WATER QUALITY VOLUME AND WATER QUALITY FLOW RATE CALCULATOR

This work sheet calculates the Water Quality Flow Rates or Water Quality Volumes for each drainage management area on your site.

CALCULATOR

Step 1	**Total Site Area**	100,000	square feet
Step 2	**# of DMAs**	2	

Input cell =	User enters value
Default value =	User should only change value if able to provide explanation for adjustment
Calculation cell =	User should not change cell

Step 3	Step 4	Step 5					Step 6	Step 7	Step 8									Sl
		Area Impervious (all in square feet)						Area Pervious (all in square feet)										
Drainage Management Areas	Drainage Management Area (square feet)	TOTAL	Standard Roof	Asphalt	Concrete	Brick/Pavers	Other	TOTAL	Permeable Pavement[a]	Vegetated Roof[b]	Gravel[c]	Landscaping	Grass Pavers/Turf Blocks	Lawns/grass, sandy soil, slope<2%	Lawns/grass, sandy soil, slope>7%	Lawns/grass, heavy soil, slope<2%	Lawns/grass, heavy soil, slope>7%	
A Roof	50000	50000	50000					0										
B Yard	50000	0						50000								50000		
C		0						0										
D		0						0										
E		0						0										
F		0						0										
G		0						0										
H		0						0										
I		0						0										
J		0						0										
Total	100000																	
Total Area Check	Okay																	
Number of DMAs Check	Okay																	

Impervious Runoff Coefficients		
Standard Roof	0.85	
Asphalt	0.8	
Concrete	0.9	
Brick/Pavers	0.75	
Other		Step 6

Pervious Runoff Coefficients		
Permeable Pavement [a]	NA	
Vegetated Roof [b]	NA	
Gravel [c]	0.25	
Landscaping	0.2	
Grass Pavers/Turf Blocks	0.35	
Lawns/grass, sandy soil, slope<2%	0.08	
Lawns/grass, sandy soil, slope>7%	0.17	
Lawns/grass, heavy soil, slope<2%	0.15	
Lawns/grass, heavy soil, slope>7%	0.3	
Other		Step 9

Drainage Management Area	Step 11 Composite Runoff Coefficient
A Roof	0.850
B Yard	0.150
C 0	#DIV/0!
D 0	#DIV/0!
E 0	#DIV/0!
F 0	#DIV/0!
G 0	#DIV/0!
H 0	#DIV/0!
I 0	#DIV/0!
J 0	#DIV/0!

Chose Jurisdiction for WQv Performance Measure	2	Step 12
1. Port of San Francisco jurisdiction: 48 hour, 80% capture. Enter "1" in Step 12.		
2. SFPUC jurisdiction: 0.75 inch rainfall depth. Enter "2" in Step 12.		

WQf Performance Measure	
Design Rainfall Intensity (in/hr)	0.2

Note: For both the Port of San Francisco and the SFPUC, the WQf performance measure is based on a 0.2 in/hr rainfall intensil

Drainage Management Area	Step 13 Water Quality Flow Rate cubic feet/sec	Step 14 Water Quality Volume cubic feet
A Roof	0.195	2656
B Yard	0.034	469
C 0	#DIV/0!	#DIV/0!
D 0	#DIV/0!	#DIV/0!
E 0	#DIV/0!	#DIV/0!
F 0	#DIV/0!	#DIV/0!
G 0	#DIV/0!	#DIV/0!
H 0	#DIV/0!	#DIV/0!
I 0	#DIV/0!	#DIV/0!
J 0	#DIV/0!	#DIV/0!

