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STORM WATER QUALITY MANAGEMENT PLAN FOR COUNTY OF SAN DIEGO

RANCHO VERONA
ESCONDIDO, CALIFORNIA
APN: 187-100-11

Prepared For:
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CTE Job No. 15-0191C

(Revised) December 29, 2008
October 30, 2008

Storm Water Management Plan

For Priority Projects
(Major SWMP)

The Major Storm Water Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Storm Water Intake Form for Development Projects.

Project Name:	Rancho Verona
Permit Number (Land Development Projects):	MUP P04-050 RPL6
Work Authorization Number (**CIP only**):	
Applicant:	Willam Somer
Applicant's Address:	795 Poinsettia Street Encinitas, Ca. 92024
Plan Prepare By (*Leave blank if same as applicant*):	Construction Testing and Engineering, Inc. 1441 Montiel Road, Suite 115 Escondido, CA 92026
Date:	10/06/08
Revision Date (If applicable):	10/27/08

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9424) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
Third Submittal	X		10/06/08
Fourth Submittal (2nd for SWMP)	X		10/30/08

Instructions for a Major SWMP can be downloaded at http://www.co.san-diego.ca.us/dpw/stormwater/susmp.html.

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

PROJECT DESCRIPTION

Please provide a brief description of the project in the following box. Please include:

- Project Location
- Project Description
- Physical Features (Topography)
- Surrounding Land Use
- Proposed Project Land Use
- Location of dry weather flows (year-round flows in streams, or creeks) within project limits, if applicable.

The site encompasses 9.75 acre that topographically appears to be predominantly in a relatively natural state. The project is located east of I-15 in the Jesmond area, North of The City of Escondido, in San Diego County, California. The proposed project consists of a major use permit for an existing group care facility. No significant grading improvements are proposed for this project. An application has been submitted to the department of health to remodel the existing leach fields. Minor grading will be required to re-align the mid section of the walkway accessing the existing structures.

PRIORITY DEVELOPMENT PROJECT DETERMINATION

Please check the box that best describes the project. Does the project meet one of the following criteria?

Table 1

PRIORITY DEVELOPMENT PROJECT	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area		X
Residential development of more than 10 units		X
Commercial developments with a land area for development of greater than 1 acre		X
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface		X
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.		X
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff		X
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project.
If you answered **YES** to any of the questions, please continue.

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

Table 2

	QUESTIONS	YES	NO	Information
1.	Will the proposed project disturb 50 or more acres of land? (Including all phases of development)		X	If YES, continue to 2. If NO, go to 6.
2.	Would the project site discharge directly into channels that are concrete-lined or significantly hardened such as with riprap, sackcrete, etc, downstream to their outfall into bays or the ocean?			If NO, continue to 3. If YES, go to 6.
3.	Would the project site discharge directly into underground storm drains discharging directly to bays or the ocean?			If NO, continue to 4. If YES, go to 6.
4.	Would the project site discharge directly to a channel (lined or un-lined) and the combined impervious surfaces downstream from the project site to discharge at the ocean or bay are 70% or greater?			If NO, continue to 5. If YES, go to 6.
5.	Project is required to manage hydromodification impacts.			Hydromodification Management Required as described in Section 67.812 b(4) of the WPO.
6.	Project is not required to manage hydromodification impacts.	X		Hydromodification Exempt. Keep on file.

An exemption is potentially available for projects that are required (No. 5. in Table 2 above) to manage hydromodification impacts: The project proponent may conduct an independent geomorphic study to determine the project's full hydromodification impact. The study must incorporate sediment transport modeling across the range of geomorphically-significant flows and demonstrate to the County's satisfaction that the project flows and sediment reductions will not detrimentally affect the receiving water to qualify for the exemption.

STORMWATER QUALITY DETERMINATION

The following questions provide a guide to collecting information relevant to project stormwater quality issues. Please provide the following information in a printed report accompanying this form.

Table 3

	QUESTIONS	COMPLETED	NA
1.	Describe the topography of the project area.	X	
2.	Describe the local land use within the project area and adjacent areas.	X	
3.	Evaluate the presence of dry weather flow.		X
4.	Determine the receiving waters that may be affected by the project throughout all phases of development (i.e., construction, maintenance and operation).	X	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	X	
6.	Determine if there are any High Risk Areas (which is defined by the presence of municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.		X
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.	X	
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	X	
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	X	
10.	Determine contaminated or hazardous soils within the project area.	X	

Site soils are classified as FvD (Fallbrook – Vista sandy loams

Elevation: 200 to 3,900 feet

- *Mean annual precipitation:* 10 to 18 inches
- *Mean annual air temperature:* 59 to 64 degrees F
- *Frost-free period:* 210 to 320 days
- *Slope:* 9 to 15 percent
- *Depth to restrictive feature:* 40 to 60 inches to paralithic bedrock
- *Depth to water table:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)

According to 2006 303(d), the closest impaired water body is the Reidy Canyon Creek and the constituent of concern is phosphorus located in the easterly approximately 1000 feet. There are no high risk areas within the project limit. TMDL completion will be in 2019. There are no hazardous soils within the project limits.

The site currently has one existing family dwelling and half of the site slopes towards the west and east (9 to 15%) and is sparsely vegetated. The local land use onsite and the surrounding areas are designated as Rural Residential (RR1).

WATERSHED

Please check the watershed(s) for the project.

	San Juan 901		Santa Margarita 902		San Luis Rey 903	X	Carlsbad 904
	San Dieguito 905		Penasquitos 906		San Diego 907		Sweetwater 909
	Otay 910		Tijuana 911		Whitewater 719		Clark 720
	West Salton 721		Anza Borrego 722		Imperial 723		

Please provide the hydrologic sub-area and number(s)

Number	Name
904.62	Escondido Hydrologic Subarea

Please provide the beneficial uses for Inland Surface Waters and Ground Waters. Beneficial Uses can be obtained from the Water Quality Control Plan for the San Diego Basin, which is available at the Regional Board office or at http://www.swrcb.ca.gov/rwqcb9/programs/basinplan.html.

SURFACE WATERS	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters																
	904.62	X	X	O					X	X		X	X	X		
Ground Waters																
	904.62	X	X	X												

*** Excepted from Municipal**

X Existing Beneficial Use
0 Potential Beneficial Use

POLLUTANTS OF CONCERN

Using Table 5, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

Table 5. Anticipated and Potential Pollutants Generated by Land Use Type

	General Pollutant Categories								
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development 1 acre or greater	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft2	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets									
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

Note: If other monitoring data that is relevant to the project is available. Please include as Attachment C.

CONSTRUCTION BMPs

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- [X] Silt Fence
- [X] Fiber Rolls
- [X] Street Sweeping and Vacuuming
- [X] Storm Drain Inlet Protection
- [X] Stockpile Management
- [X] Solid Waste Management
- [X] Stabilized Construction Entrance/Exit
- [ ] Dewatering Operations
- [X] Vehicle and Equipment Maintenance
- [ ] Desilting Basin
- [X] Gravel Bag Berm
- [ ] Sandbag Barrier
- [X] Material Delivery and Storage
- [ ] Spill Prevention and Control
- [X] Concrete Waste Management
- [ ] Water Conservation Practices
- [X] Paving and Grinding Operations
- [ ] Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices.

Table 6

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_reqtmdls.pdf		X	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?			If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?			If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors kf greater than or equal to 0.4?			If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	X		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.			Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment:
Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required.

