rain water. The rain garden overflows to the 35 ft bioswale for further infiltration and outlet to the road. The existing concrete driveway was removed and replaced with permeable asphalt (425 sq ft) in order to reduce runoff to the roadside ditch. The permeable asphalt provides infiltration as primary treatment. Overflow in the gravel reservoir base under the permeable asphalt flows into a perforated pipe underdrain that outlets on the southeast side of the house. The project also involved removing a tree stump and invasive Pittosporum tree during grading operations for the rain garden/bioswale system.

BMP Photo Documentation

Pre-construction


Rain garden area with tree to be removed (left) and bioswale area to be connected to rain garden (right)


South side of property showing driveway (left) and area for driveway underdrain and outlet (right)

During construction

Piping from downspouts to rain garden

Rain garden area where tree was removed (left), bioswale leading to the rain garden (middle), and bioswale to rain garden connection

South side of property showing permeable asphalt work on driveway

South side of property showing driveway underdrain and outlet area

Post-construction

Rain garden on north side of house

Bioswale with sod (left) and connection of the swale and rain garden (right)

Permeable asphalt driveway (left) and underdrain and outlet for driveway (right)

San Mateo County Resource Conservation District

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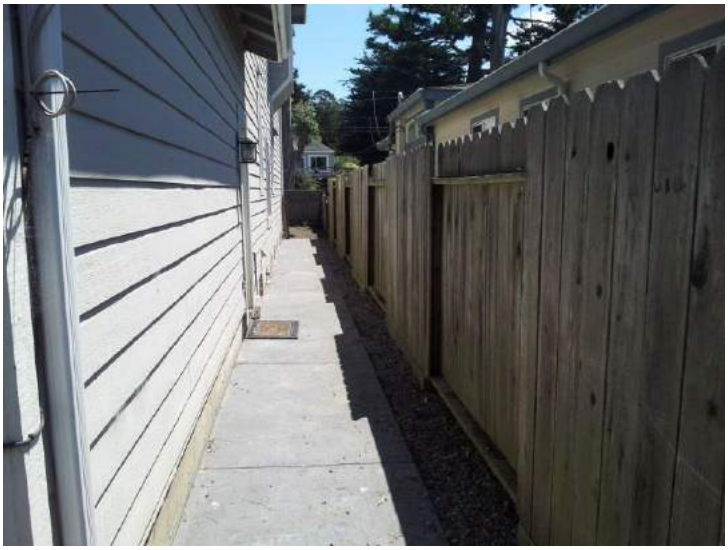
LID Site #7 Cooperator ID # 202.0813.02

Site Information: 1174 Hawthorne Street, Montara, California
This property is on ~7,000 square foot parcel near the boundary of Sunshine/Dean Creek near the drainage divide of Montara Creek. Stormwater would run off the property onto neighbor's property and then into a roadside ditch.

Project Summary
This project was designed to infiltrate and treat stormwater from the asphalt shed roof (210 sq ft) and the new chicken coop cover through a rain garden. A permanent 350 square foot roof was constructed over the chicken coop with gutters and a downspout to keep feces separated from rain water. Drainage inlets were installed at the downspouts on the shed and the chicken roof cover to allow flow into a drain line which outlets at a gravel inlet riser to a 22x10 foot rain garden on the northwest side of the property. The rain garden provides infiltration as primary treatment. Perforated pipe was installed under the rain garden to provide an outlet for water filtered through the biofiltration media after the soil under the system is saturated. An outlet riser in the rain garden was installed to drain the feature during a large storm event to run through a drain line on the south side of the house to a gravel drainage outlet with riprap at the road.

BMP Photo Documentation
Pre-construction

Northwest side of property showing future rain garden area and chicken coop without roof



South side of property and future location for drain line (left) leading to gravel drainage outlet (right)

During construction

Rain garden installation with piping from shed and around to south side of property

Wooden posts for chicken coop roof structure

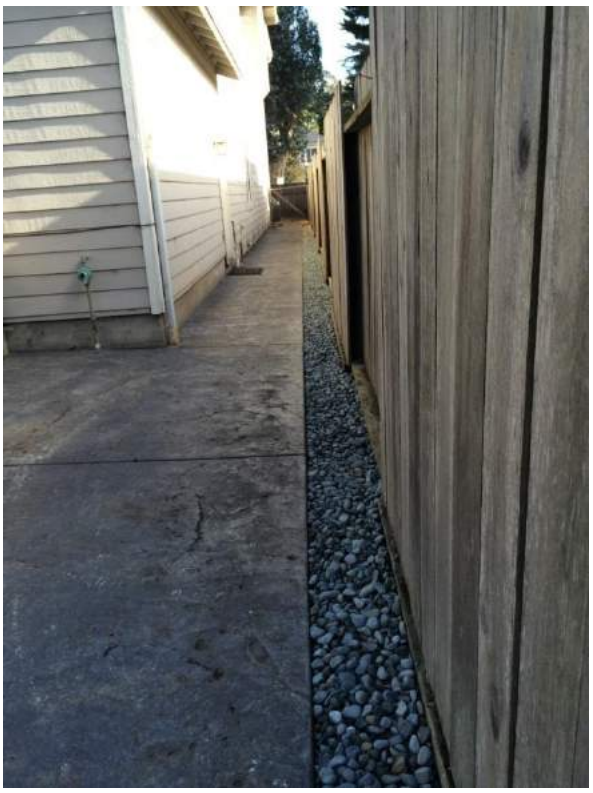
Trench for drain line from rain garden (left) that leads to gravel drainage outlet at road (right)

