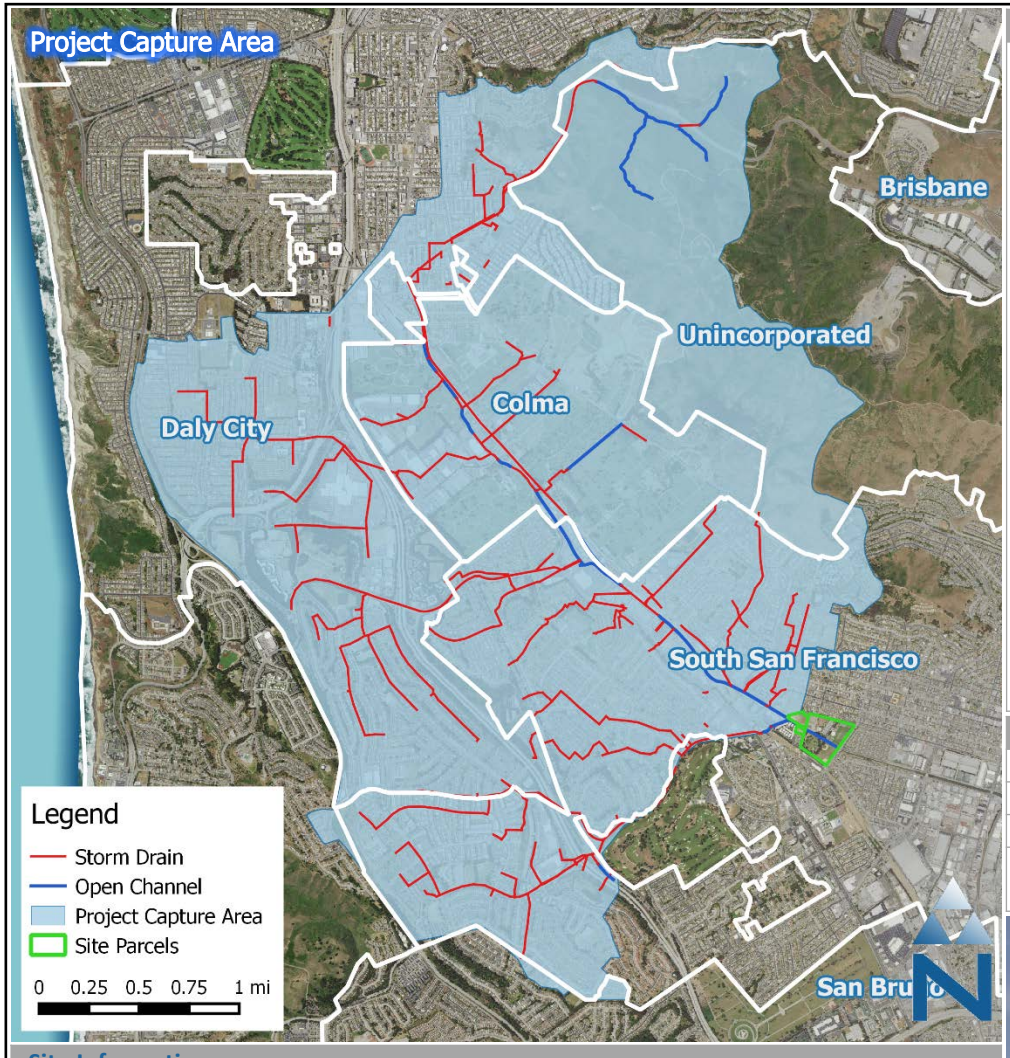


Site Description:

This project concept consists of two offline subsurface infiltration chambers at Orange Memorial Park. The park is a prime location to site a regional stormwater capture project and captures stormwater from large portion of the upper Colma Creek watershed and multiple city and county jurisdictions. The potential capture area of the project is roughly 6,300 acres that drains portions of the cities of South San Francisco, Colma, and Daly City and Unincorporated San Mateo County. A stormwater capture project at this location would aid these jurisdictions in meeting stormwater permit compliance and alleviate flooding in the lower reaches of Colma Creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (including TMDLs that require reductions of mercury and PCB loads), augment water supply by recharging the Westside groundwater basin, and provide community enhancement through integration with the recreational facilities of the park. With the incorporation of a hydrodynamic separator for pretreatment of diverted water from the creek, the project also provides the reduction of trash transported through the creek to the San Francisco Bay. The Orange Memorial Park Master Plan (2007) was referenced in this design to ensure that the concept is consistent with the goals of future development for the park.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

Drainage Characteristics

Capture Area (acres)	6,300
Impervious Area (%)	38
Dominant Land Use	Residential
Jurisdictions	South San Francisco, Colma, Daly City, Unincorporated San Mateo County

Orange Memorial Park: street view facing upstream of Colma Creek from W Orange Ave

Site Information

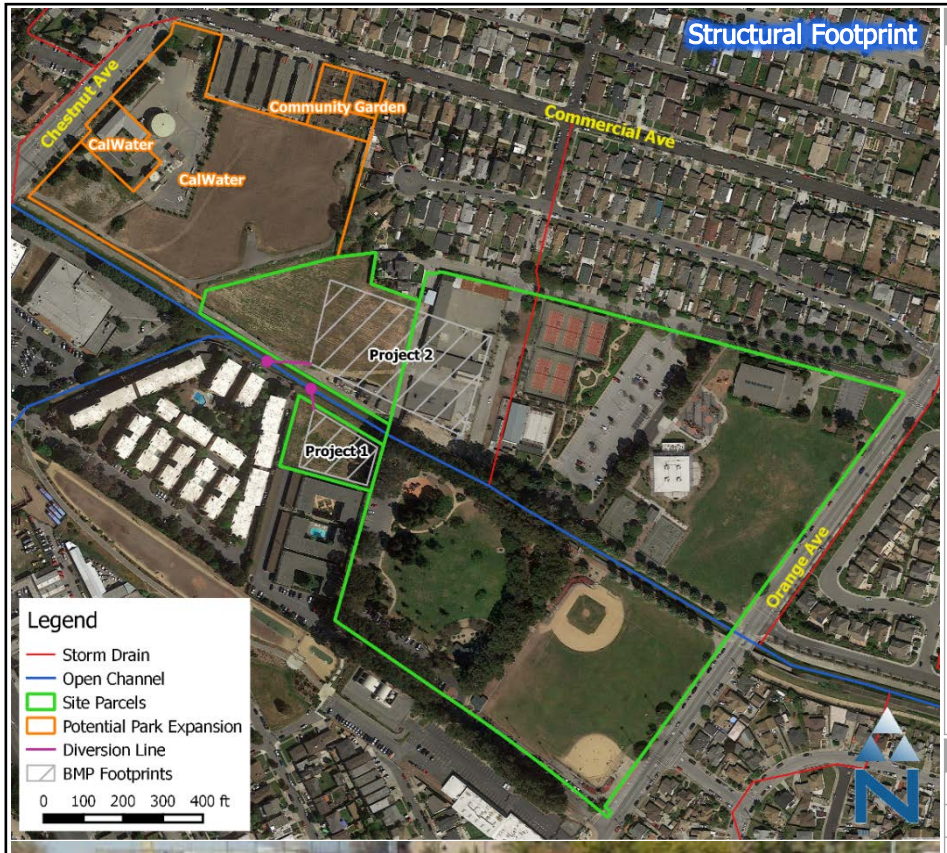
Land Owner	City of South San Francisco
Street Address	Orange Ave, South San Francisco, CA 94080
Latitude/Longitude	37° 39’ 13.1” N / 122° 25’ 35.4” W
Watershed	Colma Creek