Now that the need for treatment BMPs has been determined, other information is needed to complete the SWMP.

SITE DESIGN

To minimize stormwater impacts, site design measures must be addressed. The following checklist provides options for avoiding or reducing potential impacts during project planning. If YES is checked, it is assumed that the measure was used for this project.

Table 7

	OPTIONS		YES	NO	N/A
1.	Has the project been located and road improvements aligned to avoid or minimize impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?				X
2.	Is the project designed to minimize impervious footprint?				X
3.	Is the project conserving natural areas where feasible?				X
4.	Where landscape is proposed, are rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?		X		
5.	For roadway projects, are structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?				X
6.	Can any of the following methods be utilized to minimize erosion from slopes:				
	6.a.	Disturbing existing slopes only when necessary?	X		
	6.b.	Minimize cut and fill areas to reduce slope lengths?	X		
	6.c.	Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?			X
	6.d.	Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?			X
	6.e.	Rounding and shaping slopes to reduce concentrated flow?	X		
	6.f.	Collecting concentrated flows in stabilized drains and channels?	X		

LOW IMPACT DEVELOPMENT (LID)

Each numbered item below is a LID requirement of the WPO. Please check the box(s) under each number that best describes the Low Impact Development BMP(s) selected for this project.

Table 8

1. Conserve natural areas, soils, and vegetation- County LID Handbook 2.2.1		
	X	Preserve well draining soils (Type A or B)
	X	Preserve Significant Trees
		Other. Description:
		1. Not feasible. State reason.
2. Minimize Disturbance to Natural Drainages- County LID Handbook 2.2.2		
	X	Setback development envelope from drainages
	X	Restrict heavy construction equipment access to planned green/open space areas
		Other. Description:
		2. Not feasible. State Reason.
3. Minimize and Disconnect Impervious Surfaces (see 5) -County LID Handbook 2.2.3		
		Clustered Lot Design
		Items checked in 5?
		Other. Description
	X	3. Not feasible. State Reason. No new buildings
4. Minimize Soil Compaction-County LID Handbook 2.2.4		
		Restrict heavy construction equipment access to planned green/open space areas
	X	Re-till soils compacted by construction vehicles/equipment
	X	Collect & re-use upper soil layers of development site containing organic materials
		Other. Description:
		4. Not feasible. State Reason.
5. Drain Runoff from Impervious Surfaces to Pervious Areas-County LID Handbook 2.2.5		

LID Street & Road Design		
		Curb-cuts to landscaping
	X	Rural Swales
		Concave Median
		Cul-de-sac Landscaping Design
		Other. Description:
LID Parking Lot Design		
		Permeable Pavements
	X	Curb-cuts to landscaping
		Other. Description:
LID Driveway, Sidewalk, Bike-path Design		
		Permeable Pavements
	X	Pitch pavements toward landscaping
		Other. Description:
LID Building Design		
		Cisterns & Rain Barrels
	X	Downspout to swale
		Vegetated Roofs
		Other. Description:
LID Landscaping Design		
		Soil Amendments
	X	Reuse of Native Soils
	X	Smart Irrigation Systems
		Street Trees
		Other. Description:
		5. Not feasible. State Reason:

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

Table 9

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?		X		If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?				If YES go to 6.
3.	Will the project discharge to unlined channels?				If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?				If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?				If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.				Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.				Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.				Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.				Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.				
11.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.				Continue to 12.
12.	Provide other design principles that are comparable and equally effective.				Continue to 13.
13.	End	X			

SOURCE CONTROL

Please complete the following checklist for Source Control BMPs. If the BMP is not applicable for this project, then check N/A only at the main category.

Table 10

BMP			YES	NO	N/A
1.	**Provide Storm Drain System Stenciling and Signage**				X
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language (such as: "NO DUMPING – DRAINS TO _____") and/or graphical icons to discourage illegal dumping.			
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.			
2.	**Design Outdoors Material Storage Areas to Reduce Pollution Introduction**				X
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.			
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.			
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.			
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.			
3.	**Design Trash Storage Areas to Reduce Pollution Introduction**				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,	X		
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.	X		
4.	**Use Efficient Irrigation Systems & Landscape Design**				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible.				
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.			X
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.		X	
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.		X	
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	X		
5.	**Private Roads**				X

BMP			YES	NO	N/A
	The design of private roadway drainage shall use at least one of the following				
	5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.			
	5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.			
	5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.			
	5.d.	Other methods that are comparable and equally effective within the project.			
6.	**Residential Driveways & Guest Parking**				
	The design of driveways and private residential parking areas shall use one at least of the following features.				
	6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.	X		
	6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.	X		
	6.c.	Other features which are comparable and equally effective.		X	
7.	**Dock Areas**				X
	Loading/unloading dock areas shall include the following.				
	7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.			
	7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.			
	7.c.	Other features which are comparable and equally effective.			
8.	**Maintenance Bays**				X
	Maintenance bays shall include the following.				
	8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff.			
	8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.			
	8.c.	Other features which are comparable and equally effective.			
9.	**Vehicle Wash Areas**				X
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.				
	9.a.	Self-contained; or covered with a roof or overhang.			
	9.b.	Equipped with a clarifier or other pretreatment facility.			
	9.c.	Properly connected to a sanitary sewer.			
	9.d.	Other features which are comparable and equally effective.			

	BMP		YES	NO	N/A
10.	**Outdoor Processing Areas**				X
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements.				
	10.a.	Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.			
	10.b.	Grade or berm area to prevent run-on from surrounding areas.			
	10.c.	Installation of storm drains in areas of equipment repair is prohibited.			
	10.d.	Other features which are comparable or equally effective.			
11.	**Equipment Wash Areas**				X
	Outdoor equipment/accessory washing and steam cleaning activities shall be.				
	11.a.	Be self-contained; or covered with a roof or overhang.			
	11.b.	Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate			
	11.c.	Be properly connected to a sanitary sewer.			
	11.d.	Other features which are comparable or equally effective.			
12.	**Parking Areas**				
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.				
	12.a.	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.	X		
	12.b.	Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.	X		
	12.c.	Other design concepts that are comparable and equally effective.		X	
13.	**Fueling Area**				X
	Non-retail fuel dispensing areas shall contain the following.				
	13.a.	Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.			
	13.b.	Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.			
	13.c.	Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.			

		BMP	YES	NO	N/A
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.			

Please list other project specific Source Control BMPs in the following box. Write **N/A** if there are none.

N/A

TREATMENT CONTROL

To select a structural treatment BMP using Treatment Control BMP Selection Matrix (Table 11), each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 5). Any pollutants identified by Table 5, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of storm water BMPs from Table 11, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern.

Priority development projects that are **not** anticipated to generate a pollutant for which the receiving water is CWA 303(d) impaired shall select a single or combination of storm water BMPs from Table 11, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 11. Treatment Control BMP Selection Matrix

Pollutants of Concern	Bioretention Facilities (LID)*	Settling Basins (Dry Ponds)	Wet Ponds and Wetlands	Infiltration Facilities or Practices (LID)*	Media Filters	High-rate biofilters	High-rate media filters	Trash Racks & Hydro - dynamic Devices
Coarse Sediment and Trash	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Medium	Low
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low

*Additional information is available in the County of San Diego LID Handbook.

