Sizing Worksheet - BIO-1 Biofiltration/BIO-2 Planter Box with Underdrain

Designer: Project Proponent: Date: Project: Location:		
Type of Vegetation:		
Pretreatment Feature:		
Outflow Collection:		
Step 1: Determine water quality design volume		
1-1. Enter Project area (acres), $A_{project}$ If this BMP captures runoff from a portion of the project area, enter the tributary area	$A_{project}$ =	acres
1-2. Enter Project impervious fraction, *Imp* (e.g. 60% = 0.60)	Imp=	
1-3. Determine pervious runoff coefficient using Table C-1, C_p	C_p =	
1-4. Calculate runoff coefficient, $C = 0.95*imp + C_p (1\text{-}imp)$	C =	
1-5. Enter design rainfall depth of the storm (in), P_i	P_i =	in
1-6. Calculate rainfall depth (ft), $P = P_i/12$	P =	ft
1-7. Calculate water quality design volume (ft^3) $SQDV=43560 \bullet C*P*A_{project)}$	SQDV=	ft^3
Step 2: Determine the design percolation rate		
2-1. Enter the design saturated hydraulic conductivity of the amended filter media (2.5 in/hr recommended rate), K_{design}	K_{design} =	in/hr
Step 3: Calculate Bioretention/Planter Box surface area		
3-1. Enter water quality design volume (ft^3), *SQDV*	SQDV =	ft^3
3-2. Enter design saturated hydraulic conductivity (in/hr), K_{design}	K_{design} =	in/hr
3-3. Enter ponding depth (max 1.5 ft for Bioretention, 1 ft for Planter Box) above area, d_p	d_p =	ft
3-4. Calculate the drawdown time for the ponded water to filter through media (hours), $t_{ponding}^{*} = (d_p/K_{design}) \times 12$ **If tponding exceeds 48 hours, reduce surface ponding depth or increase media Kdesign.*	$t_{ponding}$=	hrs

3-5. Calculate the depth of water (ft) filtered, $$d_{filtered} = Minimum\left[\frac{K_{design} \times T_{routing}}{12\ in/ft}, d_p\right]$$ where $T_{routing}$= storm duration that may be assumed for routing calculations; this should be assumed to be 3 hours unless rationale for an alternative assumption is provided	$d_{filtered}$ =	ft
3-6. Calculate the infiltrating surface area as follows (ft^2); account for infiltrating 1.5 times SQDV value. A_{req} =1.5 x SQDV/(d_p + $d_{filtered}$)	A_{req} =	ft^2
Step 4: Calculate Bioretention Area Total Footprint		
4-1. Calculate total footprint required by including a buffer for side slopes and freeboard (ft^2) [A_{req} is measured at the as the filter bottom area (toe of side slopes)], A_{tot}	A_{tot} =	ft^2
Step 5: Calculate Underdrain System Capacity		
To calculate the underdrain system capacity, continue through steps 5-1 to 5-7.		
5-1. Calculated filtered flow rate to be conveyed by the longitudinal drainpipe, $Q_f = K_{design} \times A_{req}/43,200$	Q_f =	cfs
5-2. Enter minimum slope for energy gradient, S_e	S_e =	
5-3. Enter Hazen-Williams coefficient for plastic, C_{HW}	C_{HW} =	
5-4. Enter pipe diameter (min 4 inches), D	D =	in
5-5. Calculate pipe hydraulic radius (ft), $R_h = D/48$	R_h =	ft
5-6. Calculate velocity at the outlet of the pipe (ft/s), $V_p = 1.318 C_{HW} R_h^{0.63} S_e^{0.54}$	V_p =	ft/s
5-7. Calculate pipe capacity (cfs), $Q_{cap} = 0.25\pi(D/12)^2 V_p$	Q_{cap} =	cfs