



REGENERATIVE AIR STREET SWEEPER STUDY CAMBRIDGE, MA, USA



Background and Study Objectives

Overview

The Lower Charles River Basin exceeds the Total Maximum Daily Load (TMDL) of phosphorous (P) as established by the US EPA. The EPA expects the City of Cambridge, Massachusetts to reduce P contributions by more than 65% by implementing control measures (best management practices [BMPs]) to assist in meeting the TMDL of P.

Phosphorous is considered a nutrient which is found in fertilizers and produced by the decomposition of organic material such as vegetation and leaves. High concentrations of P in water can lead to harmful algal blooms depleting oxygen in water, killing aquatic wildlife such as fish and in high concentrations the algae can also be toxic to humans¹. Algal blooms can also give water a bad taste and odor.

¹US EPA 2013 – Nutrient Pollution, The Problem, <http://www2.epa.gov/nutrientpollution/problem>, Updated July 2, 2014, Accessed January 20, 2014

Study Objectives

- Better understand the physical and chemical nature of the organic and inorganic solid material on street surfaces
- Evaluate the performance of a TYMCO Model DST-6

Regenerative Air street cleaner at removing street solids, phosphorous and 32 other elements

- Make use of the Source Loading and Management Model (SLAMM) to estimate potential reductions in solid and phosphorus loading to the lower Charles River from various street-cleaning technologies and frequencies

Study Partners

- Massachusetts Department of Environmental Protection (MassDEP)
- United States Environmental Protection Agency (US EPA)
- United States Geological Survey (USGS)
- City of Cambridge, Massachusetts
- TYMCO

USGS Report Download

The complete USGS Scientific Investigations Report is available for download at no charge:
<http://pubs.usgs.gov/sir/2012/5292/>

Questions and Comments

Please visit www.tymco.com/contact

Conclusions

- Streets represent a significant source of pollutants contributing to stormwater and air quality degradation
- SLAMM results show that when sweeping monthly, the TYMCO Model DST-6 is:
 - 5.9x more effective than mechanical broom sweepers at reducing solids
 - 3.1x more effective than vacuum-assist sweepers at reducing solids
- Full width street cleaning matters!
 - 57% of solids found within 3 feet of the curb
 - 95% of solids found within 9 feet of the curb
- Sweeping once a month with the TYMCO Model DST-6 is more effective at reducing solids and P contributions to stormwater than sweeping three times a week with mechanical or vacuum sweepers

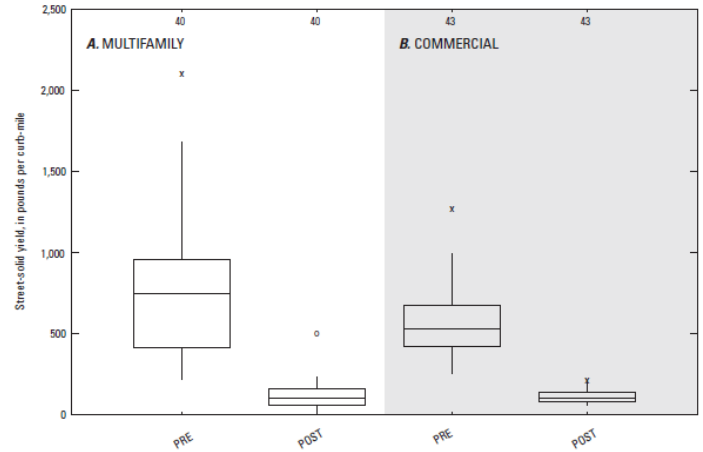
Street Solids Sampling

- Land Use Types
 - 3 multifamily residential
 - 3 commercial
- Evaluated
 - Street solids
 - Street washoff from rainfall
 - Material removed by the TYMCO Model DST-6
- Sampled
 - 10 months of sampling between Aug. 2009 and Mar. 2011
 - Curb to curb sampling
 - Samples taken with stainless steel wet / dry vacuums
- Analyzed
 - Organic carbon and 32 other elements, including phosphorous (P)