NOTES ON POLLUTANTS OF CONCERN:

In Table 12, Pollutants of Concern are grouped as gross pollutants, pollutants that tend to associate with fine particles, and pollutants that remain dissolved.

Table 12

Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

A Treatment BMP must address runoff from developed areas. Please provide the post-construction water quality values for the project. Label outfalls on the BMP map. The Water Quality peak rate of discharge flow (Q_{WQ}) and the Water Quality storage volume (V_{WQ}) is dependent on the type of treatment BMP selected for the project.

Outfall	Tributary Area (acres)	Q_{WQ} (cfs)	Q_{WQ} (cfs)
Basin 1	19.18	39.58	1.73
Basin 2	0.62	2.24	0.06
Basin 3	1.74	5.93	0.16
Basin 4	0.46	1.69	0.04
Basin 5	1.31	4.66	0.12
Basin 6	2.05	7.50	0.18
Basin 7	0.32	1.26	0.03

Please check the box(s) that best describes the Treatment BMP(s) selected for this project.

X	**Biofilters**
X	Bioretention swale
X	Vegetated filter strip
	Storm water Planter Box (open-bottomed)
	Storm water Flow-Through Planter (sealed bottom)
	Bioretention Area
	Vegetated Roofs/Modules/Walls
	Detention Basins
	Extended/dry detention basin with grass/vegetated lining
	Extended/dry detention basin with impervious lining
	Infiltration Basins
	Infiltration basin
	Infiltration trench
	Dry well
	Permeable Paving
	Gravel
	Permeable asphalt
	Pervious concrete
	Unit pavers, ungrouted, set on sand or gravel
	Subsurface reservoir bed
	Wet Ponds or Wetlands
	Wet pond/basin (permanent pool)
	Constructed wetland
	Filtration
	Media filtration
	Sand filtration
	Hydrodynamic Separator Systems
	Swirl Concentrator
	Cyclone Separator
	Trash Racks and Screens

Include Treatment Datasheet as Attachment E. The datasheet should include the following:	**COMPLETED**	**NO**
1. Description of how treatment BMP was designed. Provide a description for each type of treatment BMP.	X	
2. Engineering calculations for the BMP(s)	X	

Please describe why the selected treatment BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a detailed explanation.

The general pollution categories for detached residential development are sediments, nutrients, Trash and debris, oxygen demanding substances, oil and grease, bacteria and viruses, and pesticides. Biofilters such as grass swales were mainly utilized as a treatment control BMP as they provide on average a medium removal efficiency concerning the pollutants of concern. The site design, source control, and treatment BMPs were decided on what would be best for the project's potential pollutants

MAINTENANCE

Please check the box that best describes the maintenance mechanism(s) for this project. Guidelines for each category are located in Chapter 5, Section 5.2 of the County SUSMP.

CATEGORY	SELECTED	
	YES	NO
First	X	
Second		X
Third		X
Fourth		X

Note:

1. Projects in Category 2 or 3 may choose to establish or be included in a Storm Water Maintenance Assessment District for the long-term maintenance of treatment BMPs.

The responsible party for maintenance will be the property owners, the Rancho Verona Group Use Facility.

ATTACHMENTS

Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Site Map		X
C	Relevant Monitoring Data		X
D	LID and Treatment BMP Location Map	X	
E	Treatment BMP Datasheets	X	
F	Operation and Maintenance Program for Treatment BMPs	X	
G	Fiscal Resources	X	
H	Certification Sheet	X	
I	Addendum		X

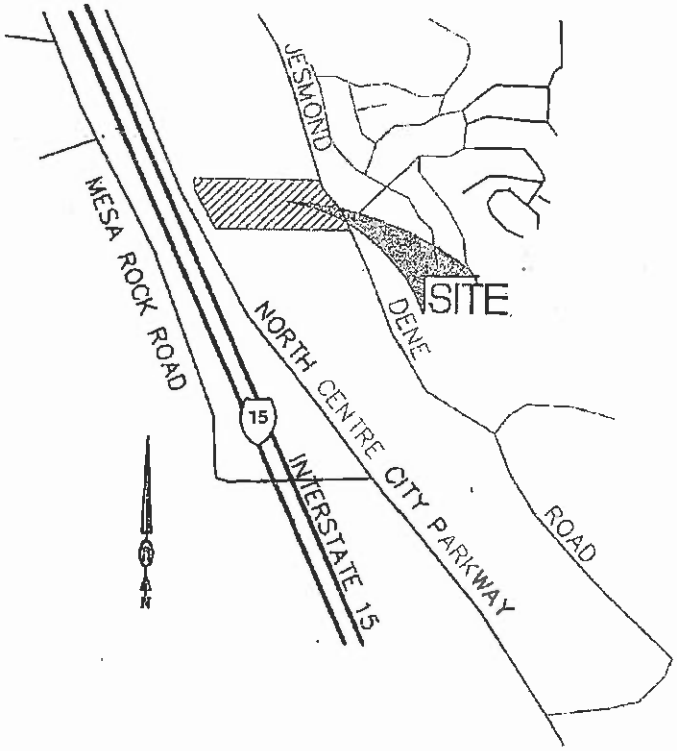
Note: Attachments A and B may be combined.

CONCLUSIONS

The combination of proposed construction and post-construction BMPs will reduce, to the maximum extent practical, the expected pollutants and will not adversely impact the beneficial uses or water quality of the receiving waters.

