# Using Sucralose to Assess Groundwater Contamination Near a Maine Landfill

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Protecting Maine's Air, Land and Water

#### The Problem: Landfill closed in 1996 Widespread ground water contamination identified in 2009

# The landfill represents only part of the problem

Tremont Landfill

Geolys, Earlistar Geographies, CNES/Air/us DS, USDA, USGS, AEX, Getmapping,



## The evidence

- Groundwater quality continued to deteriorate after landfill closure in 1996
  - Significant increases in chloride, manganese, and iron
  - Pharmaceuticals and Personal Care Products (PPCPs)
- It's unlikely a single contaminant source (landfill) is solely responsible for the widespread contamination
- Rather.....
  - Density of development with individual septic systems and application of sand/salt and the storage facility







**DW-10** 





**DW-1** 







DW-11

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#### Tremont Closed Municipal Landfill

• Limited sampling for PPCPs – AXYS Analytical

TABLE 4											
TREMONT CLOSED MUNICIPAL LANDFILL											
August 2013 - Pharmaceuticals and Personal Care Products											
		MW-DEP-18		DW-8		DW-7		DW-9		DW-12	
Parameters	1	ng/L	ng/L (RL)	ng/L	ng/L (RL)	ng/L	ng/L (RL)	ng/L	ng/L (RL)	ng/L	ng/L (RL)
Acetaminophen		U	15.3	U	14.9	U	15.5	U	15.8	U	16.2
Caffeine		U	23.1	U	14.9	U	15.5	U	15.8	U	16.2
Carbamazepine		3.4	1.64	3.85	1.49	9.98	1.55	2.57	1.58	1.67	1.62
Erythromycin-H2O		21.2	2.34	U	2.28	U	2.37	U	2.43	3.16	2.49
Flumequine		4.63	1.53	U	1.49	U	1.55	U	1.58	U	1.62
Sulfamethoxazole		U	0.61	0.797	0.594		0.619	U	0.634	U	0.649
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4.63 ng/L = 0.00463 ug/L = 0.00000463 mg/L

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# Pursuit of another line of evidence

- Non-nutritive sweeteners As wastewater tracers
  - Aspartame
  - Acesulfame
  - Saccharin
  - Sucralose marketed under the brand Splenda
    - Because it's the most heat stable artificial sweetener, it's used in lots of products.
  - Discovery
    - Sucralose was discovered in 1976 by a graduate student at King's College London. The lead researcher asked the student to "test" some compounds. The student responded to "testing" of a chlorinated sugar as a request for "tasting"....

#### SUCROSE



#### SUCRALOSE



600 TIMES SWEETER THAN SUCROSE



## Sucralose

- Non-nutritive sweetener
  - Discovered in 1976
  - 1998 approved for use in USA



- 1999 FDA expands its use as a general purpose sweetener
- 2000 large scale commercial use begins:
  - soft drinks, candy, breakfast bars, baking
- Only 2 to 8% consumed is metabolized
- Ubiquitous in the human diet, highly soluble, recalcitrant and low adsorption potential – Sounds like an excellent tracer

# You will find Sucralose in all sorts of products - 4,000 and counting







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### **Sampling Program**

2 Monitoring wells9 Water supply wells + 1 duplicate(AXYX provided analytical services)

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900 Feet

600

www.maine.gov/dep

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# What's it all mean?

- The detection of sucralose in all of the private wells demonstrates the presence of dilute septic system effluent in groundwater!
- Contaminants leached from the landfill are likely only a small part of the problem
  - The increases in iron and manganese after 1996 are unrelated to the landfill....Why? Continued contaminant increases not expected after landfill closure
- And let's not forget sucralose is only a tracer and its presence suggests there may be other septic related components in groundwater
- What's a solution to this problem?

### A public water supply?



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