

Villanova Bio-Infiltration Traffic Island

An existing mounded grass median or traffic island was retrofitted to form the Villanova Bio-Infiltration Traffic Island. Funds for the Traffic Island construction were provided through the Pennsylvania DEP Growing Greener program. The Traffic Island is located on Villanova University's West Campus. The majority of the



drainage area is composed of asphalt parking area for the adjacent student housing facilities and some grass areas. Approximately half of the 1.2 acre drainage area is impervious surface. The site is part of the Villanova University Stormwater Best Management Practice Demonstration Park. The Bio-Infiltration Traffic Island has been the focus of an ongoing study that has shown that the BMP captures and infiltrates 70% of the annual runoff from the drainage area.

The Traffic Island drainage area is located in the headwaters of the Darby Creek which ultimately flows to the Delaware River. The Darby Creek is an impaired waterway which has already been severely impacted by excess runoff from impervious surfaces. The recharge provided by the Traffic Island BMP is especially critical since the Traffic Island is located in the headwaters. The BMP helps maintain baseflow in local first-order tributaries of the Darby.

The retrofit was constructed in 2001. The concept of the retrofit is simple; a typical mounded traffic island was dug out to capture and infiltrate stormwater runoff. Runoff enters the Traffic Island through two cuts made in the curb. The runoff travels through two rip-rap lined channels onto the surface of the infiltration bed. The first curb cut was created after an existing storm sewer inlet was filled and paved over. The location of the second curb cut was determined by observing the flow of water across the adjacent pavement. A diversion wall was placed within the adjacent storm sewer thereby redirecting flow from the existing storm sewer system into Traffic Island. In the event that inflows exceed the capacity of the Traffic Island, the flows are directed over the diversion wall and back into the existing storm sewer system where they are piped to an existing standard detention

basin just downstream of the BMP. Two monitoring wells were also installed to monitor the groundwater table.

To create the infiltration bed, the original soil was first excavated to a four foot depth. The native soil was then sifted and mixed with sand at a 1:1 ratio to increase the hydraulic conductivity thereby increasing the infiltration rate. The made



soil was placed back into the Traffic Island and a depression was formed. Vegetation was planted inside the Traffic Island. The plants were chosen for their ability to survive both prolonged wet and dry conditions. The plants chosen are native to the Southern New Jersey shore, where they predominately inhabit tidal regions.

Monitoring equipment has been installed to record both rainfall and the water surface elevation in the Traffic Island. This data has been used to create a computer model of the Traffic Island and its contributing watershed. The model is used to estimate the amount of stormwater infiltrated by the BMP on a storm by storm basis. This model was used along with historical rain gage data from the National Weather Surface to predict the annual effectiveness of the Bio-Infiltration Traffic Island. The results of the study show that the Traffic Island reduces the annual runoff volume from the drainage area by approximately 70%. This research also illustrates the importance of properly sizing the BMP based on a given drainage area size and a desired infiltration volume.

Future studies of the Traffic Island will focus on water quality. Sampling equipment will be installed to collect samples of runoff before entering the Traffic Island. Groundwater samplers will also be installed that enable infiltrated water to be collected for analysis in the lab. In addition to the future water quality studies, soil moisture meters have been purchased that will be used to monitor the passing moisture front produced by the infiltration of stormwater runoff. This will also help relate antecedent soil moisture content with observed infiltration rates.