ATTACHMENT A

PROJECT LOCATION MAP



LOCATION MAP

NTS

ATTACHMENT B

SITE MAP

ATTACHMENT C

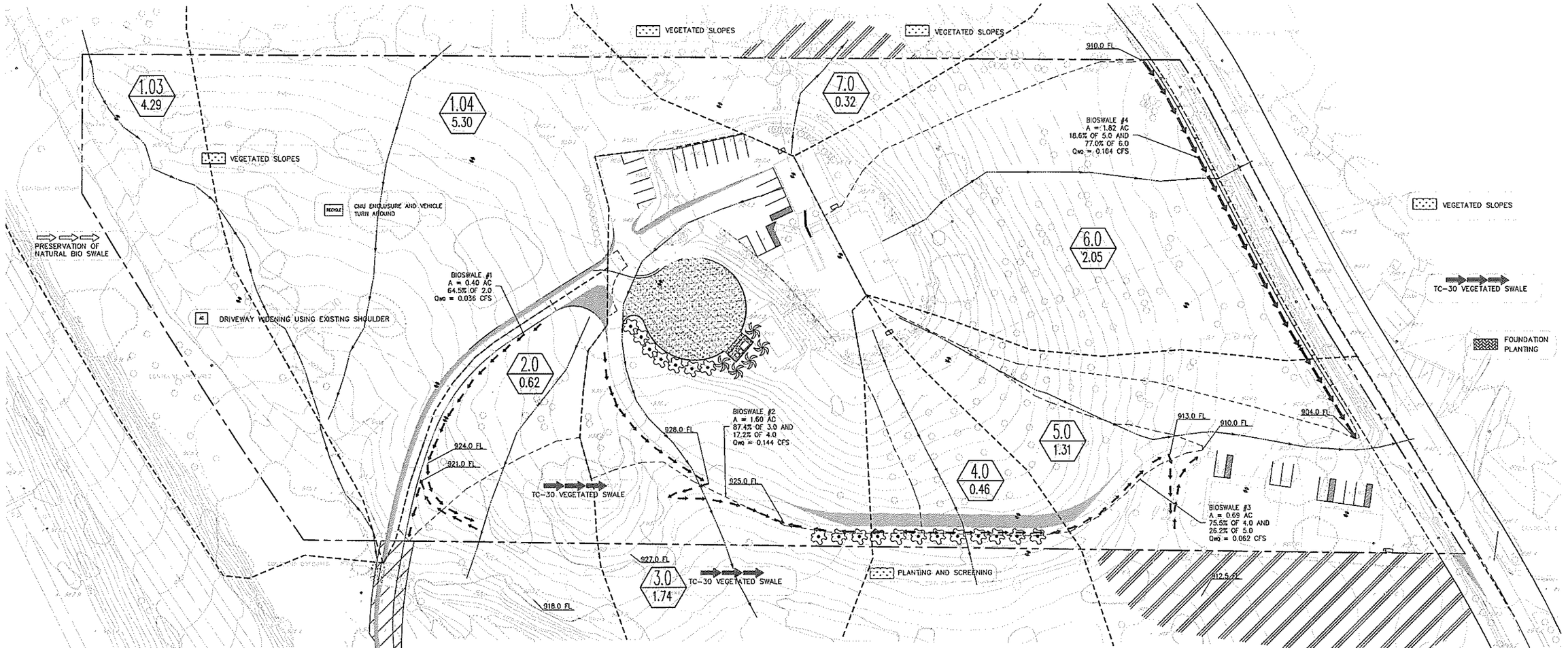
RELEVANT MONITORING DATA

(NOTE: PROVIDE RELEVANT WATER QUALITY MONITORING DATA IF AVAILABLE.)

ATTACHMENT D

LID AND TREATMENT BMP LOCATION MAP

RANCHO VERONA - ESCONDIDO CALIFORNIA



PERMANENT BMP'S

SOURCE / TREATMENT CONTROL

DESCRIPTION	COMMENTS	SYMBOL
SD-10 SITE DESIGN AND LANDSCAPE PLANNING		
PRESERVATION OF NATURAL BIO SWALE	AREA TO REMAIN INTACT AND PROTECTED	
TC-30 VEGETATED SWALE	TREATMENT FOR JESMOND DENE ROAD	
VEGETATED SLOPES	REVEGETATION OF AREAS DISTURBED BY LEACH FIELD INSTALLATION	
DRIVEWAY WIDENING USING EXISTING SHOULDER	NEW PAVEMENT TO BE PLACED IN UNVEGETATED AREAS	AC
PLANTING AND SCREENING	REVEGETATION AT PAVEMENT REMOVAL AND SCREEN PLANTING DOWN HILL OF NEW PAVING	
SD-11 ROOF CONTROLS		
FOUNDATION PLANTING	PLANTING LOCATED OF FOOTING TO DISTRIBUTE FOR RUNOFF	
SD-32 TRASH STORAGE AREAS		
CMU ENCLOSURE AND VEHICLE TURN AROUND	IMPLEMENTATION OF RECYCLABLE MATERIALS COLLECTION AREA	RECYCLE

40 20 0 40 80 120
SCALE IN FEET
GRAPHIC SCALE

N

ATTACHMENT D
LID AND TREATMENT BMP
LOCATION MAP

CONSTRUCTION TESTING & ENGINEERING, INC.
PLANNING - CIVIL ENGINEERING - LAND SURVEYING - GEOTECHNICAL
1441 MORRELL ROAD, SUITE 105 ESCONDIDO CA. 92026, PH:(760) 746-4505

ATTACHMENT E

TREATMENT BMP DATASHEET

*(**NOTE:** POSSIBLE SOURCE FOR DATASHEETS CAN BE FOUND AT WWW.CABMPHANDBOOKS.COM. INCLUDE ENGINEERING CALCULATIONS FOR SIZING THE TREATMENT BMP.)*

BIOSWALE #1

C = 0.45; I = 0.2; A = 0.40 acres

Qwq = 0.45x0.2x0.40 = 0.036 cfs

Slope = 1.7%; Bottom = 0.5'; X-Slope = 3:1; n = 0.25

Length	Base Width	Slopes	N	Time	Water Depth
168ft.	6 inches	1.78%	0.25	14.91min.	2.18 inches

Given Input Data:

Shape ..... Advanced
Solving for ..... Depth of Flow
Flowrate ..... 0.0360 cfs
Slope ..... 0.0178 ft/ft
Manning's n 0.2500
Height ..... 6.0000 in
Bottom width ..... 6.0000 in
Left radius ..... 0.0000 in
Right radius ..... 0.0000 in
Left slope ..... 0.3300 ft/ft (V/H)
Right slope ..... 0.3300 ft/ft (V/H)

Computed Results:

Depth ..... 2.1861 in
Velocity ..... 0.1878 fps
Full Flowrate ..... 0.3362 cfs
Flow area 0.1917 ft2
Flow perimeter ..... 19.9520 in
Hydraulic radius ..... 1.3833 in
Top width ..... 19.2492 in
Area 1.0076 ft2
Perimeter ..... 44.2925 in
Percent full ..... 36.4354 %

Critical Information

Critical depth ..... 1.1102 in
Critical slope ..... 3.0797 ft/ft
Critical velocity ..... 0.4987 fps
Critical area 0.0722 ft2
Critical perimeter ..... 13.0851 in
Critical hydraulic radius ..... 0.7945 in
Critical top width ..... 9.5643 in
Specific energy ..... 0.1827 ft
Minimum energy ..... 0.1388 ft
Froude number 0.0958
Flow condition ..... Subcritical

Contact Time

V = 0.1878 fps; L = 168 feet

Tt = L/Vx60 = 168 ft/0.1878 fps/60 sec/min = 14.91 min

BIOSWALE #2

C = 0.45; I = 0.2; A = 1.60 acres

Qwq = 0.45x0.2x1.60 = 0.144 cfs

Slope = 1.3%; Bottom = 0.5'; X-Slope = 3:1; n = 0.25

Length	Base Width	Slopes	N	Time	Water Depth
148ft.	12 inches	1.3%	0.25	10.30 min.	3.72 inches

Given Input Data:

Shape ..... Advanced
Solving for ..... Depth of Flow
Flowrate ..... 0.1440 cfs
Slope ..... 0.0137 ft/ft
Manning's n 0.2500
Height ..... 6.0000 in
Bottom width ..... 12.0000 in
Left radius ..... 0.0000 in
Right radius ..... 0.0000 in
Left slope ..... 0.3300 ft/ft (V/H)
Right slope ..... 0.3300 ft/ft (V/H)

Computed Results:

Depth ..... 3.7209 in
Velocity ..... 0.2394 fps
Full Flowrate ..... 0.3921 cfs
Flow area 0.6014 ft2
Flow perimeter ..... 35.7468 in
Hydraulic radius ..... 2.4227 in
Top width ..... 34.5507 in
Area 1.2576 ft2
Perimeter ..... 50.2925 in
Percent full ..... 62.0143 %

Critical Information

Critical depth ..... 2.2644 in
Critical slope ..... 2.6450 ft/ft
Critical velocity ..... 0.4855 fps
Critical area 0.2966 ft2
Critical perimeter ..... 26.4518 in
Critical hydraulic radius ..... 1.6147 in
Critical top width ..... 17.7724 in
Specific energy ..... 0.3110 ft
Minimum energy ..... 0.2831 ft
Froude number 0.0924
Flow condition ..... Subcritical