Concept for a Multi-jurisdictional Regional Stormwater Capture Project

Site: Orange Memorial Park (City of South San Francisco)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL



Example concrete infiltration chamber

Site Description:

Two subsurface infiltration chambers will be considered on parcels owned by the City of South San Francisco to the west of Orange Memorial Park. Both parcels were acquired by the City of South San Francisco in 1996 and, while vacant, are included in plans for future park expansion. The first chamber (Project 1) will be located in the vacant parcel to the south of the Colma Creek channel. The second chamber (Project 2) will be located in portions of the vacant parcel to the north of the channel and the current park parcel. The Project 2 site represents the location of the future little league baseball fields according to the Master Plan. Runoff would be diverted directly from Colma Creek and details of the diversion structures will be determined during the design phase through coordination with the San Mateo County Flood Control District. A pretreatment unit (e.g. hydrodynamic separator) will be implemented to provide trash and sediment capture. Two projects are proposed to maximize the amount of available space used for the design and to provide an option for the City of South San Francisco to implement the design in two separate phases. This would allow the City to move forward with each phase separately as funding is acquired. The Master Plan also accounts for the possible purchase of the CalWater parcels along Chestnut Avenue for future park expansion, which could be used to expand Project 2 if that land becomes available. The proposed design (both chambers) would allow for the treatment of 26% of the 85th percentile, 24-hour runoff volume (36.4 of 142.4 ac-ft) for the Colma Creek watershed. As these volumes are completely removed via storage and infiltration, this provides an equivalent 26% reduction of pollutant loads for the storm event.

DISCLAIMER: All elements of this conceptual design are planning-level, based on desktop analysis. All assumptions and parameters must be re-evaluated during the detailed design process. Costs estimates are based on available data. Actual costs will vary.

Design Criteria

Precipitation, 85th percentile, 24-hr storm (in)	0.83
Colma Creek Runoff Volume, 85th percentile, 24-hr storm (ac-ft)	142.4
Colma Creek Peak Discharge, 85th percentile, 24-hr storm (cfs)	309
Infiltration Rate (in/hr)	0.5

Project Characteristics	Project 1	Project 2
Stormwater Capture Process	Subsurface Infiltration Chamber	
Footprint (acres)	0.5	2.3
Design Height (ft)	12	12
Depth of Excavation (ft)	15	15
Pumping Requirements	Dependent on Geotechnical Investigation	
Design Volume (ac-ft)	6	27.6
24-hr Infiltration Volume (ac-ft)	0.5	2.3
Total Treatment Volume (ac-ft) [1]	**6.5**	**29.9**
Percent Treated [2]	**5%**	**21%**

1 – sum of the Design Volume and 24-hr Infiltration Volume
2 – percentage the 85th percentile 24-hr storm Runoff Volume that is treated

Concept for a Multi-jurisdictional Regional Stormwater Capture Project

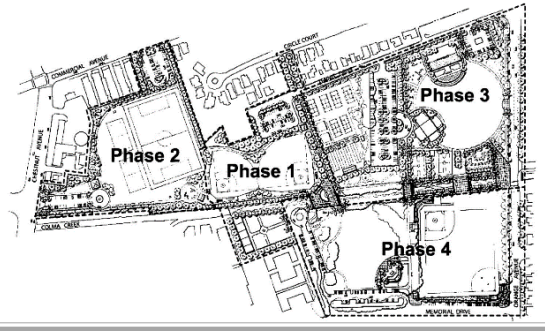
Site: Orange Memorial Park (City of South San Francisco)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Project Implementation:

The figure to the left depicts the layout for the two subsurface infiltration chambers in relation to the planned improvements in the Orange Memorial Park Master Plan 2007. The figure below depicts the phased implementation of various areas of the park according to the Master Plan. The proposed infiltration chambers would coincide with Phase 1. Adding a stormwater component to the first phase of park improvements would likely garner enthusiasm for park enhancements and open avenues for funding. Phase 1 of the Master Plan can be further split into two sub-phases. The first sub-phase of park improvements would include Project 1 in the location of the future community gardens. The second sub-phase would include Project 2 at the little league baseball fields.



Cost Estimate for Infiltration Chamber south of Colma Creek (Project 1)

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Removal	12,100	CY	$50.00	$605,000
Rubber Dam System	1	LS	$80,000.00	$80,000
Diversion Structure	1	LS	$100,000.00	$80,000
Hydrodynamic Separator Device	1	LS	$90,000.00	$100,000
Pump Structure	1	LS	$1,000,000.00	$1,000,000
Diversion Pipe (24" RCP)	100	LF	$200.00	$20,000
Infiltration Structure	9,680	CY	$300.00	$2,904,000
Restoration	21,780	SF	$2.00	$44,000
			CONSTRUCTION SUBTOTAL	$4,833,000
Mobilization (10% construction)				$483,000
Contingency (25% construction)				$1,208,000
Design (10% total)				$652,000
			TOTAL COST	**$7,176,000**

Cost Estimate for Infiltration Chamber north of Colma Creek (Project 2)