Post-construction

Rain garden and chicken coop roof

Rain garden with runoff from chicken coop roof and shed

Redwood chicken coop roof with corrugated plastic panels and gutters



South side of property with drain line under rock (left) leading to gravel drainage outlet with riprap (right)

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LID Site #9 – Cooperator ID #202.0724.01

Site Information: 278 California Street, Moss Beach, California
This property is on a ~ 5,000 square foot parcel about a block from the Fitzgerald Marine Reserve on California Street. Stormwater from the roof structures (1,080 square feet) and the neighboring properties infiltrated very poorly and would flow to a drainage ditch discharging directly to the Reserve and the ASBS.

Project Summary
This project was designed to capture and infiltrate stormwater from the house and shed roofs through rain barrels and rain gardens. A first flush system was installed at the outlet of the existing north house gutter. Three 205 gallon rain barrels were installed on the north side of the property which accept filtered water from the first flush system. These rain barrels overflow into a drain line which outlets at a gravel inlet riser to a 5x14 ft rain garden on the east side of the property.

A first flush system was also installed at the outlet of the existing south house gutter. Three 205 gallon rain barrels were installed on the south side of the property which accept filtered water from the first flush system. The rain barrels overflow into a drain line which outlets at a gravel inlet riser to a 8x24 ft rain garden on the south side of the property.

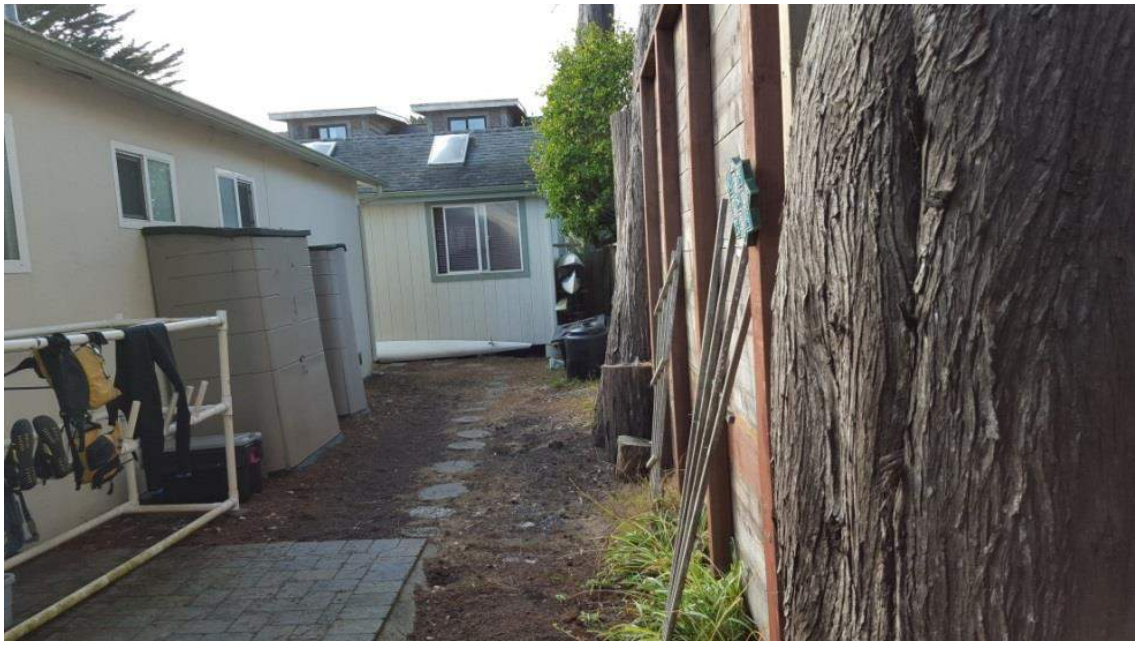
The rain gardens provide treatment and infiltration of captured rain water. The rain gardens will overflow overland in the case of a large storm event as installing underdrains and outlets was not possible at this site. Irrigation risers were installed and connected to both rain barrel systems allowing stored water to be used for irrigation and the reduction of water levels in the tanks before storm events. Impervious membranes were installed vertically in the rain gardens as a water-proofing measure to protect infrastructure on neighboring properties.

BMP Photo Documentation

Pre-construction

North side of property and future location for rain water tanks

East side of property and future location for rain garden



South side of property and future location for rain water tanks and bioswale

During construction

Rain water tanks on north side of property that overflow to the east rain garden

East rain garden installation

Installation of rain water tanks and rain garden on south side of house

Post-construction

Rain water tanks and rain garden on east side of property

Rain water tanks and rain garden on south side of property