Contact Time

V = 0.2394 fps; L = 148 feet

Tt = L/Vx60 = 148 ft/0.2394 fps/60 sec/min = 10.30 min

BIOSWALE #3

C = 0.45; I = 0.2; A = 0.69 acres

Qwq = 0.45x0.2x0.69 = 0.062 cfs

Slope = 1.4%; Bottom = 0.5'; X-Slope = 3:1; n = 0.25

Length	Base Width	Slopes	N	Time	Water Depth
140ft.	6 inches	2.14%	0.25	10.06 min.	2.71 inches

Given Input Data:

Shape ..... Advanced
Solving for ..... Depth of Flow
Flowrate ..... 0.0620 cfs
Slope ..... 0.0214 ft/ft
Manning's n 0.2500
Height ..... 6.0000 in
Bottom width ..... 6.0000 in
Left radius ..... 0.0000 in
Right radius ..... 0.0000 in
Left slope ..... 0.3300 ft/ft (V/H)
Right slope ..... 0.3300 ft/ft (V/H)

Computed Results:

Depth ..... 2.7092 in
Velocity ..... 0.2319 fps
Full Flowrate ..... 0.3687 cfs
Flow area 0.2673 ft2
Flow perimeter ..... 23.2903 in
Hydraulic radius ..... 1.6529 in
Top width ..... 22.4193 in
Area 1.0076 ft2
Perimeter ..... 44.2925 in
Percent full ..... 45.1532 %

Critical Information

Critical depth ..... 1.4657 in
Critical slope ..... 2.9338 ft/ft
Critical velocity ..... 0.5834 fps
Critical area 0.1063 ft2
Critical perimeter ..... 15.3543 in
Critical hydraulic radius ..... 0.9967 in
Critical top width ..... 10.9231 in
Specific energy ..... 0.2266 ft
Minimum energy ..... 0.1832 ft
Froude number 0.1081
Flow condition ..... Subcritical

Contact Time

V = 0.2319 fps; L = 140 feet

Tt = L/Vx60 = 140 ft/0.2319 fps/60 sec/min = 10.06 min

BIOSWALE #4
C = 0.45; I = 0.2; A = 1.82 acres
Qwq = 0.45x0.2x1.82 = 0.164 cfs
Slope = 1.6%; Bottom = 0.5'; X-Slope = 3:1; n = 0.25

Length	Base Width	Slopes	N	Time	Water Depth
370ft.	12 inches	1.6%	0.25	23.5 min.	3.81 inches

Given Input Data:

Shape ..... Advanced
Solving for ..... Depth of Flow
Flowrate ..... 0.1640 cfs
Slope ..... 0.0160 ft/ft
Manning's n 0.2500
Height ..... 6.0000 in
Bottom width ..... 12.0000 in
Left radius ..... 0.0000 in
Right radius ..... 0.0000 in
Left slope ..... 0.3300 ft/ft (V/H)
Right slope ..... 0.3300 ft/ft (V/H)

Computed Results:

Depth ..... 3.8180 in
Velocity ..... 0.2624 fps
Full Flowrate ..... 0.4238 cfs
Flow area 0.6249 ft2
Flow perimeter ..... 36.3670 in
Hydraulic radius ..... 2.4745 in
Top width ..... 35.1396 in
Area 1.2576 ft2
Perimeter ..... 50.2925 in
Percent full ..... 63.6339 %

Critical Information

Critical depth ..... 2.4229 in
Critical slope ..... 2.6253 ft/ft
Critical velocity ..... 0.5039 fps
Critical area 0.3255 ft2
Critical perimeter ..... 27.4635 in
Critical hydraulic radius ..... 1.7065 in
Critical top width ..... 18.2508 in
Specific energy ..... 0.3192 ft
Minimum energy ..... 0.3029 ft
Froude number 0.1001
Flow condition ..... Subcritical

Contact Time
V = 0.2624 fps; L = 370 feet
Tt = L/Vx60 = 370 ft/0.2624 fps/60 sec/min = 23.50 min

WATER QUALITY PEAK FLOW

Modified Rational Method - Effective for Watersheds < 1.0 mi^2

Masson & Associates - Escondido

Note: Only Enter Values in Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-1

Developed Drainage Area =	19.2	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	**19.2**	**acres**

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

$Q = CIA$ where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45
I =	0.2 inch/hour
A =	19.2 acres
Q =	**1.73 cfs**

WATER QUALITY PEAK FLOW
Modified Rational Method - Effective for Watersheds < 1.0 mi^2
Masson & Associates - Escondido

Note: Only Enter Values in Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-2

Developed Drainage Area =	0.6	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	**0.6**	acres

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

Q = CIA where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45
I =	0.2 inch/hour
A =	0.6 acres
Q =	**0.06 cfs**

WATER QUALITY PEAK FLOW

Modified Rational Method - Effective for Watersheds < 1.0 mi^2

Masson & Associates - Escondido

Note: Only Enter Values in Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-3

Developed Drainage Area =	1.7	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	**1.7**	**acres**

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

Q = CIA where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45	
I =	0.2	inch/hour
A =	1.7	acres
Q =	**0.16**	**cfs**

WATER QUALITY **PEAK FLOW**

Modified Rational Method - Effective for Watersheds < 1.0 mi^2

Masson & Associates - Escondido

Note: Only Enter Values in Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-4

Developed Drainage Area =	0.5	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	**0.5**	**acres**

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

Q = CIA where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45
I =	0.2 inch/hour
A =	0.5 acres
Q =	**0.04 cfs**

WATER QUALITY PEAK FLOW

Modified Rational Method - Effective for Watersheds < 1.0 mi^2

Masson & Associates - Escondido

Note: Only Enter Values in Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-5

Developed Drainage Area =	1.3	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	**1.3**	**acres**

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

$Q = CIA$ where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45	
I =	0.2	inch/hour
A =	1.3	acres
Q =	**0.12**	**cfs**

WATER QUALITY PEAK FLOW
Modified Rational Method - Effective for Watersheds < 1.0 mi^2
Masson & Associates - Escondido

Note: Only Enter Values In Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-6

Developed Drainage Area =	2.1	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	**2.1**	**acres**

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

Q = CIA where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45
I =	0.2 inch/hour
A =	2.1 acres
Q =	**0.18 cfs**

WATER QUALITY PEAK FLOW
Modified Rational Method - Effective for Watersheds < 1.0 mi^2
Masson & Associates - Escondido

Note: Only Enter Values in Boxes - Spreadsheet Will Calculate Remaining Values

Project Name	RANCHO VERONA
Work Order	4022
Jurisdiction	

BMP Location	BASIN-7

Developed Drainage Area =	0.3	acres
Natural Drainage Area =	0.0	acres
Total Drainage Area to BMP =	0.3	acres

Dev. Area Runoff Coefficient =	0.45
Nat. Area Runoff Coefficient =	
Runoff Coefficient =	**0.45**

RATIONAL METHOD RESULTS

Q = CIA where

Q =	85th Percentile Peak Flow (cfs)
C =	Runoff Coefficient
I =	Rainfall Intensity (0.2 inch/hour per RWQCB mandate)
A =	Drainage Area (acres)

Using the Total Drainage Area:

C =	0.45	
I =	0.2	inch/hour
A =	0.3	acres
Q =	**0.03**	**cfs**

TREATMENT CONTROL BMP SELECTION DISCUSSION

1.0 Extended Detention Basins

Extended detention basins are designed to provide temporary storage for runoff from multiple design events.