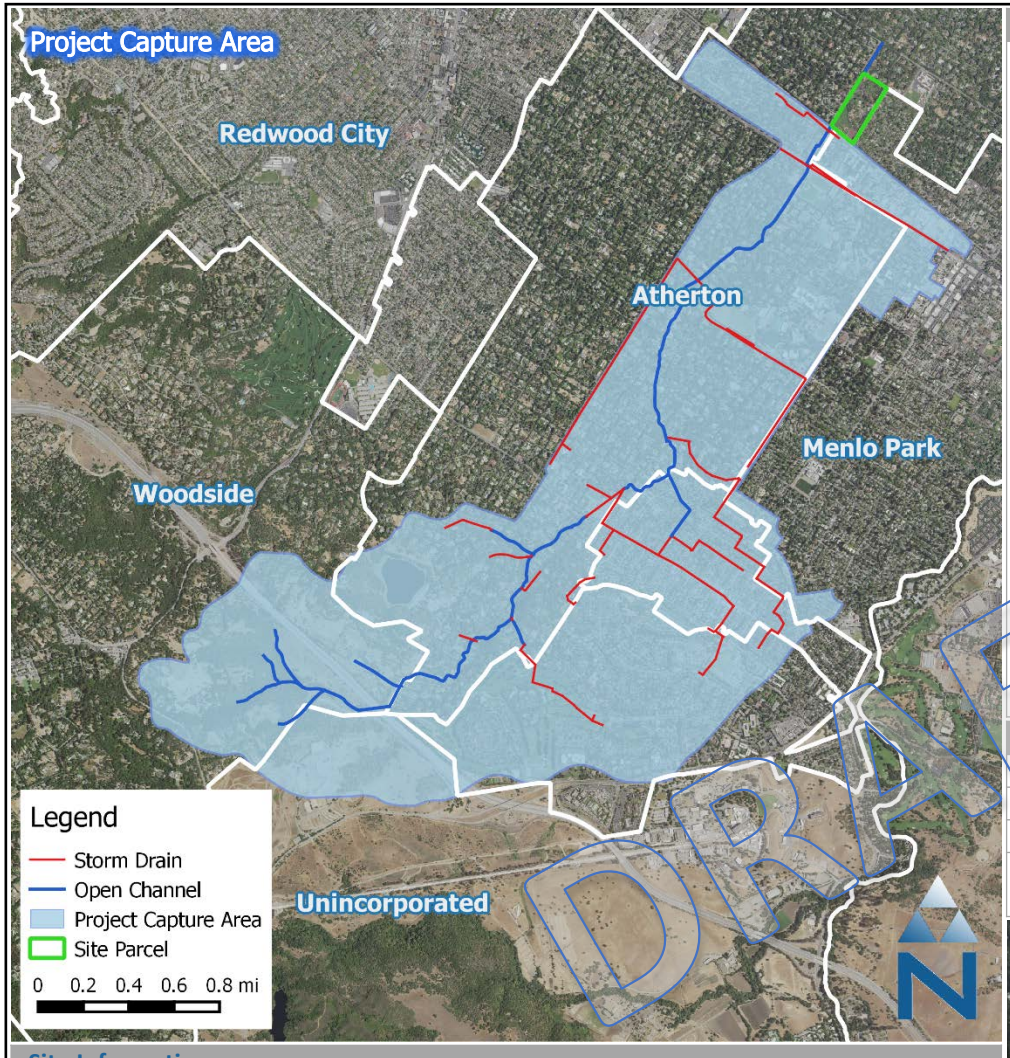
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Removal	55,660	CY	$50.00	$2,783,000
Rubber Dam System (dam from Project 1 can be utilized by both projects)				N/A
Diversion Structure	1	LS	$150,000.00	$150,000
Hydrodynamic Separator	1	LS	$150,000.00	$150,000
Pump Structure	1	LS	$1,750,000.00	$1,750,000
Diversion Pipe (24" RCP)	150	LF	$200.00	$30,000
Infiltration Structure	44,528	CY	$300.00	$13,358,000
Restoration	100,188	SF	$2.00	$200,000
			CONSTRUCTION SUBTOTAL	$18,421,000
Mobilization (10% construction)				$1,842,000
Contingency (25% construction)				$4,605,000
Design (10% total)				$2,487,000
			TOTAL COST	**$27,355,000**

Concept for a Multi-jurisdictional Regional Stormwater Capture Project

Site: Orange Memorial Park (City of South San Francisco)

San Mateo Countywide Water Pollution Prevention Program — Clean Water. Healthy Community. www.flowstostay.org

PARADIGM ENVIRONMENTAL



Site Description:

This project concept consists of an offline subsurface infiltration chamber at Holbrook-Palmer Park, owned and operated by the Town of Atherton. This is an ideal site for a regional stormwater capture project because of its proximity to Atherton Creek and the potential to treat a large multi-jurisdictional area. The project would capture flows and associated pollutant loadings from a large portion of the upper Atherton Creek watershed, encompassing sections of the Towns of Atherton and Woodside, City of Menlo Park, and Unincorporated San Mateo County. The project would help to address known flooding issues in the lower reaches of the creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (including TMDLs that require reductions of mercury and PCB loads), augment water supply by recharging the Santa Clara Valley groundwater basin, and provide community enhancement through integration with the recreational facilities of the park. With the incorporation of a hydrodynamic separator for pretreatment of diverted water from the creek, the project also provides the reduction of trash transported through the creek to the San Francisco Bay.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

DISCLAIMER: All elements of this conceptual design are planning-level, based on desktop analysis. All assumptions and parameters must be re-evaluated during the detailed design process. Costs estimates are based on available data. Actual costs will vary.

Drainage Characteristics

Capture Area (acres)	2,875
Impervious Area (%)	19
Dominant Land Use	Residential
Jurisdictions	Atherton, Menlo Park, Woodside Unincorporated San Mateo County


Holbrook-Palmer Park Sports Field

Site Information

Land Owner	Town of Atherton
Street Address	150 Watkins Ave, Atherton, CA 94027
Latitude/Longitude	37° 27’ 44.9” N / 122° 11’ 34.8” W
Watershed	Atherton Creek

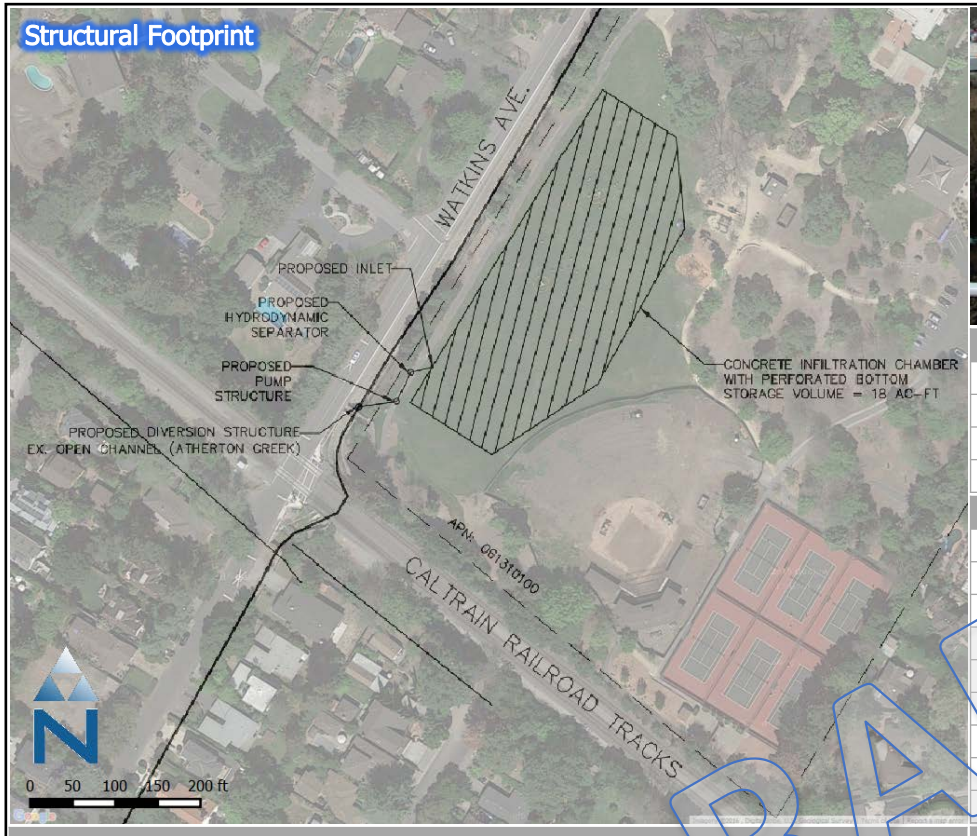
Concept for a Multi-jurisdictional Regional Stormwater Capture Project

Site: Holbrook-Palmer Park (Town of Atherton)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Structural Footprint




Example concrete infiltration chamber


Example Hydrodynamic Separator

Design Criteria	
Precipitation, 85th percentile, 24-hr storm (in)	0.86
Runoff Volume, 85th percentile, 24-hr storm (ac-ft)	65.90
Peak Discharge, 85th percentile, 24-hr storm (cfs)	72
Infiltration Rate (in/hr)	0.5

Project Characteristics	
Stormwater Capture Process	Subsurface Infiltration Chamber
Footprint (acres)	1.5
Design Height (ft)	12
Depth of Excavation (ft)	15
Pumping Requirements	Dependent on Geotechnical Investigation
Design Volume (ac-ft)	18
24-hr Infiltration Volume (ac-ft)	1.5
Total Treatment Volume (ac-ft) [1]	**19.5**
Percent Treated [2]	**30%**

