# Water Quality (Storm Water Treatment)

## GENERAL

1. All new development/redevelopment must address the following areas:
   1. Prevent or minimize impacts to water quality
   2. Meet current retention requirements
   3. Apply a low impact development (LID) approach

## DESIGN CRITERIA

1. State permit requirements call for projects to “manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80th percentile rainfall event.” The volume of water generated from this 80th percentile event is defined as the Water Quality Volume or WQV.

Table ‑: 80th Percentile Precipitation Rates at Surrounding Weather Stations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Location | Station | Elevation | Years of Record | 80th Percentile Storm (in.) |
| Cutler Dam | USC00421918 | 4,290 | 36 | 0.50 |
| KVNU | USC00425182 | 4,475 | 36 | 0.47 |
| Richmond | USC00427271 | 4,680 | 36 | 0.50 |
| Logan SW Experimental Farm | USC00425194 | 4,488 | 36 | 0.48 |
| Trenton | USC00428828 | 4,454 | 36 | 0.45 |
| USU | USC00425186 | 4,790 | 36 | 0.49 |

Based on the surrounding stations shown above, the average 80th percentile storm equals **0.48 inches or 0.0401 feet.** To simplify design and provide consistency across the USU main campus these depths should be used for LID implementation.

The WQV calculated in cubic feet (cf) is found using the following equation:

Where: RV = Volumetric runoff coefficient, unitless

d = 80th percentile precipitation depth, ft (convert from inches to feet if required)

A = Project area or BMP drainage area, square feet (sf)

The NRCS developed regression equations based on hydrologic soil groups for the 2-year event should be used to calculate the runoff coefficient.

Table ‑: Runoff Coefficient Equations Based on NRCS Soil Groups

|  |  |  |  |
| --- | --- | --- | --- |
| NRCS Soil Group | A | B | C/D |
| Rv | 0.84i1.302 | 0.84i1.169 | 0.84i1.122 |

Note = “i” is percent imperviousness of the drainage area in decimal format (0.0 – 1.0)

Contractors/developers should refer to the State of Utah’s published LID Manual “A Guide to Low Impact Development within Utah” for further explanation and analysis related to WQV calculations along with various examples.

## PRODUCTS/PRACTICES

1. Most LID Best Management Practices (BMP) fit into three functional categories; Infiltration, Bioretention/Natural Filter or Harvesting. There may also be opportunities to combine BMPs within the categories listed above.
2. The following BMPs are recommended for implementation with all new development/redevelopment on the USU campus. Other BMPs may be considered if feasible and approved/reviewed by USU Planning and Design.
   1. Infiltration Basin/Trench – Infiltration
      1. Infiltration basins consist of an earthen basin constructed in naturally pervious soils with a flat bottom typically vegetated with dry‐land grasses or irrigated turf grass. An infiltration basin functions by retaining the design runoff volume in the basin and allowing the retained runoff to percolate into the underlying native soils over a specified period.
      2. Infiltration trenches, which are like basins, are long, narrow, gravel‐filled trenches, often vegetated, that infiltrate storm water runoff from small drainage areas. Infiltration trenches may include a shallow depression at the surface, but the majority of runoff is stored in the void space within the gravel and infiltrates through the sides and bottom of the trench.
   2. Underground Infiltration Galleries – Infiltration
3. Infiltration galleries are like infiltration basins and trenches except they are underground. Several vendors offer prefabricated, modular infiltration galleries that provide subsurface storage and allow for infiltration. Infiltration galleries come in a variety of material types, shapes and sizes.
   1. Dry Well – Infiltration
4. Dry wells are underground storage areas that are sized to retain the water quality volume and infiltrate runoff into the existing soils.
   1. Vegetated Strip/Swale – Bioretention
5. Vegetated swales are open, shallow channels with dense, low‐lying vegetation covering the side slopes and bottom that collect and slowly convey runoff to downstream discharge points. An effective vegetated swale achieves uniform sheet flow through the densely vegetated area for a period of several minutes. The vegetation in the swale can vary depending on its location and is the choice of the designer. Most swales are grass lined.
   1. Tree Box Filter – Bioretention
6. Tree box filters are bioretention systems typically designed as flow-through devices, meaning that they do not retain storm water but rather allow flows to pass through them. These are commonly found in urban drainage areas where space is limited.