# Characterizing the variability of phosphorus export from urban stormwater for potential treatment strategies

**Sadia Khan**[1], **Edward Beighley**[1,2], **David VanHoven**[3], **Kathy Watkins**[4]

[1] Civil and Environmental Engineering, Northeastern University, 360 Huntington Ave., Boston, MA 02115, USA
[2] Marine and Environmental Sciences, Northeastern University, 360 Huntington Ave., Boston, MA 02115, USA
[3] Stantec David VanHoven, PE, 226 Causeway St, Boston, MA 02114, USA
[4] City of Cambridge, Kathy Watkins, 147 Hampshire St, Cambridge, MA 02139
* Correspondence: khan.sad@husky.neu.edu

## Abstract

The escalating awareness of improving the eutrophication situation of Charles River by has led to regulations aimed at reducing phosphorus loading to the river. The stormwater runoff from industrial, commercial, and residential lands which account for most of the phosphorus loading might not be controlled by traditional mitigation measures. To address these loadings, as per regulations, the City of Cambridge, MA, must reduce its annual phosphorus export over a period of years based on incremental reductions. One potential treatment approach for areas with separated sewers is to divert stormwater to some type of treatment. However, it is not possible to treat all stormwater. To develop an optimized diversion and treatment strategy, a collaborative study between the City of Cambridge, Stantec, and Northeastern University is conducting stormwater sampling to understand the variability in phosphorus export from different urban landscapes. The focus on particle size provides a connection to flow velocity required for transport (i.e., shear stress), which can be modeled to trigger flow diversions. To characterize the potential export reductions based on flow velocity thresholds, 1-hour composite samples for six storm events were collected from four locations within the City of Cambridge. The samples were divided into six subsamples: unfiltered, filtered through 250, 100, 50, 25, and 10 µm filters. They were then analyzed for total phosphorus and total solids. The analysis of these high-resolution stormwater samples shows that the phosphorus is not uniformly distributed between particle size fractions. However, the loading distribution is highly dependent on rainfall and landcover characteristics.