Project Description:

A subsurface infiltration chamber will be considered in the sports field of Holbrook-Palmer Park. The project site is in the south-west corner of the park and will be located just outside of the newly-renovated baseball field. Stormwater will be diverted directly from the channelized segment of Atherton Creek that borders the park along Watkins Avenue. Runoff would first be directed to a pretreatment unit (e.g. hydrodynamic separator) before being routed to the chamber. This will assist in removing trash and sediments from the creek while also reducing maintenance requirements of the chamber. The proposed design would allow for the treatment of 30% of the 85th percentile, 24-hr runoff volume (19.5 of 65.90 ac-ft) for the Atherton Creek watershed. As these volumes are completely removed via storage and infiltration, this provides an equivalent 30% reduction of pollutant loads for the storm event. While no major enhancements are planned for the sports field in the Holbrook-Palmer Park Master Plan (2015), the Master Plan noted that the field could be regraded to improve the playing surface. This project would provide the opportunity to coordinate with the field regrading effort once the chamber is installed.

1 – sum of the Design Volume and 24-hr Infiltration Volume
2 – percentage of the 85th percentile, 24-hr storm Runoff Volume that is treated

Cost Estimate

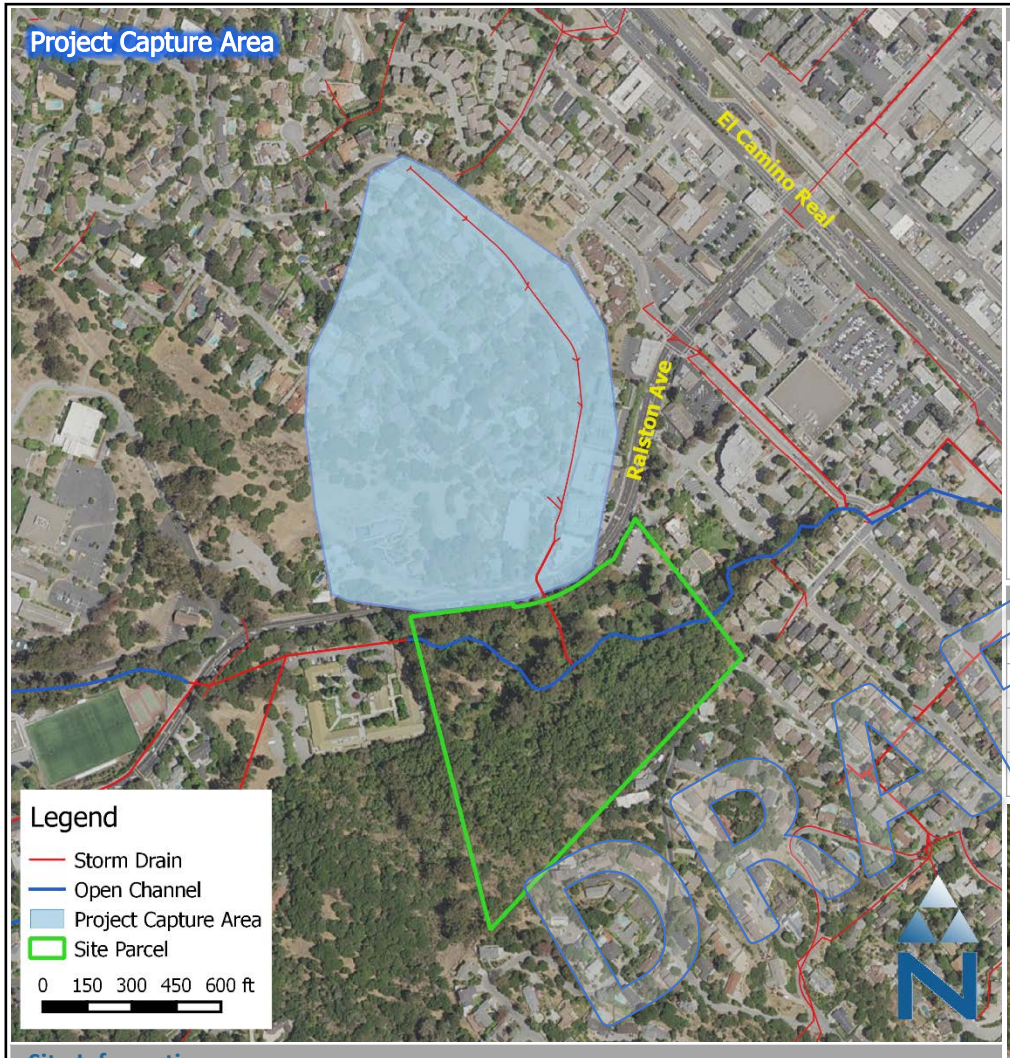
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Removal	36,300	CY	$50.00	$1,815,000
Rubber Dam System	1	LS	$80,000.00	$80,000
Diversion Structure	1	LS	$150,000.00	$150,000
Hydrodynamic Separator	1	LS	$120,000.00	$120,000
Pump Structure	1	LS	$1,500,000.00	$1,500,000
Diversion Pipe (24" RCP)	120	LF	$200.00	$24,000
Infiltration Structure	29,040	CY	$300.00	$8,712,000
Restoration	65,340	SF	$2.00	$131,000
			CONSTRUCTION SUBTOTAL	$12,532,000
Mobilization (10% construction)				$1,253,000
Contingency (25% construction)				$3,133,000
Design (10% total)				$1,692,000
			TOTAL COST	**$18,610,000**

Concept for a Multi-jurisdictional Regional Stormwater Capture Project

Site: Holbrook-Palmer Park (Town of Atherton)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL



Site Description:

This project concept consists of an offline subsurface infiltration chamber at Twin Pines Park. The park is owned and operated by the City of Belmont and is adjacent to City Hall. The park provides the opportunity to treat runoff from a 30-acre area that is primarily residential and drains directly to Belmont Creek. Due to the heavy tree cover that dominates most areas of the park, the parking lots represents some of the few opportunities for stormwater capture. The project would capture flows and associated pollutant loadings from a small portion of the upper Belmont Creek, entirely within the City of Belmont. The project would help to alleviate flooding issues in lower reaches of Belmont Creek. The project would also contribute to reductions of high-priority pollutants discharged to San Francisco Bay (mercury and PCBs), augment water supply by recharging the Santa Clara Valley groundwater basin, and provide community enhancement through integration with the recreational facilities of the park.

Although not specifically included within this project concept, the project also provides the opportunity for future integration of Low Impact Development (LID) within parking lots of the park to provide further community enhancement and opportunities for public education of LID and other project components.

