Wastewater Solids Management
- Atlantic Canada Perspective

Dwayne Doucette, MASc. P.Eng.

June 19, 2013
Wastewater Treatment in Atlantic Canada

Dramatic improvement in this Region over the Past 10 to 15 years.

St. John, NB

Charlottetown, PEI

Dartmouth, NS

Halifax
Herring Cove
New Glasgow
Wastewater Treatment in Atlantic Canada

Dramatic improvement in this Region over the Past 10 to 15 years.

- Summerside, PEI
- Moncton, NB
- Quispamsis
- Miramichi
- Fredericton
- St John’s, NFLD
Wastewater Treatment in Atlantic Canada - progress

◆ Nova Scotia
  - Sydney: from raw discharge → enhanced primary
  - Halifax: 3 WWTFs Halifax, Dartmouth and Herring Cove
    from raw discharge → enhanced primary treatment.

◆ New Brunswick:
  - Moncton: from raw sewage discharge → enhanced primary
  - Saint John: from raw discharge → secondary treatment
Wastewater Treatment in Atlantic Canada - progress

- **Newfoundland**
  - St. John’s: from raw sewage discharge → to enhanced primary.

- **Prince Edward Island**
  - Charlottetown: from primary treatment → secondary treatment
  - Summerside: from primary treatment → advanced tertiary treatment.
Wastewater Treatment in Atlantic Canada - progress

Progress in the last 10 to 15 years

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>None/Prelim</td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>Primary</td>
<td>40%</td>
<td>30%</td>
</tr>
<tr>
<td>Secondary</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Tertiary</td>
<td>20%</td>
<td>None</td>
</tr>
</tbody>
</table>
Sewage Treatment in Nova Scotia

Source: 2011 Municipal Water Use Report by Environment Canada
Sewage Treatment in New Brunswick

- None/Prelim: 2.0%
- Primary/enhanced: 14.0%
- Secondary: 53.0%
- Tertiary: 31.0%

Source: 2011 Municipal Water Use Report by Environment Canada
Sewage Treatment in Newfoundland

Source: 2011 Municipal Water Use Report by Environment Canada
Sewage Treatment in Prince Edward Island

Source: 2011 Municipal Water Use Report by Environment Canada
But....

- Treatment of wastewater produces solids also known as sludge.

- Treated sludge is referred to as “Biosolids” using industry lingo.
### Sludge & biosolids production by province

<table>
<thead>
<tr>
<th>Province</th>
<th>Sludge / Biosolids Estimated w.t./yr*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nova Scotia</td>
<td>55,000</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>24,000</td>
</tr>
<tr>
<td>Newfoundland</td>
<td>9,000</td>
</tr>
<tr>
<td>PEI</td>
<td>8,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96,000 w.t./year</strong></td>
</tr>
</tbody>
</table>

*Does not include lagoon sludges. Quantity would more than double with lagoons.*
Macro Approach (includes lagoons)

- 2.4M population Atl Can; of which 1.8M is sewered
- $1.8M \times 0.1\text{kg DS/day} = 180\text{ kg DS/day}$
- $180\text{ kg DS/day} \times 365\text{ day/year} = 66,000\text{t DS/year}$
- $66,000\text{t DS/year} \div 25\% \text{ cake solids}$
- $= 265,000\text{ WT/year}$

Three sludge treatment requirements include:
1. Pathogen Reduction
2. Vector Attraction Reduction
3. Trace Metals
Atlantic Canada Guidelines
pathogen reduction requirements

**Class A & EQ**
(FCM Categories 1 & 2, USEPA Class A etc.)

- FC $< 1,000$ MPN/g d.s. OR
- Salmonella $< 3$ MPN/4 g d.s.

**Class B**
(FCM Category 3, USEPA Class B etc.)

- FC $< 2,000,000$ MPN/g d.s.
Vector Attraction Reduction
aka stabilization

- Reduce volatile solids by at least 38% during treatment.

  OR

- Specific oxygen uptake rate (SOUR) < 1.5 mg O$_2$/hr/g dry sludge (only applicable to aerobic processes)

  OR

- Addition of sufficient alkaline material (lime) to produce mixture with minimum pH of 12 after 2 hours of vigorous mixing
## Trace Metal Requirements

<table>
<thead>
<tr>
<th>METAL (mg/kg)</th>
<th>Atl Can Guide Class A/B</th>
<th>Atl Can Guide EQ</th>
<th>NS Guidelines A/B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>75</td>
<td>41</td>
<td>13/75</td>
</tr>
<tr>
<td>Cadmium</td>
<td>85</td>
<td>39</td>
<td>3/20</td>
</tr>
<tr>
<td>Chromium</td>
<td>-</td>
<td>1200</td>
<td>210/1060</td>
</tr>
<tr>
<td>Cobalt</td>
<td></td>
<td></td>
<td>34/150</td>
</tr>
<tr>
<td>Copper</td>
<td>4300</td>
<td>1500</td>
<td>400/760</td>
</tr>
<tr>
<td>Mercury</td>
<td>57</td>
<td>17</td>
<td>0.8/5</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>75</td>
<td>-</td>
<td>5/20</td>
</tr>
<tr>
<td>Nickel</td>
<td>420</td>
<td>420</td>
<td>62/180</td>
</tr>
<tr>
<td>Lead</td>
<td>840</td>
<td>300</td>
<td>150/500</td>
</tr>
<tr>
<td>Selenium</td>
<td>100</td>
<td>100</td>
<td>2/14</td>
</tr>
<tr>
<td>Zinc</td>
<td>7500</td>
<td>2800</td>
<td>700/1850</td>
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</tbody>
</table>
Solids Handling major centres in NS

- **Halifax, NS - Aerotech**
  - 40,000 w.t/year alkaline stabilization & pasteurization.
  - Beneficial reuse land application.

