In San Mateo County, many sites will not have both the relatively flat terrain and high percolation rates required for infiltration facilities. Infiltration facilities should not be designed to retain stormwater in areas with Class C or D soils, that have a high water table, or that have known soil contamination. Infiltration is also infeasible in areas with steep slopes or high clay content soils. Therefore, these sites will have to incorporate design measures that do not rely primarily on stormwater infiltration.

The best first step for these poor soil sites is to reduce impervious area, thereby reducing the amount of runoff needing treatment. Remember, increasing a site's landscape area by 25% is in essence decreasing the site's stormwater runoff by almost 25% even without the use of active stormwater facilities. These passive site design strategies are described in Chapter 2.

Once a site is designed to minimize stormwater runoff to the fullest extent possible, stormwater facilities should treat the remaining runoff. Stormwater facilities designed in Class C or D soils will require the use of imported soil and often an underdrain system. As water moves through the amended soil bed of any given facility, it enters the underdrain to be discharged back into the storm drain system or dispersed back into the natural environment. These types of flow-through facilities attenuate peak flows and reduce total runoff volume through evapotranspiration.

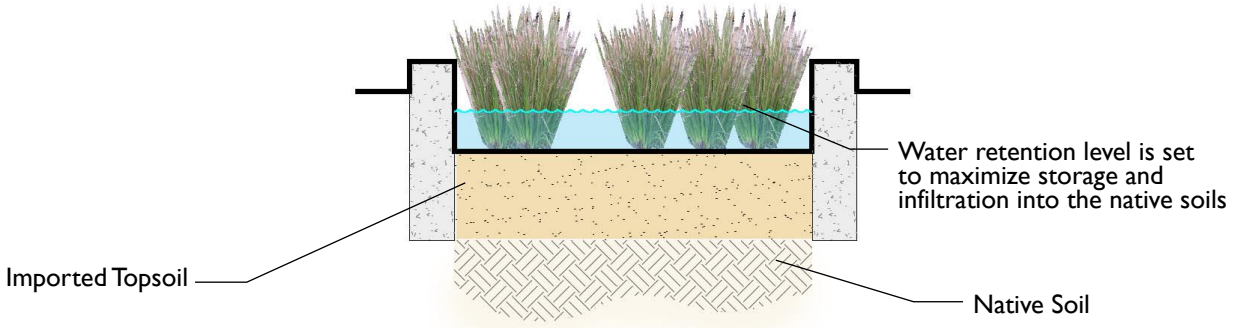
The San Mateo Countywide Water Pollution Prevention Program recommends that perforated or slotted underdrains be used where the native soil infiltration rates are low (Class C and D soils). The C.3 Stormwater Technical Guidance document provides information on the design and construction of underdrains for a variety of stormwater facility types. It should be noted that the use of underdrains to collect treated stormwater runoff will often increase the overall project costs. The C.3 Stormwater Technical Guidance also provides information on imported soil specifications. If the proper soil is used and the stormwater facility is built in accordance with the referenced guidelines, the soil bed should be able to infiltrate stormwater at a rate of 5 inches/hour.

To encourage the use of green street and parking lot projects, some flexibility in use of the C.3 Stormwater Technical Guidance should be allowed. For example, on Hydrologic Soil Groups C and D there may be situations where the stormwater treatment system could be designed without an underdrain provided sufficient stormwater treatment is achieved without retaining stormwater runoff for a prolonged period of time. For example, shallower and larger stormwater treatment systems may be used or an adequately sized vegetated swale may be constructed where there is sufficient slope not to retain stormwater runoff for a prolonged period of time.