Drainage Characteristics

Capture Area (acres)	30
Impervious Area (%)	27
Dominant Land Use	Residential
Jurisdictions	Belmont

Twin Pines Park: west parking lot

Site Information

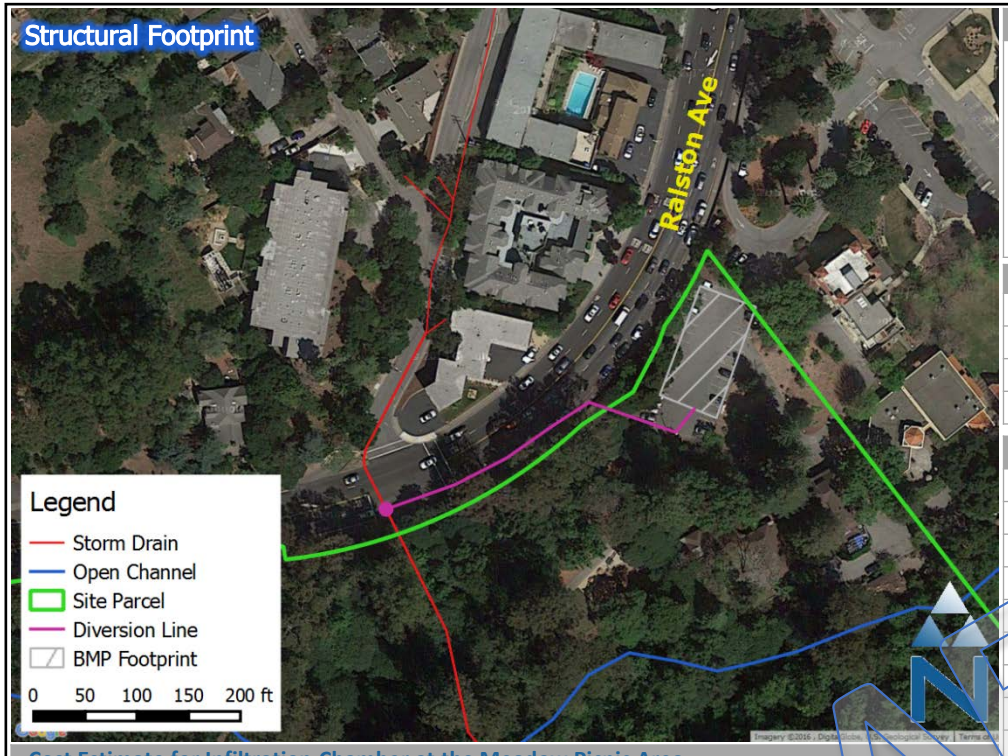
Land Owner	City of Belmont
Street Address	30 Twin Pines Ln, Belmont, CA 94002
Latitude/Longitude	37° 31’ 02.3” N / 122° 16’ 40.4” W
Watershed	Belmont Creek

Concept for a Multi-jurisdictional Regional Stormwater Capture Project

Site: Twin Pines Park (City of Belmont)

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL



Project Description:

A subsurface infiltration chamber will be considered in the parking lot to the west of the Twin Pines Manor. The project would require a 350-foot diversion from the storm drain that crosses Ralston Avenue at the South Road intersection. A subsurface facility would preserve functional use of the parking lot after construction and would prevent disturbance of other recreational areas of the park. The proposed design would allow for the treatment of over 100% of the 85th percentile, 24-hr runoff volume (0.47 ac-ft) from the 30-acre area.

Design Criteria

Precipitation, 85th percentile, 24-hr storm (in)	0.75
Runoff Volume, 85th percentile, 24-hr storm (ac-ft)	0.47
Peak Discharge, 85th percentile, 24-hr storm (cfs)	1.0
Infiltration Rate (in/hr)	0.5

Project Characteristics

Stormwater Capture Process	Subsurface Infiltration Chamber
Footprint (acres)	0.15
Design Height (ft)	3
Depth of Excavation (ft)	6
Pumping Requirements	Dependent on Geotechnical Investigation
Design Volume (ac-ft)	0.45
24-hr Infiltration Volume (ac-ft)	0.15
Total Treatment Volume (ac-ft) [1]	**0.6**
Percent Treated [2]	**100%**

1 – sum of the Design Volume and 24-hr Infiltration Volume
2 – percentage of the 85th percentile 24-hr storm Runoff Volume that is treated

Cost Estimate for Infiltration Chamber at the Meadow Picnic Area

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Removal	1,614	CY	$50.00	$81,000
Diversion Structure	1	LS	$20,000.00	$20,000
Hydrodynamic Separator	1	LS	$15,000.00	$15,000
Pump Structure (450 GPM)	1	LS	$50,000.00	$50,000
Diversion Pipe (12" RCP)	350	LF	$150.00	$53,000
Infiltration Structure	726	CY	$300.00	$218,000
Restoration/Pavement	8,712	SF	$10.00	$87,000
			CONSTRUCTION SUBTOTAL	$524,000
Mobilization (10% construction)				$52,000
Contingency (25% construction)				$131,000
Design (10% total)				$71,000
			TOTAL COST	**$778,000**

***DISCLAIMER**: All elements of this conceptual design are planning-level, based on desktop analysis. All assumptions and parameters must be re-evaluated during the detailed design process. Cost estimates are based on available data. Actual costs will vary.

Example plastic infiltration chamber beneath a future parking lot

Concept for a Multi-jurisdictional Regional Stormwater Capture Project

Site: Twin Pines Park (City of Belmont)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Pervious Interlocking Joint Pavers

Curb Extension at Pedestrian Crossing

Site Information

Jurisdiction	City of East Palo Alto
Street Name	Addison Ave
Bounding Streets	E Bayshore Rd / Bay Rd
Street Typology	High-Density Residential
Capture Area (acres)	9.55
Impervious Area (%)	57
85th Percentile Rainfall (in)	0.70
Generated Runoff (ac-ft)	0.32

Site Description:

The proposed project consists of green street improvements on Addison Avenue between East Bayshore Road and Bay Road, a segment approximately 2,000 feet long. Because of the heavy use of street parking and lack of a pedestrian walkway on most of the street, pervious interlocking joint pavers are recommended as the primary treatment type. Curb extensions are recommended at the Addison-Garden and Addison-Bay intersections. Mid-block curb extensions are also recommended to replace the two existing speed bumps. The mid-block curb extensions would serve the same traffic-calming function while providing additional capture capacity.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.32 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

DISCLAIMER: All elements of this conceptual design are planning-level. Locations of opportunities for placement of green infrastructure shown in the map are preliminary and subject to further site assessment and design. Percent imperviousness is based on best professional judgement. All design assumptions/parameters and cost estimates must be re-evaluated during the detailed design process.

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Permeable Pavement	3	3,400	0.237
Bioretention (Curb Extension)	4	500	0.086