Advantages:

- Due to the simplicity of design, extended detention basins are relatively easy and inexpensive to construct and operate.
- Widespread application with sufficient capture volume can provide significant control of channel erosion and enlargement caused by changes to flow frequency relationships resulting from the increase of impervious cover in the watershed.

Limitations:

- Require relatively large land area;
- Generally not prescribed for drainage areas smaller than 10 acres.

Conclusion:

Due to the site constraints and limited filtration areas available extended detention basins are not a feasible option for the project site.

2.0 Bio swales

Bio swales (filter strips) are densely vegetated, uniformly graded areas that tread sheet flow from adjacent impervious surfaces. Filter strips function by slowing runoff velocities, trapping particulate pollutants (suspended solids and trace metals) and providing infiltration.
Swales can be natural or manmade. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and stormwater systems.

Advantages:

- If properly designed, vegetated and manmade swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits;
- Bio swales are best suited to treating runoff from roads, roof downspouts and small parking lots;
- Relatively simply to install;
- Relatively low-maintenance;

Limitations:

- May not be appropriate for industrial sites or locations where spills may occur;
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales;
- A thick vegetative cover is needed for these practices to function properly;

- They are impractical in areas with steep topography;
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.

Conclusion:
Vegetated swales are suited to this type of development and provide adequate treatment.

3.0 Infiltration basins.

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff.

Limitations:
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D;
- Not suitable on fill sites or steep slopes;
- Upstream drainage area must be completely stabilized before construction;
- Difficult to restore functioning of infiltration basins once clogged.

Conclusion:
Infiltration basins are not a feasible option for the project site.

4.0 Wet Ponds

Wet ponds are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season) and differ from constructed wetlands primarily in having a greater average depth.

Advantages:
- If properly designed, constructed and maintained, wet basins can provide substantial aesthetic/recreational value and wildlife and wetland habitat;
- Due to the presence of the permanent wet pool, properly designed and maintained wet basins can provide significant water quality improvements across a relatively broad spectrum of constituents including dissolved nutrients.

Limitations:
- Generally not prescribed for drainage areas smaller than 10 acres;
- Requires relatively large storage areas;
- Improperly designed or maintained ponds may result in stratification and anoxic conditions than can promote the release of nutrients and metals.

Conclusion:

Due to the landscape of the property and proximity to residences, wet ponds are not a feasible option for the project site.

5.0 Drainage Inserts

Drainage inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling to one of three different groups: socks, boxes and trays.

Advantages:

- Does not require additional space as inserts as the drain inserts are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.

Limitations:

- Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults.
- Usually not suited for large areas or areas with trash or leaves that can plug the insert.

Conclusion:

When used in a BMP "treatment train", drainage inserts provides a good secondary source of treatment. However, there are no proposed storm drain lines or inlets on the project site.

6.0 Hydrodynamic Separator Systems

Hydrodynamic separators are flow-through structures with a settling or separation unit to remove sediments and other pollutants that are widely used in storm water treatment. No outside power source is required, because the energy of the flowing water allows the sediments to efficiently separate. Depending on the type of unit, this separation may be by means of swirl action or indirect filtration. Variations of this unit have been designed to meet specific needs. Hydrodynamic separators are most effective where the materials to be removed from runoff are heavy particulates, which can be settled - or floatables -which can be captured, rather than solids with poor settleability or dissolved pollutants. In addition to the standard units, some vendors offer supplemental features to reduce the velocity of the flow entering the system. This increases the efficiency of the unit by allowing more sediment to settle.

Advantages:

- May provide the desired performance in less space and therefore less cost;
- May be more cost-effective pre-treatment devices than traditional wet or dry basins;
- Mosquito control may be less of an issue than with traditional wet basins.

Limitations:

- The area served is limited by the capacity of the largest models.

- As the products come in standard sizes, the facilities will be oversized in many cases relative to the design treatment storm, increasing cost.
- The non-steady flows of stormwater decreases the efficiency of vortex separators from what may be estimated or determined from testing under constant flow.

Conclusion:
Hydrodynamic separators are not suited to this type of development and are not used on this project site.

ATTACHMENT F

OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMPS

(NOTE: INFORMATION REGARDING OPERATION AND MAINTENANCE CAN BE OBTAINED FROM THE FOLLOWING WEB SITE: HTTP://WWW.CO.SAN-DIEGO.CA.US/DPW/WATERSHEDS/LAND_DEV/SUSMP.HTML.)

OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMPs

Bioswales

The operational and maintenance needs of a Swale are:

- Vegetation management to maintain adequate hydraulic functioning and to limit habitat for disease-carrying animals.
- Animal and vector control.
- Periodic sediment removal to optimize performance.
- Trash, debris. Grass trimmings, tree pruning and leaf pruning and removal to prevent obstruction of a Swale and monitoring equipment.
- Removal of standing water, which may contribute to the development of aquatic plant communities or mosquito breeding areas.
- Erosion and structural maintenance to prevent the loss of soil and maintain the performance of the Swale.

Inspection frequency

The facility will be inspected and inspection visits will be completely documented:

- Once a month at a minimum.
- After every large storm (after every storm monitored or those storms with more than 0.50 inch of precipitation.)
- On a weekly basis during wet weather.

Aesthetic and Functional Maintenance

Aesthetic maintenance is important for public acceptance of storm water facilities.
Functional maintenance is important for performance and safety reasons.

Aesthetic Maintenance

The following activities will be included in the aesthetic maintenance program:

- Grass Trimming. Trimming of grass will be done on the Swale, around fences, at the inlet and outlet structures.
- Weed Control. Weeds will be removed through mechanical means. Herbicides will not be used because these chemicals may impact the water quality monitoring.

Functional Maintenance

Functional Maintenance has two components: preventative maintenance and corrective maintenance.

Preventative Maintenance

Preventative maintenance activities to be instituted at a Swale are:

- Grass Mowing. Vegetation seed mix within the Swale is designed to be kept short to maintain adequate hydraulic functioning and to limit the development of faunal habitats.

- Trash and Debris. During each inspection and maintenance visit to the site, debris and trash removal will be conducted to reduce the potential for inlet and outlet structures and other components from becoming clogged and inoperable during storm events.
- Sediment Removal. Sediment accumulation, as part of the operation and maintenance program at a Swale, will be monitored once a month during the dry season, after every large storm (0.50 inch rainfall or more), and monthly during the wet season. Specifically, if sediment reaches a level at or near plant height, or could interfere with flow or operation, the sediment will be removed. If accumulation of debris or sediment is determined to be the cause of decline in design performance, prompt action (i.e., within ten working days) will be taken to restore the Swale to design performance standards. Actions will include using additional fill and vegetation and/or removing accumulated sediment to correct channeling or ponding. Characterization and Appropriate disposal of sediment will comply with applicable local, county, state or federal requirements. The swale will be regraded, if the flow gradient has changed, and then replanted with sod.
- Removal of Standing Water. Standing water must be removed if it contributes to the development of aquatic plant communities or mosquito breeding areas.
- Fertilization and Irrigation. The vegetation seed mix has been designed so that fertilization and irrigation are not necessary. Fertilizers and irrigation will not be used to maintain the vegetation.
- Elimination of Mosquito Breeding Habitats. The most effective mosquito control program is on that eliminates potential breeding habitats.

