ONTARIO LAND APPLICATION & INTERNATIONAL GUIDELINES

Michael Payne, OMAFRA &

Dr. Mel Webber, Webber Environmental

Ontario Biosolids (2005)**

- Production – 136,000 mT dry solids (ds)
- Management

  Agriculture - 125,000 mT ds - 36%

  Pelletization - 4,000 mT ds - 1%

  Incineration - 120,000 mT ds - 35%

  Landfill - 97,000 mT ds - 28%

** From Schut L., OMAFRA

Sewage Biosolids

- Treated (stabilized) to reduce organic mass and pathogens
  - **Aerobic digestion**
  - **Anaerobic digestion**
  - **Long term lagoon storage**

  - **Alkaline stabilization**
  - **Pelletization**
  - **Composting**

Biosolids Properties

- Organic matter: ~50% ds
- Total N: 1-6% ds (NH4 + variable)
- Total P: 2-5% ds
- Total K: trace
- Bacteria & Other Microbes
- Trace metals (ppm)
- Pharmaceuticals & Personal Care Products (ppb – ppt)

Acceptable Crops

- Field crops - depends on source
- Pasture - waiting period for grazing
  - **Horses, beef & dairy cattle - 2 months**
  - **Sheep & goats - 6 months**
- Tree fruits, grapes - 3 months
- Vegetables - 12 months

Nutrient Loadings

- Application rate based on crop requirement for N or P
  - **If based on N, the rate may supply enough P for multiple years**
  - **Fertilizer value $150 - $200 / ha in year of application**
- Rate may also be limited by site conditions, solids loading or C of A

Land Requirement For Biosolids

- Estimate - 15,600 ha/yr
- Estimate as percentage of cropland - 0.6%
- But application limited to a 5 yr cycle, so a reserve of land is required - 78,000 ha or 3.25% of cropland

Ontario Regulatory Framework

Under EPA Reg. 347

- **Certificates of Approval required for generation, transport, storage and land application**
- **Administered by MOE**

Under NMA Reg. 267/03 as amended

- **NM strategy & plan requirements by generators and receivers**
- **Certification & licensing for brokers and land applicators**
- **Phased-in approach**

Biosolids Quality Regulation

- Pathogens through treatment
- 11 metal concentrations
- Organics and PPCP's not currently regulated
  - **Furan & Dioxin concentrations were monitored and found to be very low**
  - **Other organics currently being researched**

Land Application Regulation

- **Site C of A defines:**
  - Site criteria: depth to bedrock, slopes, soil metals and P conc., soil pH
  - Application management: rates, method of application, timing
  - Waiting periods between application and harvest / grazing

International Regulation

- Ontario & CFIA
- USEPA (EPA)
- European Community (EC)
- EC Member States

Regulations

- Biosolids Quality
  - **Pathogens (sludge treatment)**
  - **Metals**
  - **Organics**
- Application Site Quality
  - **pH, metals, nutrients**
  - **Physical characteristics**

Biosolids Quality Regulation

- Pathogens (Sludge Treatment)
- Metals
- Organics

Treated Sludge

- “Sludge which has undergone biological, chemical or heat treatment, long-term storage or any other appropriate process so as to significantly reduce its fermentability and the health hazards resulting from its use.” (EC)

Sludge Treatment

- Pathogen Reduction (EPA – “Class B”)
  - **Anaerobic digestion**
  - **Aerobic digestion**
  - **Long-term lagooning**
- Pathogen Eradication (EPA – “Class A”)
  - **Various heat treatments**
  - **Alkaline stabilization**
  - **Composting**

Pathogens

	Salmonella	Other
Ontario		$<2x10^6$ MPN F. coli /g ds
EPA – "A"	<3 MPN/4g ds	or <1000 MPN F. coli
EPA – "B"		$<2x10^6$ MPN F. coli /g ds
France	8 MPN/10g ds	Enterovirus: 3 MPCN/10g ds Helminths eggs: 3/10 g ds
Italy	1000 MPN/g ds	
Luxembourg		Enterobacteria: 100/g ds ND Helminth eggs: ND
Poland	ND	Helminth eggs: 10/kg ds

Metals In Biosolids (mg/kg ds)

	Ontario	CFIA	EC	EPA
Cd	20 – 34	20	20 – 40	39 – 85
Hg	5 – 11	5	16 – 25	17 – 57
Pb	500 – 1100	500	75 – 1200	300 – 840

Organics In Biosolids (mg/kg ds)

	PCDD/F pg/g TE ds	PCBs	AOX	PAH	DEHP	LAS	NPE
Austria	50 - 100	0.2 - 1	500	6	-	-	-
Denmark	-	-	-	3	50	1300	10
France	-	0.8 (7)	-	2 - 5 1.5 - 4	-	-	-
Germany	100	0.2 (ea. 6)	500		-	-	-
Sweden	-	0.4	-		-	-	100

Land Application Regulation

- Soil metals
- Other site criteria

Metals In Soil (mg/kg ds)

	Ontario	CFIA	EC	EPA
Cd	**1.6**	**–**	**1 – 3**	**–**
Hg	**0.5**	**–**	**1.0 – 1.5**	**–**
Pb	**60**	**–**	**50 – 300**	**–**

Metal Loads To Soil (kg/ha)

	Ontario / 5 yr	CFIA total	EC / yr (10 yr mean)	EPA / yr, (total)
Cd	0.27	4	0.15	1.9 (39)
Hg	0.09	1	0.1	0.85 (17)
Pb	9	100	15	15 (300)

Application Site Management

- Site characteristics - depth to bedrock, slopes, soil metals and P conc., soil pH, etc.
- Application management - rates, method of application, timing
- Waiting periods between application and harvest / grazing

Conclusions

- Ontario & International Biosolids Regs. – pathogens, metals, organics, nutrients, site characteristics
- Ontario Biosolids Regs. – conservative
- 30+ yr. history of successful land application

Selected References

- http://ec.europa.eu/environment/waste/sludge/sludge_pollutants.htm
- http://ec.europa.eu/environment/waste/sludge/sludge_disposal.htm
- http://ec.europa.eu/environment/waste/sludge/index.htm

Public Acceptance

- Difficulties in all jurisdictions
- Exemplary land application practice important
- UK – “Safe Sludge Matrix” developed by Water UK and British Retail Consortium to insure food safety
- Input from – farm organizations, food manufacturers, food processors and government agencies

UK Safe Sludge Matrix

Crop Type	Treated (Class B) Biosolids	Advanced Treated (Class A) Biosolids
Salads	N	Y
Vegetables	N (12-month harvest interval)	Y
Animal feed crops	Y	Y
Grass-Grazing	N (deep inject or plough down only)	Y
Grass-Silage	Y	Y