Cost Estimate

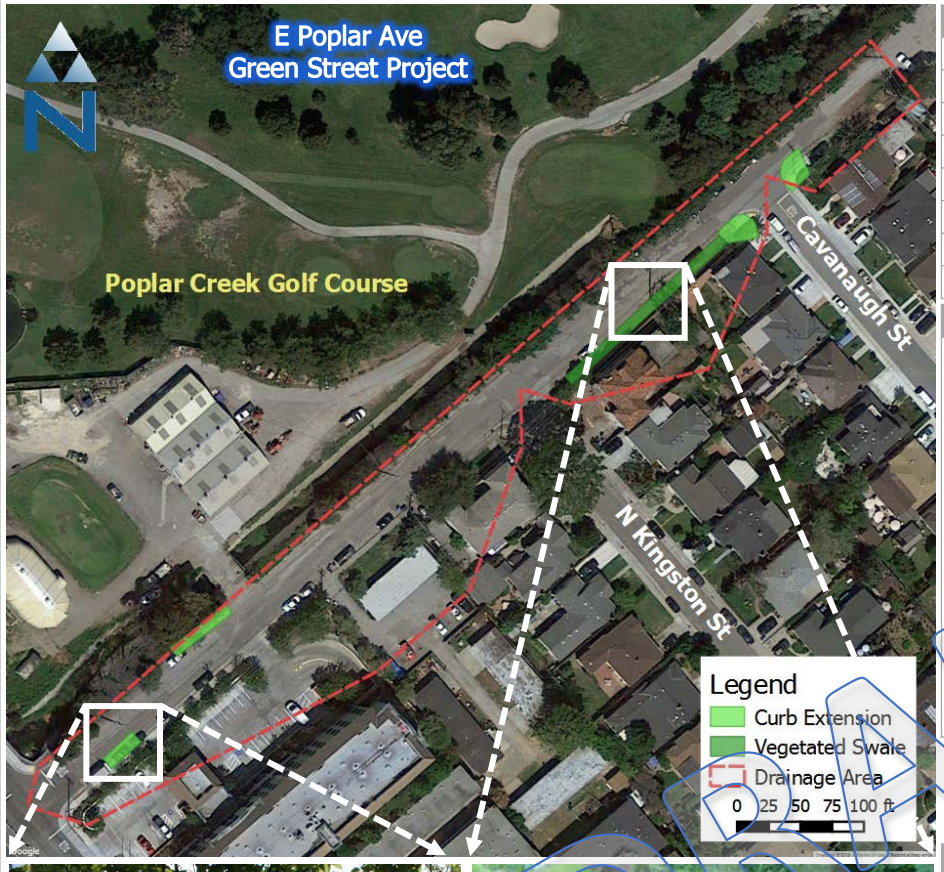
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	2,260	CY	$50.00	$113,000
Permeable Pavement	10,200	SF	$35.00	$357,000
Bioretention	2,000	SF	$25.00	$50,000
Curbs and Gutters	500	LF	$22.00	$11,000
			CONSTRUCTION SUBTOTAL	$531,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$451,000
			TOTAL COST	**$982,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Addison Avenue (City of East Palo Alto)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL



Site Information

Jurisdiction	City of San Mateo
Street Name	E Poplar Ave
Bounding Streets	N Bayshore Blvd / Cavanaugh St
Street Typology	Low-Density Residential
Capture Area (acres)	1.67
Impervious Area (%)	70
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.08

Site Description:

The proposed project consists of green street improvements along East Poplar Avenue, east of the Bayshore Freeway (US-101). The street segment is approximately 850 feet long. The street is considered low-density residential with development primarily on the south side of the street. Curb extensions are recommended as the primary treatment type and can be placed in such a way to maximize street parking. Curb extensions can occupy "no parking" zones that border lot entrances to perform the same function while also capturing stormwater. In addition to curb extensions, a vegetated swale can be considered between North Kingston Street and Cavanaugh Street, where there currently is no gutter. This would not provide stormwater capture but would provide the added benefits of slowing flows and increased infiltration.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.04 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

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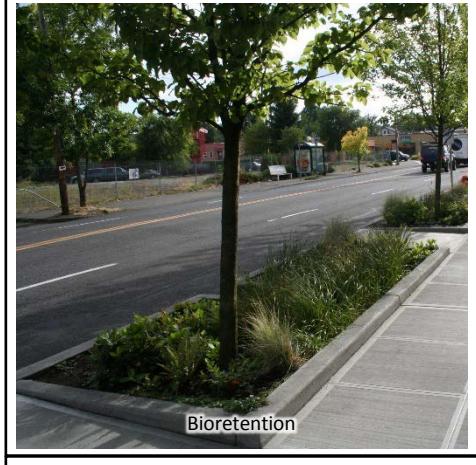
Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	8	230	0.080
Vegetated Swale	3	175	-

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	340	CY	$50.00	$17,000
Bioretention	1,840	SF	$25.00	$46,000
Vegetated Swale	525	SF	$18.50	$10,000
Curbs and Gutters	635	LF	$22.00	$14,000
			CONSTRUCTION SUBTOTAL	$87,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$74,000
			TOTAL COST	**$161,000**



Concept for a Green Street Retrofit for Stormwater Capture

Site: East Poplar Avenue (City of San Mateo)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of South San Francisco
Street Name	Grand Ave
Bounding Streets	Airport Blvd / Linden St
Street Typology	Commercial Main Street
Capture Area (acres)	1.20
Impervious Area (%)	90
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.08

Site Description:

The proposed project consists of green street improvements along Grand Avenue between Airport Boulevard and Linden Street. The street segment is approximately 650 feet long. The street is a commercial main street with 30° angled parking. Angled parking often results in unused space and converting to parallel parking would provide the additional area necessary to incorporate green street enhancements. Curb extensions are recommended as the primary treatment type. The design would minimize the number of parking spaces lost. Bulb-outs at pedestrian crossings are not recommended since existing catch basins are located just before runoff would be able to enter the bulb-out bioretention elements.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.06 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

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Bioretention on a Commercial Main Street

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	8	230	0.081

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	340	CY	$50.00	$17,000
Bioretention	1,840	SF	$25.00	$46,000
Curbs and Gutters	460	LF	$17.25	$8,000
			CONSTRUCTION SUBTOTAL	$71,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$60,000
			TOTAL COST	**$131,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Grand Avenue (City of South San Francisco)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Foster City
Street Name	Beach Park Blvd
Bounding Streets	Swordfish St / Tarpon St
Street Typology	Arterial / Low-Density Residential
Co-Located Project	Safe Routes to School - Bowditch Middle School
Capture Area (acres)	4.66
Impervious Area (%)	49
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.30

Site Description:

The proposed project consists of green street improvements along Beach Park Boulevard between Swordfish Street and Tarpon Street. Additionally, green infrastructure will be implemented along the first blocks of Swordfish and Tarpon Street from Beach Park Boulevard. The total street length is approximately 2,500 feet. Curb extensions are recommended as the primary treatment type. Beach Park Boulevard is an arterial street, while the other two streets are low-density residential with low parking demand so curb extensions can be placed with minimal impact on parking. Bulb-outs at four pedestrian crossings will be implemented for stormwater capture and will integrate with the Safe Routes to School Program at Bowditch Middle School.

The proposed improvements would capture a total of 0.27 acre-feet while providing flood risk mitigation, community enhancement, increased property values, safer pedestrian routes, and other multiple benefits.

DISCLAIMER: All elements of this conceptual design are planning-level. Locations of opportunities for placement of green infrastructure shown in the map are preliminary and subject to further site assessment and design. Percent imperviousness is based on best professional judgement. All design assumptions/parameters and cost estimates must be re-evaluated during the detailed design process.

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	2	3,470	0.30

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	1,285	CY	$50.00	$64,000
Bioretention	6,940	SF	$25.00	$174,000
Curbs and Gutters	3,470	LF	$17.25	$60,000
			CONSTRUCTION SUBTOTAL	$298,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$253,000
			($624,000) **TOTAL COST**	**$551,000**


Curb Extension on an Arterial Street

Concept for a Green Street Retrofit for Stormwater Capture

Site: Beach Park Boulevard (City of Foster City)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Millbrae
Street Name	San Anselmo Ave
Bounding Streets	Santa Helena Ave / Landing Ln
Street Typology	High-Density Residential
Co-Located Project	Safe Routes to School – Lomita Park Elementary
Capture Area (acres)	3.68
Impervious Area (%)	65
85th Percentile Rainfall (in)	0.90
Generated Runoff (ac-ft)	0.3

Site Description:

The proposed project consists of green street improvements along San Anselmo Avenue between Santa Helena Avenue and Landing Lane and San Juan Avenue between San Anselmo and El Camino Real. The total street length is 1,150 feet. The site is considered high-density residential with limited space for parking. Curb extensions are recommended as the primary treatment type and must be placed to minimize loss of parking. Bulb-outs at the San Anselmo-San Juan pedestrian crossings will be implemented for stormwater capture and will integrate with the Safe Routes to School Program at the Lomita Park Elementary School.

