

The effectiveness and benefits of bridge deck systems in stormwater management

Abstract

This study is to investigate the stormwater drainage practices in public transportation systems by reviewing the work conducted in Massachusetts. Appropriate stormwater drainage system must be implemented so that water quality can be maintained at the safe level for intake. This study focuses on determining how bridges can be implemented to control the flooding of water into traffic lanes and the surface or parking lots while improving the quality of stormwater runoff.

Massachusetts Department of Transportation conducted a field study from August 2014 through August 2016 in which they monitored the concentrations of suspended sediment, loss on ignition of suspended solids, particular carbon, total phosphorus, total dissolved nitrogen, and particulate nitrogen. During this study, monitoring stations were placed at three bridges. Samples of the bridge deck run off was collected throughout the year in various conditions such as during rain, snowmelt runoff, and dry periods as well. The three bridge deck monitoring stations included State Route 2A in the city of Boston, Interstate 90 in the town of Weston, and State Route 20 near Quinsigamond Village in the city of Worcester. Samples were collected from five fixed locations on each bridge.

When testing for each particle, flow-proportional samples were used. This study concluded that there were median concentrations of suspended sediment. But individual composites were much greater. At the State Route 2A and Interstate 90 bridges the median concentrations of suspended sediment were very similar. Concentrations of loss on ignition and particular carbon in composite samples generally were less than of the median mass of suspended sediment. Concentrations of total phosphorus were median and the highest on the State 2A in Boston. Concentrations of total nitrogen were variable.

The sample yields at the three bridges collected were widely different but were very similar to the other bridges without the bridge decks in Massachusetts. Though the results of bridge-decks and other stormwater management systems were very similar, this study concluded best management practice to treat deck-runoff may significantly reduce discharge yields. This method would help produce the best quality of water.