AquaShield™ TECH REPORT

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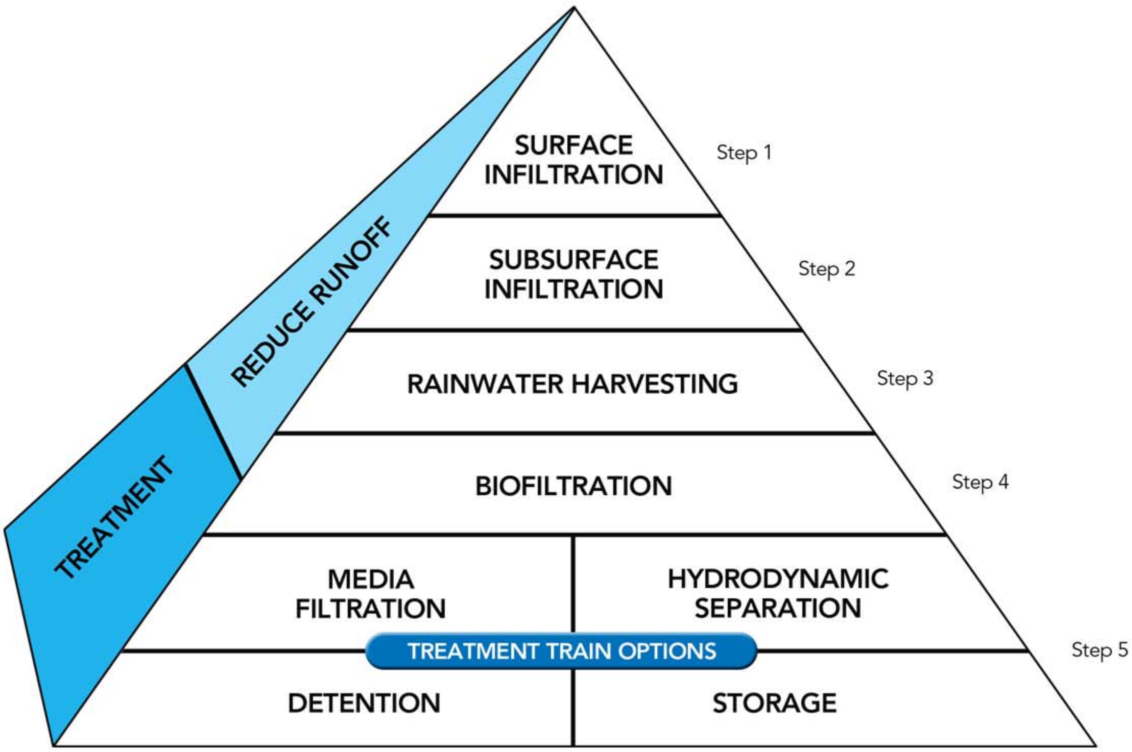
The Low Impact Development (LID) Technology Selection Pyramid



The stormwater community is witnessing the burgeoning implementation of green infrastructure and Low Impact Development (LID) practices. A systematic approach is necessary to identify an LID-based technology suitable for a given site. The LID technology selection pyramid illustrates a step-by-step approach to identify technologies to meet the fundamental goals of LID – runoff reduction and water quality treatment.

Step 1 Begins with subsurface infiltration as the most preferred design option to reduce runoff

Steps 2 & 3 Further consider subsurface infiltration and rainwater harvesting.

Step 4 Biofiltration designs spanning both aspects of runoff reduction and water treatment.

Step 5 Relies on conventional designs including a variety of treatment train options for both water quality and quantity designs. The advantages and limitations associated with these technologies are summarized below.