The proposed improvements would capture a total of 0.27 acre-feet while providing flood risk mitigation, community enhancement, increased property values, safer pedestrian routes, and other multiple benefits.

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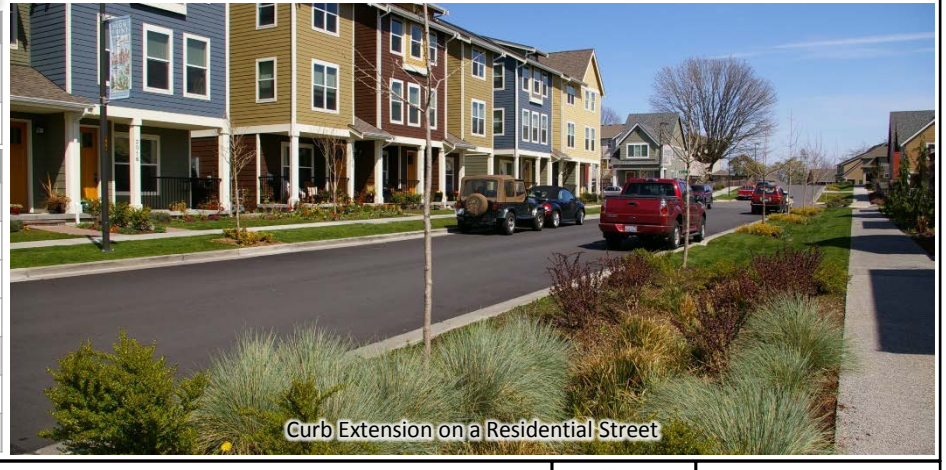
Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	4	1,740	0.30

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	1,290	CY	$50.00	$65,000
Bioretention	6,960	SF	$25.00	$174,000
Curbs and Gutters	1,740	LF	$17.25	$30,000
			CONSTRUCTION SUBTOTAL	$269,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$229,000
			TOTAL COST	**$498,000**


Curb Extension on a Residential Street

Concept for a Green Street Retrofit for Stormwater Capture

Site: San Anselmo Avenue (City of Millbrae)

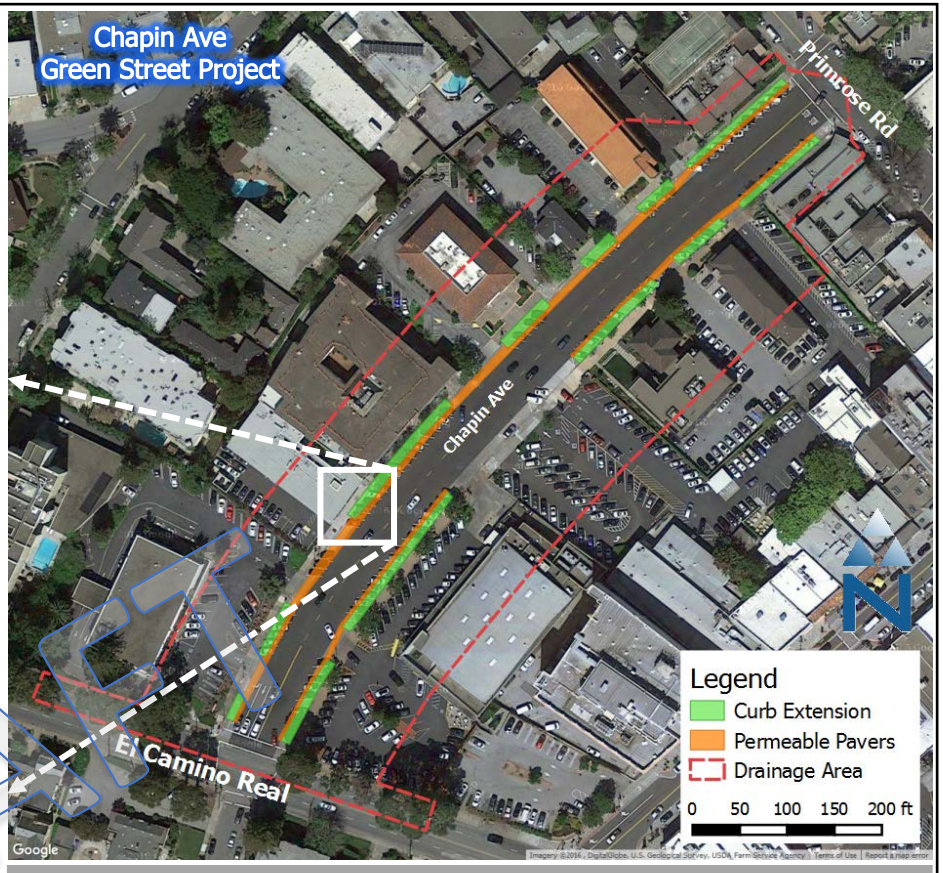
San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Burlingame
Street Name	Chapin Ave
Bounding Streets	El Camino Real/ Primrose Rd
Street Typology	Commercial Main Street
Co-Located Project	Parking Lot LID Projects near El Camino Real
Capture Area (acres)	5.53
Impervious Area (%)	79
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.27

Bioretention on a Commercial Main Street



Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	4	1,000	0.173
Permeable Pavement	3	1,400	0.097

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	1,520	CY	$50.00	$76,000
Bioretention	4,000	SF	$25.00	$100,000
Permeable Pavement	4,200	SF	$35.00	$147,000
Curbs and Gutters	1,000	LF	$17.25	$17,000
			CONSTRUCTION SUBTOTAL	$340,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$289,000
			TOTAL COST	**$629,000**

Site Description:

The proposed project consists of green street improvements along Chapin Avenue between El Camino Real and Primrose Road. The total street length is 925 feet. The site is a commercial main street with high parking demand. Curb extensions are recommended as the primary treatment type. The street is relatively wide and if angled parking is converted to parallel parking, wider curb extensions can be placed. Permeable pavers are suggested at parking spaces to meet stormwater capture goals. Planned parking lot LID retrofits near this site may reduce the required capture volume and permeable pavers may not be necessary.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.27 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

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Concept for a Green Street Retrofit for Stormwater Capture

Site: Chapin Avenue (City of Burlingame)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Redwood City
Street Name	Middlefield Rd
Bounding Streets	Main St / Woodside Rd
Street Typology	Arterial
Co-Located Project	Middlefield Streetscape Project
Capture Area (acres)	4.16
Impervious Area (%)	90
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.27


Curb Extension on an Arterial Street

Site Description:

The proposed project consists of green street improvements along Middlefield Road between Main Street and Woodside Road. The street segment is approximately 2,250 feet long. Middlefield Road is an arterial street that is relatively narrow. Limited space is divided between bike lanes, multiple lanes each direction, turn lanes, and parking lanes. This presents a challenge with siting green infrastructure without sacrificing some usage of the roadway. Curb extensions are recommended as the primary treatment type. Segments of the street that feature two lanes may be reduced to single lanes to allow adequate area for improvements. Center medians can be removed to provide additional area. Curb extensions can also be placed at crosswalks to improve pedestrian safety while increasing stormwater capture capacity. Where lanes cannot be reduced, some parking may need to be removed.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.27 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, safer pedestrian routes, and other multiple benefits.