Model DST-6 Performance

- Vacuumed strip sample 9 feet from the curb
- Sampled before and after a single pass of the Model DST-6
- 7 experiments May - December 2010
- Median removal efficiency
 - Multifamily residential – about 82%
 - Commercial – about 78%
- Total P reductions
 - Multifamily residential – about 82%
 - Commercial – about 62%

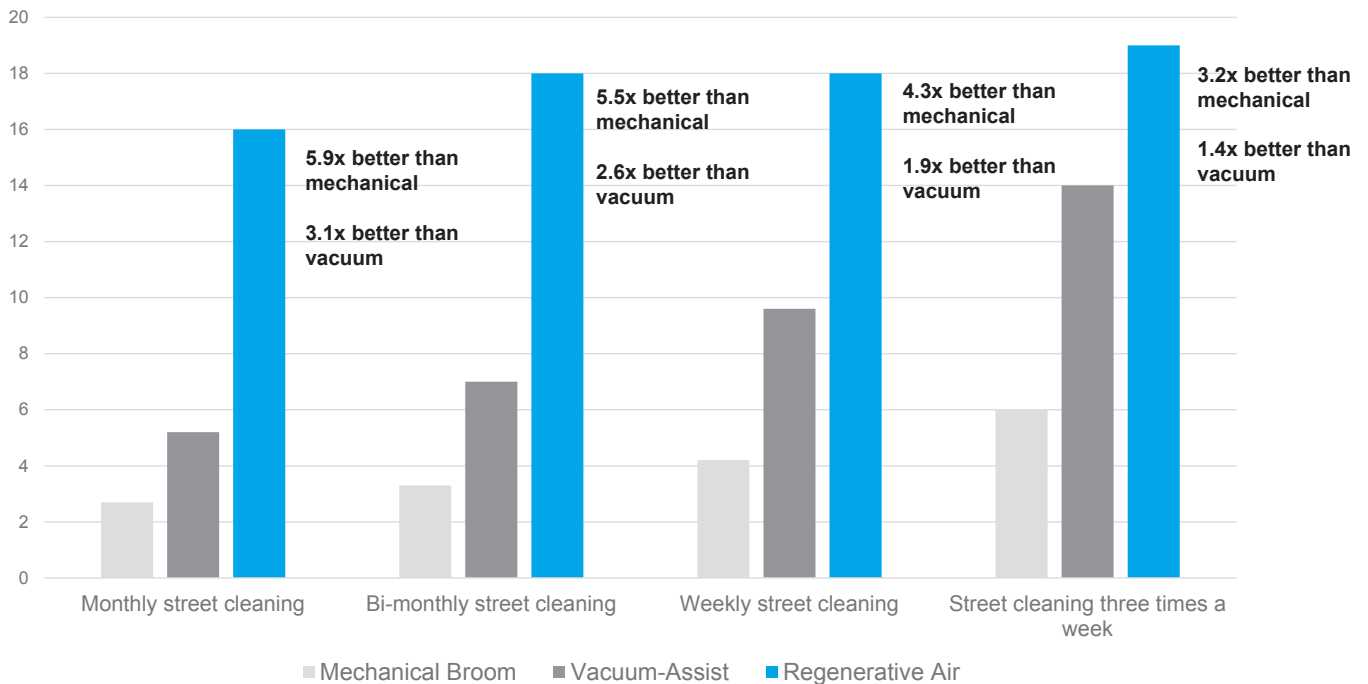
Model DST-6 Solids Removal Efficiency



Source Loading and Management Model (SLAMM) Benchmark

- Computer simulation developed in the late 1970s
- Used to predict
 - Stormwater runoff volume
 - Loads of suspended sediments and other constituents
 - Effects of stormwater-control measures
- Stormwater and control measure effectiveness data is continually added
- Assumes 24 hour on-street parking controls
- Based on 5 years of average climatic conditions
- The below illustration summarizes the results of the SLAMM Benchmark for the Cambridge Study

Total Percent Solids Reduction to Stormwater



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