Additional Notes: Soakage Trench

USER INPUTS

24-Hour Rainfall Depth [in]: Enter the size of the storm that you're required or wish to infiltrate. A good minimum rule of thumb to protect streams from scouring is the 2-year 24-hour design storm, but use whatever your jurisdiction requires.

Drainage Area [sf]: This value is entered automatically from completing the top portion of the form in which the drainage area (total remaining hardscape area) is calculated.

Drainage Area Runoff Coefficient: This is the C in Q=CIA of the rational method. Click here to learn more about the rational method and to see typical values if you'd like to model this for all areas, not just impervious areas, draining to the pervious pavement/soakage trench (not typical). Choosing the upper end of the range for the particular land cover is safe. For instance, according to the link provided, lawns are have a runoff coefficient between 0.05 and 0.35, so enter 0.35. If you are only managing impervious area (typical), then leave this at 0.9. Note that this worksheet is NOT able to model pervious pavement that drains any landscape areas (lawns, grasses, forest, etc.). Another method would be needed for this.

Design Infiltration Rate of Soil [in/hr]: Enter the infiltration rate of the native soils. This would come from running an infiltration test (see fact sheet "Infiltration Testing") in the location of the infiltration BMP at the depth where the constructed facility intersects with the native uncompacted soil. This tested infiltration rate cannot be altered by the design. If the infiltration rate is low, then the facility will have to be bigger, incorporate a rock trench, import soils or use a lined BMP.

Maximum Depth of Storage Rock [in]: Guess a value for the depth of storage rock (equivalent to the base rock) and check the calculated values. This is an iterative process. For Type IA SBUH storms such as those found in Western Oregon, 12" is a good first guess, but you could also enter the depth of rock needed for structural stability for your traffic loads on your wet uncompacted native soils if you've gotten a geotechnical report already.

Void Porosity of Storage Rock [%]: The rock trench is made up of open graded (all almost the same size) rock. The open graded rock provides storage for the additional volume of water that must be stored in the voids between the rocks. The void ratio is ratio of solid to voids and is often 40%, but your rock supplier should be able to confirm this. Some jurisdictions require you to assume 30% void ratio to account for fines moving upwards or downwards, which will reduce storage unless you deepen the rock. In effect, this requirement becomes a safety factor, but the actual void ratio may be easily measured. Measuring your void ratio ahead of time may allow you to incorporate a smaller design and save money.

Soakage Trench Area [sf]: Adjust this until the maximum ponding depth in facility is just less than the "Desired Ponding Depth" you just entered. This will ensure the facility is completely empty in 30 hours.

CALCULATED VALUES

Maximum Ponding Depth in Storage Rock During Storm [in]: This is the maximum depth to which the design storm will rise in the Storage Rock. This number is calculated from the SBUH hydrograph and usually occurs in the middle of the storm when the most intense rainfall is modeled to occur. If structural design does not require a deeper rock section, you could set your Depth of Storage Rock to this value.

Depth of Water Left in Storage Trench After 30 Hours [in]: In some jurisdictions, this will be required to be zero (0). Due to the frequency of rainstorms, there is a common of thumb that all stormwater facilities should be empty in 30 hours to be ready for the next storm.

Is the Soakage Trench Adequately Sized: This cell will check that the Maximum Ponding Depth does not exceed the Depth of Water Left in Storage Trench After 30 Hours. If this criterion is not met, the cell will display "FALSE" and you will need to increase the Storage Trench Area until it says "TRUE." There is a range of numbers that will give a TRUE result, so feel free to experiment with the Storage Trench area until you have minimized the footprint of the facility.

OTHER CALCULATED VALUES

Peak Rainfall Intensity [in/hr]: This provides the peak rainfall intensity for the storm entered, calculated from the Santa Barbara Urban Hydrograph (SBUH) for different rainfall distribution.

Peak flow overflowing/leaving facility/site: Calculated from the Santa Barbara Urban Hydrograph (SBUH) for different rainfall distribution. Depending on your jurisdiction, this should be 0 (i.e. keeping 100% of stormwater on-site) or at least less than the predeveloped peak flow.

SIZING FACTOR: Ratio of Soakage Trench to Drainage Area: This is provided for agencies who would like to create a SIM form similar to that of the City of Portland. If you look on page 4 of this link to Portland's SIM Form, you'll see what's called a "Sizing Factor." This number accounts for rainfall patterns (i.e. storm type), 24-hour design storm size, the infiltration rate of the native soils, etc. For hydraulically isolated pavements where the Contribution Area is the same size as the Storage Rock Area, this number is always 1.0.

Storage Capacity of Storage Rock [cf]: This calculates the volume of storage in the voids in the rock based on the Depth of Storage Rock and Void Ratio for Rock Trench values that you entered.