

Memorandum


To: City of Laramie Stormwater Focus Group
From: WSP Environment and Infrastructure
CC: City of Laramie Public Works and Engineering
Date: December 1, 2023
Ref: Stormwater Funding Feasibility Study
Background on Green Infrastructure for Stormwater Management





Implementation of Green Infrastructure/Low Impact Development

Green Infrastructure is an approach to managing stormwater runoff using natural systems that provides social, economic, and environmental benefits. Low Impact Development (LID), a term often used interchangeably with Green Infrastructure, is a subset of Green Infrastructure that implements site designs intended to mimic the predevelopment site hydrology using techniques that store, infiltrate, evaporate, and detain runoff.

Stormwater is managed in multiple smaller, cost-effective landscape features instead of being collected, conveyed, and treated in large pond facilities at the bottom of watersheds. Use of this technique reduces the volume and frequency of off-site runoff while improving the water quality of stormwater discharges. While Green Infrastructure is often incorporated during the initial design and construction of a site, there are several practices that can be used to retrofit existing sites. Green Infrastructure techniques can be applied on both private developments and within City right-of-way.

A few examples of Green Infrastructure practices are shown in the Table below.

Practice	Description	Application
Bio-retention Areas	Also called Porous Landscape Detention, consists of a low-lying vegetated area underlain by a sand bed with an underdrain pipe. A shallow surcharge volume exists above the bio-retention area for temporary storage of runoff. During a storm, accumulated runoff ponds in the vegetated area and gradually infiltrates into the sand bed. The under drain gradually dewateres the sand bed and discharges the runoff to a nearby channel or storm sewer.	Parking lot islands & landscaped areas 

<p>Tree Box Filters</p>	<p>Consist of a tree planted in a soil media filtration system contained in a small, square, concrete box. Runoff is often collected through curb cuts and retained and filtered by the tree box as it passes through the vegetation and microorganisms in the soil. The water is then either consumed by the tree or transferred into the storm drain system.</p>	<p>Along sidewalks, streets, or parking lots</p> 
<p>Bioswales</p>	<p>A vegetated channel used to collect and convey runoff with underground components that store, filter, and infiltrate stormwater. Bioswales typically include dense grasses over a layer of sand, a layer of gravel, and an underdrain pipe.</p>	<p>Alternative to gutters, pipes, or ditches</p> 
<p>Permeable Pavements</p>	<p>Open graded asphalt or concrete with reduced fine material and a special binder that allows for the rapid flow of water. Stormwater runoff is able to pass through the pavement by flowing through voids between the aggregate. Paver blocks can also be used to construct a permeable paving surface. An aggregate subbase is installed below the permeable pavement surface to filter and store runoff.</p>	<p>Parking lots, driveways</p> 
<p>Green Roofs</p>	<p>Green roofs can be installed on existing buildings and even on sloping roofs. Green roofs can be installed using a layered system or a modular system in which plants are pre-grown. Green roof plants should be hardy, self-sustaining, drought-resistant plants. A lightweight soil mix is used to reduce structural loading on the roof. Roofs that are designed to handle snow loads are usually suitable for a green roof installation.</p>	

Green Infrastructure could be incorporated into the City's stormwater management program in several ways, as a method to improve stormwater quality and reduce stormwater runoff at the source while waiting for funding of downstream improvements. For example, the City could require or incentivize the use of Green Infrastructure in private development and re-development projects. The City could also incorporate Green Infrastructure into capital projects in the City right-of-way, as part of street or park improvements. As discussed in the section below, the construction and maintenance of Green Infrastructure practices are key to their successful operation.

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