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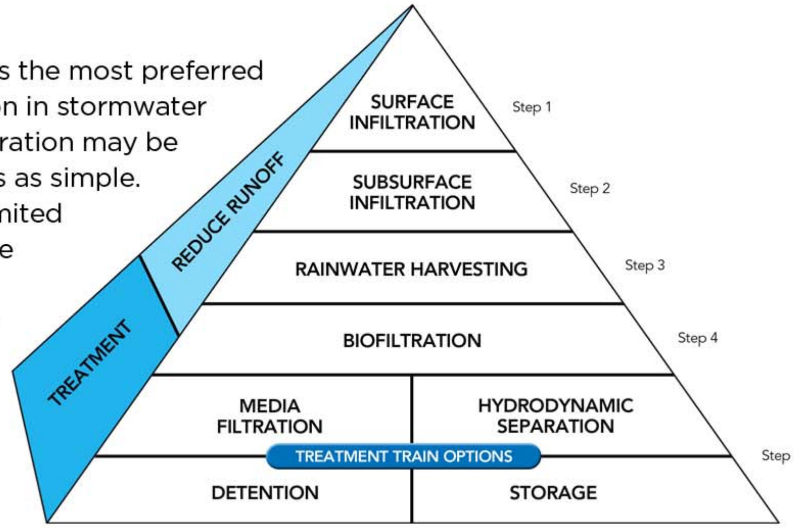

Step 1: Surface Infiltration

Many LID regulations promote surface infiltration as the most preferred LID practice since it can achieve the most reduction in stormwater runoff compared to the other practices. While infiltration may be a simple approach, its implementation is not always as simple. The potential to utilize surface infiltration can be limited within highly urban settings given that it can require a large amount of space relative to development area. It may also not be feasible where the majority of the site must be paved to accommodate the intended land use. Thus, development area and property use constraints can prohibit the use of surface infiltration as the first choice for an LID technology.

Step 2: Subsurface Infiltration

An alternative approach to surface infiltration is to move infiltration underground. This strategy can allow for green space opportunities in urban settings where land space limits surface infiltration. However, subsurface infiltration is not immune to limitations either. For example, (a) soils may be unsuitable for infiltration, (b) a large footprint may be needed, (c) the groundwater table is shallow, and/or (d) bedrock may prevent the installation of underground structures.

Step 3: Rainwater Harvesting

In keeping with a fundamental LID goal of reducing runoff, stormwater harvesting captures rainwater and can reduce runoff from the site. This strategy utilizes stormwater as a valuable resource and asset instead of managing runoff as a liability. Rainwater harvesting can allow the property to utilize runoff as a source for non-potable water uses by capturing water that would otherwise have been lost. However, local regulations may not allow for harvesting since it can deprive the groundwater table from local recharge. Harvesting systems may require a large footprint or storage vessel that does not conform to the intended use of the site. In addition, other local regulations, building codes or other use-based issues can limit harvesting opportunities.

Step 4: Biofiltration

When the technologies of Steps 1, 2 or 3 cannot be feasibly implemented, the use of biofiltration is typically considered next. Biofiltration spans the gap between the fundamental LID goal of runoff reduction and the need for water quality treatment. Biofiltration can offer the ability to manage a considerable volume of water on a per storm basis, but the infiltration rates can be low when compared to end of pipe solutions. Biofiltration technologies, whether via land based designs or engineered solutions such as modular “tree boxes,” offer an effective level of water treatment while providing a green viewscape. While biofiltration designs often provide a high level of treatment, it may be necessary to supplement this practice with other technologies to better address the goals of LID due to their typically low treatment flows.

Step 5: Treatment Train Options

This step in the technology selection process differs from the four prior technologies since it offers the opportunity to incorporate a site-specific treatment train approach to water quality using land based designs in combination with manufactured treatment devices. Media filtration provides a high level of treatment typically such that a sediment removal goal of 80% can be achieved on a standalone basis. Media filtration can also provide pretreatment when advanced water quality treatment is necessary. Hydrodynamic separation technology is often used for pretreatment in association with detention or storage features, whether aboveground or underground. Detention and storage strategies can also be used in association with biofiltration, media filtration and hydrodynamic separation. The technologies included in Step 5 may be considered more conventional than those prior steps, but given any set of circumstances including those of retrofit designs, can be an excellent strategy for site design and development.