Corrective Maintenance

Corrective maintenance is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe function of a swale. Corrective maintenance activities include:

- Removal of Debris and Sediment. Sediment, debris and trash which impede the hydraulic functioning of a Swale and prevent vegetative growth, will be removed and properly disposed. Temporary arrangements will be made for handling the sediments until a permanent arrangement is made. Vegetation will be reestablished after sediment removal.
- Structural Repairs. Once deemed necessary, repairs to structural components of a swale and its inlet and outlet structures will be done within 10 working days. Qualified individuals (i.e., the designers or contractors) will conduct repairs where structural damage has occurred.
- Embankment and Slope Repairs. Once deemed necessary, damage to the embankments and slopes of Swales will be repaired within 10 working days.
- Erosion Repair. Where a reseeding program has been ineffective, or where other factors have created erosive conditions (i.e., pedestrian traffic, concentrated flow, etc.), corrective steps will be taken to prevent loss of soil and any subsequent danger to the performance of the Swale. There are a number of corrective actions that can be taken. These include erosion control blankets, riprap, placing sod, or reducing flow through the area. Designers or contractors, will be consulted to address erosion problems if the solution is not evident.

Maintenance Costs

Annual maintenance of the bio-filtration swales is estimated as follows:

4 Swales, each 5.5 feet in width.
Total length of swales is 1,115 feet.
Total swale area is 6,132.5 square feet.

Mowing ($0.85/1000 Sq. feet) 0.85x6132.5/1000 = $5.21
Mow 8x a year. 8x5.21 = **$41.70**

General Lawn Care ($9.00/1000 Sq. Feet/year) 9.00x6132.5/1000 = **$55.19**

Debris and Litter Removal ($0.10/linear foot/year) 0.10x1115 = **$111.50**

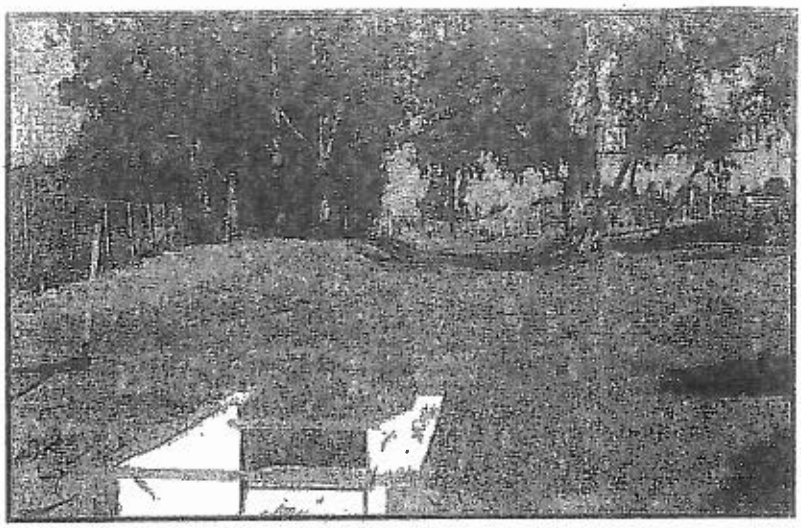
Grass Reseeding ($0.30/Sq. Yard) 0.30x6132.5/9 = $204.42
Reseed 1% per year 204.42x0.01 = **$2.04**

Administration and Inspection ($0.15/linear foot/year) 0.15x1115 = **$167.25**
Plus $25.00/inspection (4 inspections/year) 25x4 = **$100.00**

Total Cost/Year = $477.68
Costs are in 1991 dollars
Total Cost for 2008 = **$767.31**
Used Inflation calculator: Bureau of Labor Statistics see link below.
http://www.bls.gov/data/inflation_calculator.htm

Vegetated Swale

TC-30



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

CASQA

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- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data							
	Removal Efficiencies (% Removal)						
Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately $0.25 per ft². This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately $0.50 per ft², which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost			Total Cost		
			Low	Moderate	High	Low	Moderate	High
Mobilization / Demobilization-Light	Swale	1	$107	$274	$441	$107	$274	$441
Site Preparation								
Clearing[b]	Acre	0.5	$2,200	$3,800	$5,400	$1,100	$1,900	$2,700
Grubbing[c]	Acre	0.25	$3,800	$5,200	$6,600	$950	$1,300	$1,650
General Excavation[d]	Yd[3]	372	$2.10	$3.70	$5.30	$781	$1,376	$1,972
Level and Till[e]	Yd[2]	1,210	$0.20	$0.35	$0.50	$242	$424	$605
Sites Development								
Salvaged Topsoil Seed, and Mulch[f]	Yd[2]	1,210	$0.40	$1.00	$1.60	$484	$1,210	$1,936
Sod[g]	Yd[2]	1,210	$1.20	$2.40	$3.60	$1,452	$2,904	$4,356
Subtotal	--	--	--	--	--	$5,116	$9,388	$13,660
Contingencies	Swale	1	25%	25%	25%	$1,279	$2,347	$3,415
Total	--	--	--	--	--	$6,395	$11,735	$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

[a] Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

[b] Area cleared = (top width + 10 feet) x swale length.

[c] Area grubbed = (top width x swale length).

[d] Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

[e] Area tilled = $\left(\text{top width} + \frac{8(\text{swale depth}^2)}{3(\text{top width})}\right) \times$ swale length (parabolic cross-section).

[f] Area seeded = area cleared x 0.5.

[g] Area sodded = area cleared x 0.5.

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.18 / linear foot	$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	–
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	–	**$0.58 / linear foot**	**$ 0.75 / linear foot**	–

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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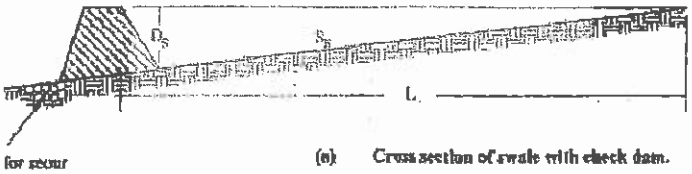
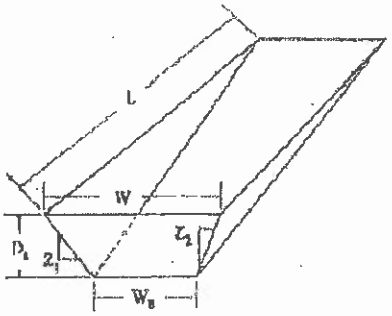


Provide for scour protection.

(a) Cross section of swale with check dam.



(b) Dimensional view of swale impoundment area.

Notation:

L = Length of swale impoundment area per check dam (ft)
D_s = Depth of check dam (ft)
S_s = Bottom slope of swale (ft/ft)
W = Top width of check dam (ft)
W_s = Bottom width of check dam (ft)
$Z_{1,2}$ = Ratio of horizontal to vertical change in swale side slope (ft/ft)

SUMMARY AND CONCLUSIONS

This SWMP has been prepared in accordance with The County of San Diego Standard Urban Stormwater Mitigation Plan for Land Development and Public Improvement Projects (SUSMP). This SWMP has evaluated and addressed the potential pollutants associated with this project and their effects on water quality. A summary of the facts and findings associated with this project and the measures addressed by this SWMP is as follows:

- The beneficial uses for the receiving waters have been identified. None of these beneficial uses will be impaired or diminish due to the construction and operation of this project.