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Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	3	2,080	0.270

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	1,160	CY	$50.00	$58,000
Bioretention	6,240	SF	$25.00	$156,000
Curbs and Gutters	2,080	LF	$17.25	$36,000
			CONSTRUCTION SUBTOTAL	$250,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$213,000
			TOTAL COST	**$463,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Middlefield Road (City of Redwood City)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Brisbane
Street Name	Valley Dr
Bounding Streets	Park Ln / Park Pl
Street Typology	Arterial
Capture Area (acres)	2.02
Impervious Area (%)	90
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.13

Site Description:

The proposed project consists of green street improvements along Valley Drive between Park Lane and Park Place, in front of the City Hall. The street segment is approximately 750 feet long and is an arterial street. Curb extensions are recommended as the primary treatment type. The street is relatively wide with no parking along this segment, so improvements can be implemented without significantly affecting the road use. Bulb-outs with bioretention elements can be implemeneted at pedestrian crossings to increase safety while providing additional stormwater capture.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.13 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, safer pedestrian routes, and other multiple benefits.

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Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	4	750	0.13

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	560	CY	$50.00	$28,000
Bioretention	3,000	SF	$25.00	$75,000
Curbs and Gutters	750	LF	$17.25	$13,000
			CONSTRUCTION SUBTOTAL	$116,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$99,000
			TOTAL COST	**$215,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Valley Drive (City of Brisbane)

San Mateo Countywide Water Pollution Prevention Program — Clean Water. Healthy Community. www.flowstobay.org

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Belmont
Street Name	Ruth Ave
Bounding Streets	El Camino Real / North Rd
Street Typology	High-Density Residential
Capture Area (acres)	4.31
Impervious Area (%)	70
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.21

Site Description:

The proposed project consists of green street improvements along Ruth Avenue between El Camino Real and North Road. The street segment is approximately 1,300 feet long and is a high-density residential street with limited parking. Curb extensions are recommended as the primary treatment type. The street is built on a relatively steep grade and bioretention elements may need to be stepped in order to effectively capture runoff.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.21 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.


Stepped Bioretention on a Mild Slope

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Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	4	1,200	0.21

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	890	CY	$50.00	$45,000
Bioretention	4,800	SF	$25.00	$120,000
Curbs and Gutters	1,200	LF	$17.25	$21,000
			CONSTRUCTION SUBTOTAL	$186,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$158,000
			TOTAL COST	**$344,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Ruth Avenue (City of Belmont)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Menlo Park
Street Name	Alma St
Bounding Streets	Ravenswood Ave / E Creek Dr
Street Typology	Low-Density Residential
Capture Area (acres)	11.17
Impervious Area (%)	50
85th Percentile Rainfall (in)	0.75
Generated Runoff (ac-ft)	0.35

Site Description:

The proposed project consists of green street improvements along Alma Street between Ravenswood Avenue and East Creek Drive, near San Francisquito Creek. The street segment is approximately 3,500 feet long and is a low-density residential street. Curb extensions are recommended as the primary treatment type. The street is relatively wide and curb extensions can be implemented while retaining adequate space for walkways, bike paths, and driving lanes. Street parking near the park can be converted from angled to parallel parking spaces so to provide additional area for stormwater capture.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.35 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

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Curb Extension at Pedestrian Crossing

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	4	2,020	0.35

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	1,500	CY	$50.00	$75,000
Bioretention	8,080	SF	$25.00	$202,000
Curbs and Gutters	2,020	LF	$17.25	$35,000
			CONSTRUCTION SUBTOTAL	$312,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$265,000
			TOTAL COST	**$577,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Alma Street (City of Menlo Park)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of San Carlos
Street Name	Rosewood Ave and Elm St
Bounding Streets	Arroyo Ave / Brittan Ave
Street Typology	Low-Density Residential
Capture Area (acres)	24.69
Impervious Area (%)	48
85th Percentile Rainfall (in)	0.85
Generated Runoff (ac-ft)	0.84

Site Description:

The proposed project consists of green street improvements along Rosewood Avenue and Elm Street between Brittan Avenue and Arroyo Avenue. The street segments total 3,700 feet in length and is a low-density residential street. Curb extensions are recommended as the primary treatment type with a rain garden at the Elm-Morse roundabout. Because of wide streets and low parking demand, curb extensions can be placed with minimal impact on parking. The curb extensions can also extend into the street to act as traffic-calming measures. Bulb-outs at pedestrian crossings can be constructed with a bioretention element for additional stormwater capture and improved pedestrian safety.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.84 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

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Curb Extension at Low-Density Residential Street


Source: cougarcreekstreamkeepers.ca

Rain Garden at Traffic Circle

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Curb Extension)	4	4,500	0.781
Rain Garden	30	40	0.059

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	3,550	CY	$50.00	$178,000
Bioretention	19,200	SF	$25.00	$480,000
Curbs and Gutters	4,500	LF	$17.25	$78,000
			CONSTRUCTION SUBTOTAL	$736,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$626,000
			TOTAL COST	**$1,362,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: Rosewood Avenue and Elm Street (City of San Carlos)

SAN MATEO COUNTYWIDE Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL

Site Information

Jurisdiction	City of Half Moon Bay
Address	501 Main St, Half Moon Bay, CA 94019
Capture Area (acres)	0.60
Impervious Area (%)	83
85th Percentile Rainfall (in)	0.95
Generated Runoff (ac-ft)	0.04

Site Description:

The proposed project consists of Low Impact Development (LID) retrofits at the parking lot of Half Moon Bay City Hall. LID is typically utilized to treat runoff on-site. The proposed improvements will treat runoff from the parking lot and the downspouts from the adjacent buildings. Curb extensions are recommended as the primary treatment type. The street is relatively wide and curb extensions can be implemented while retaining adequate space for walkways, bike paths, and driving lanes. Street parking near the park can be converted from angled to parallel parking spaces so to provide additional area for stormwater capture.

The proposed improvements would capture 100% of the 85th percentile runoff volume (0.04 ac-ft) while providing flood risk mitigation, community enhancement, increased property values, and other multiple benefits.

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Permeable Pavement Parking Lot with Bioretention Median

Design Summary

Green Infrastructure Type	Design Width (ft)	Design Length (ft)	Capture Volume (ac-ft)
Bioretention (Planter Box)	4	105	0.018
Permeable Pavement	6	160	0.022

Cost Estimate

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
Excavation/Hauling	250	CY	$50.00	$13,000
Bioretention	420	SF	$25.00	$11,000
Permeable Pavers	960	SF	$35.00	$34,000
Curbs and Gutters	210	LF	$17.25	$4,000
			CONSTRUCTION SUBTOTAL	$62,000
Planning (20%), Mobilization (10%), Design (30%), Contingency (25%)				$53,000
			TOTAL COST	**$115,000**

Concept for a Green Street Retrofit for Stormwater Capture

Site: City Hall Parking Lot (City of Half Moon Bay)

San Mateo Countywide Water Pollution Prevention Program

PARADIGM ENVIRONMENTAL