Step 15						
DMA	Area	Drainage area constraints table				
	acres	BMP	min	max	BMP	
A	1.15	Detention pond	5 ac*		Bioretention	
B	1.15	Wet pond	5 ac		Media filter	
C	0.00	Dry well		0.25 ac	Water quality inlet	
D	0.00	Infiltration basin		10 ac	Vegetated rock filter	
E	0.00	Infiltration trench		5 ac	Permeable pavement	
F	0.00	Vegetated swale		5 ac	Swirl separator	
G	0.00	Vegetated buffer strip		2(A_{strip})	Drain insert	
H	0.00	Constructed wetland	5 ac		Vegetated roof	
I	0.00	Detention vault		10 ac	Rainwater harvesting	
J	0.00	* Or minimum orifice diameter of 1 inch			** Multiple cells can be used to treat larger a	

INSTRUCTIONS

Step	
1	Enter the total square footage of your site. Areas are entered in units of square feet. Note: 1 acre = 43,560 square feet.
2	Divide your entire site into discrete drainage management areas (DMAs) and enter the number of DMAs. A DMA is a portion of your site that drains to a common location.
3	Name each DMA and enter one name per row in the cells adjacent to "A", "B", "C", etc.
4	Enter the square footage of each DMA.
5	Identify the different impervious land surfaces for each DMA and enter their square footage. If a permeable pavement area (i.e., pervious concrete, porous asphalt, or permeable paver) will receive run-on from adjacent surf entire paved area (including the area planned for permeable pavement) should be entered as an impervious surface. The required size of the permeable pavement facility can then be calculated using the permeable paven
6	Use the "other" column for impervious land surfaces not described. Enter the square footage of the "other surface" in the table. Below, in the Impervious Runoff Coefficients Table, enter a runoff coefficient, C, for the "other surface"
7	Identify any existing permeable pavement or vegetated roofs on your site that are designed according to SDG requirements and do not receive runoff from adjacent surfaces. Enter their areas. See "Notes" section (a and b) worksheet for additional description of permeable pavement and vegetated roofs.
8	Identify additional pervious land surfaces for each DMA and enter their areas. See "Notes" section (c) at bottom of worksheet for a description of whether to categorize gravel as permeable pavement or pervious area.
9	Use the "other" column, column T, for pervious land surfaces not described. Enter the square footage of the "other surface" in the table. Below, in the Pervious Runoff Coefficients Table, enter a runoff coefficient, C, for the surface .
10	Check column U is "okay". If not, adjust areas accordingly.
11	Composite runoff coefficients for each DMA are calculated and displayed here.
12	Choose jurisdication for performance measure. Projects in the Port of SF jurisdiction should select "1". Projects in SFPUC jurisdiction should select "2".
13	The Water Quality Flow Rate (WQf) for each DMA is calculated here. The WQf is the required flowrate to be managed by flow-based BMPs such that the water quality performance measure requirements are met.
14	The Water Quality Volume (WQv) for each DMA is calculated here. The WQv is the required volume to be managed by volume-based BMPs such that the water quality performance measure requirements are met.
15	Use DMA areas and drainage area constraints table to determine which BMPs are possible for which DMAs.

NEXT STEPS

Use the BMP sizing calculators to help you size and design each treatment control measure.
For flow-based measures, the treatment control measure must be sized such that it accommodates the Water Quality Flow Rate for each DMA.
For volume-based measures, the treatment control measure must be sized such that it accommodates the Water Quality Volume for each DMA.

NOTES

a Permeable pavement includes permeable pavers, porous asphalt, and pervious concrete designed according to SDG requirements. If runoff from adjacent impervious surfaces is draining to the permeable pavement, then area (including the area planned for permeable pavement) should be entered as impervious area in Step 5. The portion of this total paved area that must be converted to permeable pavement to meet the SDG treatment re then be calculated using the Permeable Pavement calculator.

b Vegetated roofs should be designed in accordance with the SDG to capture the WQv from the roof DMA.

c Gravel surfaces can be considered a permeable pavement system if designed in accordance with the storage layer requirements outlined in the permeable pavement sizer and fact sheet. The gravel should be an open grad washed AASHTO No. 8 stone or larger. The system should be designed to completely capture the WQv and either infiltrate it or detain it over a 48 hour period.

DEFINITIONS

Water Quality Volume Equation: $WQv = C \times A \times d/12$

Water Quality Flow Equation: $WQf = C \times i \times A/43560$

Where:
WQf = water quality flow (cubic feet per second)
WQv = water quality volume (cubic feet)
C = runoff coefficient
i = design rainfall intensity (in/hr)
A = drainage area (square feet)
d = design depth of rainfall (inches)