- The project will not significantly alter drainage patterns on the site. Riprap - energy dissipaters will be placed to attenuate the flow velocities thus preventing downstream erosion.

- Open areas and slopes will be landscaped to reduce or eliminate sediment discharge.

- Overall existing drainage patterns throughout the project and natural drainage basins will be maintained. Therefore, post-development peak runoff flow rates from the project site will not increase significantly. Likewise, sedimentation and erosion also will not increase significantly due to post-construction BMPs.

- The proposed construction and post-construction BMPs address mitigation measures to protect water quality and protection of water quality objectives and beneficial uses to the maximum extent practicable.

- The vegetated swale proposed as part of the project will provide some mitigation of the peak flows by detaining flows, reducing the velocities, providing opportunities for infiltration and trapping particulates.

- A combination of site design (driveways with shared access, incorporating native vegetation where practicable), source control (impervious areas drain to the landscape areas before leaving the site) and treatment control BMPs (vegetated bio-swale and natural swale) are used to reduce project's potential pollutants and maximize the treatment to the maximum extend practicable.

- The discharges from the site are not increased significantly in the post-development condition of this project; therefore the development of the project would not pose any threat to downstream facilities.

ATTACHMENT G

FISCAL RESOURCES

Table 5.1 Determinations of Appropriate Maintenance Mechanism(s)

Increased risk, complexity, cost or other maintenance factors				
	(Private Responsibility)		(Public Responsibility)	
	First Category	Second Category	Third Category	Fourth Category
Importance of Maintenance	Minimal concern; inherent in BMP or property stewardship	Need to make sure private owners maintain, and provide County ability to step in & perform maintenance	Warrants Flood Control Dist. (FCD) assuming responsibility, with funding related to project	Broader public responsibility for maintenance and funding (beyond project)
Typical BMPs	Biofilter (Grass swale, grass strip, vegetated buffer); Infiltration basin/trench	[First cat. plus:] Minor wetland swale; Small detention basin; Single storm drain insert / Oil-water separator / Catch basin insert & screen	[Second cat. plus:] Wetland swale or bioretention; Detention basin (extended/dry); Wet ponds & wetlands; Multiple storm drain inserts; Filtration Systems	[Third cat. plus:] Retrofit public storm drain inserts, etc. Master plan facility that serves area larger than project
Mechanisms	1. Stormwater Ordinance[8] requirement [section 67.813(a)&(b)], with code enforcement 2. Nuisance abatement with costs charged back to property owner 3. Condition in ongoing permit such as a Major Use Permit (if project has MUP) 4. Notice to new purchasers [67.813(e)] 5. Subdivision public report "white papers" to include notice of maintenance responsibility	6. Recorded easement agreement w/covenant binding on successors	1. Dedication to FCD. 2. Formation of benefit area 3. FCD maintenance documentation	1. Dedication to FCD or County. 2. FCD / County maintenance documentation
Funding Source(s)	None necessary	Security (Cash deposit, Letter of Credit, or other acceptable to County) for interim period. Agreement for security to contain provisions for release or refund, if not used.	**Start-up Interim:** Developer fee covering 24 months of costs **Permanent:** FCD Assessment per FCD Act Sec 105-17.5	Varies: gas tax for BMP in road ROW, Transnet for CIP projects, Special funding or General funding for others.

5. Complete to the satisfaction of the Director of the Department of Planning and Land Use, an acoustical analysis performed by a County certified acoustical engineer, demonstrating that the present and anticipated future noise levels from Interstate 15 and North Centre City Parkway for the interior and exterior of these facilities will not exceed the allowable sound level limit of the Noise Element of the San Diego County General Plan [exterior (60 dB CNEL), interior (45 dB CNEL)]. Future traffic noise level estimates for North Centre City Parkway must utilize a Level of Service "C" traffic flow for a 4-lane Collector Road that is the designated General Plan Circulation Element buildout roadway classification.

6. Furnish the Director of Planning and Land Use, along with his request for final inspection, a letter from the Director of Public Works, stating conditions B.1 through B.4 have been completed to the department's satisfaction.

7. Submit to the Director of Planning and Land Use a statement from the project California licensed landscape architect that all landscaping has been installed as shown on the approved landscape planting and irrigation plans.

C. The following conditions shall apply during the term of the Major Use Permit:

1. The applicant shall allow the County to inspect the property for which the Major Use Permit has been granted, at least once every 12 months, to determine if the applicant is complying with all terms and conditions of the Major Use Permit. If the County determines the applicant is not complying with the Major Use Permit terms and conditions the applicant shall allow the County to conduct follow up inspections more frequently than once every 12 months until the County determines the applicant is in compliance.

2. All light fixtures shall be designed and adjusted to reflect light downward, away from any road or street, and away from adjoining premises, and shall otherwise conform to Section 6324 of The Zoning Ordinance.

3. No loudspeaker or sound amplification system shall be used to produce sounds in violation of the County Noise Ordinance (except for an electric bell or chime system which may be sounded between 9:00 a.m. and sunset one day per week and on religious holidays for churches only).

4. The parking areas and driveways shall be well maintained.

5. All landscaping shall be adequately watered and well maintained at all times.

6. Water for all uses on the premises shall be imported to the premises by the Valley Center Municipal Water District. No groundwater shall be extracted from the premises unless the Director of Planning and Land Use has first issued written authorization for groundwater extraction, which authorization shall specify the maximum permitted annual water withdrawal. Thereafter, any groundwater extraction from the premises in excess of the amount so permitted shall be deemed a violation of this use permit and The Zoning Ordinance. The following shall be complied with prerequisite to the Director issuing such written authorization:

   (a) The applicant shall first obtain a State well permit from the Department of Environmental Health for each well to be utilized on the premises.

   (b) The applicant shall then notify the County Groundwater Geologist in writing of its intent to extract groundwater. The County Groundwater Geologist shall determine the maximum permitted annual water withdrawal in gallons, by applying the following formula: The number of acres the premises contains shall be multiplied by 163,000 and the product shall be divided by the applicable "Minimum Parcel Size" as shown in the table contained in Paragraph A.1 of Section 67.722 of the San Diego County Code. The maximum amount so determined shall be included in the Director's authorization.

   (c) The applicant shall enter into an agreement establishing an annual groundwater extraction monitoring program approved by the County Groundwater Geologist. Said agreement shall require that:

      (1) The applicant shall install and maintain, prior to any extraction, a cumulative flow meter on each production well to record total production quantities in gallons.

      (2) The applicant shall submit reports by January 1 of each year documenting extraction from each well monthly, in gallons.

      (3) The applicant shall establish and maintain an account with the Department of Planning and Land Use, in the minimum amount of $500.00, to which costs of technical review of monitoring reports may be charged.

ATTACHMENT H

CERTIFICATION SHEET

This Storm Water Management Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

David Caron, R.C.E. 70066

1-27-09
Date

ATTACHMENT I

ADDENDUM

ADDENDUM SHEET

Please fill in

Date: _____

Project Name: _____

Permit Number: _____

Project Location: _____

Address: _____

Address: _____

City, State, ZIP: _____

A modification to the SWMP is necessary for the following reason(s):

_____

_____

_____

_____

_____

_____

_____

_____

I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____

Signature Date

_____

Name and Title Telephone Number