

Investigation of Chemical Contaminants in Soils Following Superstorm Sandy

Amy C Mandigo*, Dana J DiScenza*, Alison R Keimowitz†, and Neil Fitzgerald*

*Marist College Department of Chemistry Biochemistry & Physics, Poughkeepsie, NY

†Vassar College Chemistry Department, Poughkeepsie, NY

Abstract

Immediately after Superstorm Sandy hit the east coast in October 2012, a project titled SUDS (Send Us your Dirt from Sandy) was launched. Using social networking and the media, 60 samples were collected through the beginning of November. The samples were prepared for the organic analysis using microwave assisted extraction. Each sample was then tested for polychlorinated biphenyls (PCBs), using gas chromatography combined with electron capture detection (GC-ECD), and polycyclic aromatic hydrocarbons (PAHs), using gas chromatography combined with mass spectrometry (GC-MS). The samples were also prepared for metallic analysis of lead and arsenic using X-ray fluorescence spectrometry (XRF). To determine the effects of renovation and rebuilding, additional samples were obtained in July 2013 from the Rockaway Peninsula and the Newtown Creek areas and measured again for PAH, PCB, lead and arsenic concentrations.

Objectives

- Collect samples from flooded areas in the immediate aftermath of storm
- Test for the presence of metals and organics (PCBs, PAHs)
- Identify areas of interest and resample
- Compare contamination concentrations of original and new samples
- Gain an understanding of the contamination mechanisms occurring as a direct or indirect result of the storm.

Methods

- X-Ray Fluorescence
- Microwave Assisted Extraction
- Gas Chromatography – Electron Capture Detection (GC-ECD) for PCBs.
- Gas Chromatography – Mass Spectrometry (GC-MS) for PAHs

Data

Lead

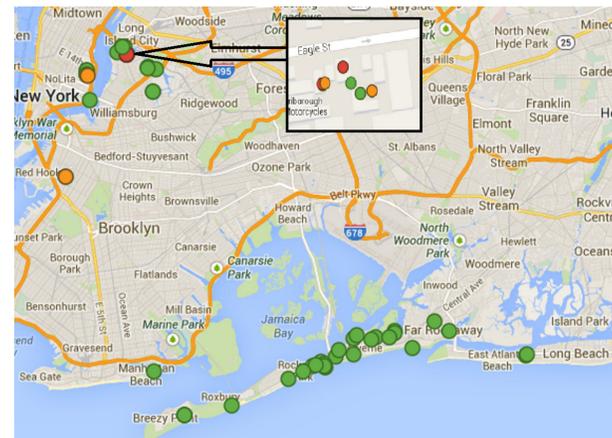


Figure 1: Concentrations above 1,200 mg/kg are red and from 400 mg/kg to 1,200 mg/kg are orange.

Arsenic*

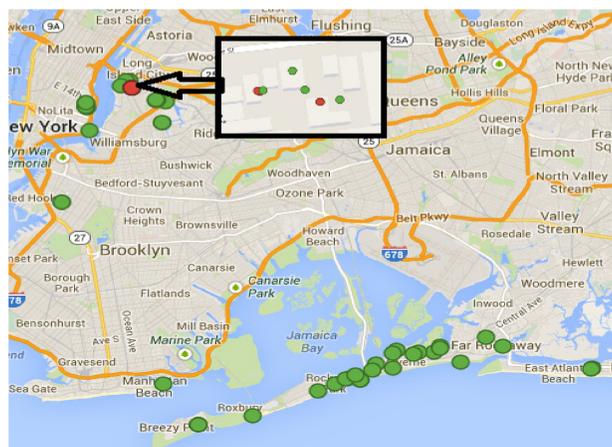


Figure 2: Concentrations above 30 mg/kg are shown in red.

Polychlorinated Biphenyls (PCBs)

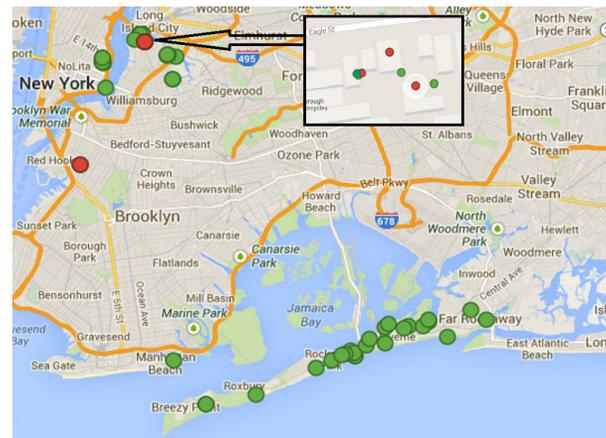


Figure 3: Concentrations above 1.0 mg/kg are indicated by red.

Polycyclic Aromatic Hydrocarbons (PAHs)

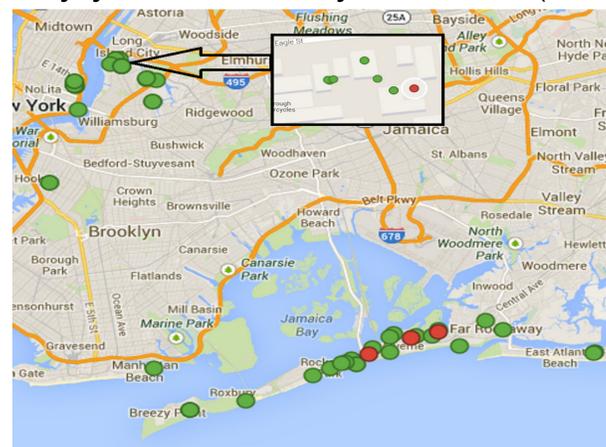


Figure 4: Concentrations of benzo[k]fluoranthene above 1.5 mg/kg are shown in red.

Results

November Samples

- Elevated levels of lead, arsenic, PCBs and PAHs near Newtown Creek
- Elevated levels of PAHs along the Rockaways Peninsula

July Samples

- Lead and arsenic levels showed little change in concentration from immediately after the storm
- Significant decrease in total PAH concentration for all samples
- Significant decrease in total PCB concentration for all samples

Conclusions

- Citizen science approach was successful method for obtaining samples in the immediate aftermath of the storm
- Some evidence for possible movement of sediment from contaminated site
- Co-contamination observed at several sites
- Cause of PAH and PCB concentration decrease unknown

Acknowledgements

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- The citizen scientists who provided the soil samples from areas affected by Superstorm Sandy.

Contaminant	November Samples Mean/Standard Deviation (mg/kg)	July Samples Mean/Standard Deviation (mg/kg)
Lead	217 (293)	251 (305)
Arsenic*	11 (16)	8.1 (4.4)
PCBs	0.37 (0.45)	0.06 (0.13)
PAHs	3.2 (4.0)	0.9 (1.6)

Table 1: The total mean and standard deviation for the Rockaway Peninsula and the Newtown Creek area of the first sampling set and the second sampling set

*Arsenic values may suffer from spectral interference at high lead concentrations