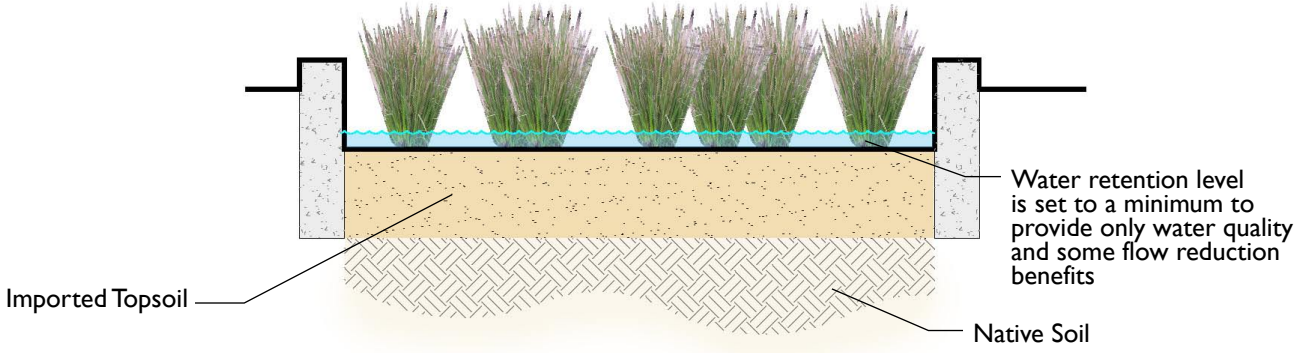
Planting trees, shrubs, and other plant material with extensive root systems can help loosen tight clayey soils, provide more capillary storage space, and allow for greater evapotranspiration of water.

When stormwater facilities are used in poor soil conditions, it is important to include design flexibility for check dams and weirs. Recently-constructed stormwater facilities and stormwater facilities built in poor soil conditions, may initially infiltrate less stormwater. Once plants have established and a stormwater facility has matured, infiltration rates may increase and allow for more ponding of water during storm events. The overall ponding of stormwater can be controlled by adjusting the height of check dams and weirs as needed. Designing for flexibility will ultimately allow for maximum performance efficiency over time.

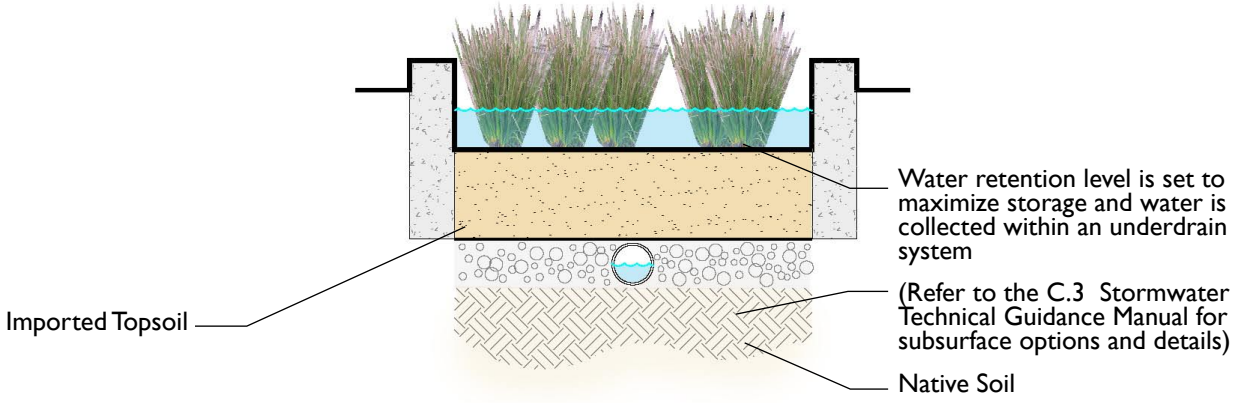
There are a multitude of soil conditions within San Mateo County, and each stormwater facility should be designed to function properly given the specific site constraints. The diagrams below illustrate three basic conditions: **Condition 1** consists of native soils that are relatively good at allowing infiltration of stormwater runoff, thus the facility design maximizes the amount of retained water. This design solution can be utilized whenever soils allow moderate to good infiltration (Class A or B Soils). **Condition 2** illustrates a design option for sites with poor native soils (Class C or D soils). This design solution maximizes the stormwater facility's horizontal footprint and reduces the ponding depth of stormwater in order to prevent any prolonged periods of standing water. This option may be appropriate for projects that are not subject to C.3 stormwater requirements but still want to provide water quality and flow reduction benefits. **Condition 3** shows how including an underdrain system in poor soil conditions (Class C or D soils) allows greater water retention, similar to Condition 1. Condition 3 may be necessary to meet C.3 stormwater requirements, however, adding an underdrain system can increase overall project costs.



Condition 1- Good Native Soils without an Underdrain



Condition 2- Poor Native Soils without an Underdrain



Condition 3- Poor Native Soils with an Underdrain