- **Sydney, NS**
  - 2200 w.t/year primary sludge cake.
  - Composted by in-vessel composting system.
Solids Handling
major centres in NS

- **Truro, NS**
  - 4500 w.t./year aerobically digested sludge cake.
  - Sent to a commercial composter end product is used for beneficial reuse.

- **New Glasgow, NS**
  - 3900 w.t./year aerobically digested sludge, alkaline stabilization & pasteurization
  - Beneficial reuse land application
Solids Handling
major centres in NB

- Fredericton & Saint John
  - 14,000 w.t./yr of dewatered sludge cake at design.
  - Sludge is then transported to commercial composting facility

- Moncton
  - 11,000 w.t./yr of dewatered sludge
  - Sludge is composted by GMSC and sold as a soil amendment.
Solids Handling
major centres in PEI

- **Charlottetown**
  - 3,000 w.t./yr anaerobically digested, pasteurized
  - Biosolids are dewatered on-site and then land applied as soil amendment

- **Summerside**
  - 4000 w.t./yr alkaline stabilization and pasteurization.
  - Biosolids are sold to a commercial lime and fertilizer company.
Solids Handling
major centres in NFLD

- St John’s
  - 8500 w.t./yr anaerobically digested, primary sludge
  - Biosolids are then disposed of.
Composting: at least 50% of the regions biosolids
Regionally, 235,500 tonnes were composted in Atlantic Canada (includes green cart waste)
Class A Sludge Treatment technologies employed
Compost for sale as “Compost Mulch”
Or “Compost Soil Conditioner”.

Price ranges from $35/yd to $20/yd
Depending on product and quantity.
http://www.edmonton.ca/for_residents/ReVive-Reclamation-Compost.pdf
Alkaline Stabilization / Pasteurization: 40% of the regions biosolids
Alkaline Stabilization / Pasteurization
N-Viro end product

- 60% + TS content
- Granular consistency
- Spread with lime spreaders
Biosolids Processing Facility
Aerotech Park
Agricultural lime spreaders
Class A Sludge Treatment technologies employed

RDP Treatment Process

Aerated Sludge

- WAS
  - 240 m³/d @ 0.9%
  - 2160 kg/d

- Feed Pumps
- Blowers

Dewatering

- ThermoBlender
  - 11.4 m³/d @ 18%
  - 2050 kg/day

Pasteurization Vessel

Quick Lime

Class A Biosolids to Land Application
Pasteurization Vessel

- Temperature of 70 °C for 30 minutes.
- Capacity of 1 tonne/hour.
- 12 kW Heating System
Class A Sludge Treatment technologies employed

- Pasteurization and Anaerobic Digestion

Diagram:
- Primary Sludge
- Septage
- WAS
- Gravity Thickeners
- Pasteurization
- Kruger
- Anaerobic Digesters
- Centrifuge
- Dewatered Class A
- Class A Biosolids to Land Application
Pasteurization and anaerobic digestion

Sludge pre-pasteurization vessels

Anaerobic digesters
End Product - Characteristics

- 25 to 40 % TS content
- Consistency of wet soil
- Spread with manure spreaders
Land Application of End Product

manure spreaders - cake
Class B Sludge Treatment

technologies employed

- Anaerobic Digestion
- Aerobic Digestion
- Lagoon Stabilization
Lagoons like…….

Kentville (New Minas), NS

Saint John, NB

Miramichi, NB

Quispamsis, NB
Land application of lagoon sludge?

- Is lagoon sludge stabilized?
- Does lagoon sludge meet pathogen content requirements?
- What about metals?
Québec

In 2007:
- 27% land application
- 42% incineration
- 31% landfill disposal

From 2007 report of environment ministry (MDDEP)

In 2011: ~36% used in agriculture, and Quebec City has announced it will shut down incineration and build anaerobic digestion.
New England States

Northern New England – more application to soils
Southern New England – more incineration

Mostly Boston
Estimates of solids produced in Canada...

- **388,700 dry tonnes solids produced in 2000**
  - 43% applied to land, 47% incinerated

- **860,000 dry tonnes solids produced in 2004**
  - One third each land applied, incinerated, landfilled
  - Estimate by the CWWA based on flow data 2004 *Municipal Water Use Statistics*, Environment Canada
Some broader context...

- In Canada about 860,000 dry tonnes solids produced in 2004

- In the U. S.: 7,180,000 dry tons in 2004
  - 55% land applied, 15% incinerated, 30% landfilled
  - From NEBRA, 2007
Conclusion

End...