

MDEQ/MWEA Water Resources Recovery Leadership Summit Solids and Nutrient Metrics and Baselines Presentation

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Michigan Governor's Recycling Council



http://www.michigan.gov/deq/0,4561,7-135-70153_69695-313206--,00.html

SIMILARITIES AND SYNERGIES BETWEEN LANDFILLS AND WASTEWATER FACILITIES

Solid Waste

- * Build it / Use it / Close it
- * Relies on haulers bringing waste to the landfill
- * Generates biogas
- * Recycling used to extend life



Bing Maps www.bing.com

Wastewater Treatment

- * Build it / Use it / Renovate
- * Steady & predictable source of waste delivered to plant
- * Potential to generate biogas
- * Recycling beneficially uses nutrients, organics, and moisture



Bing Maps www.bing.com

WW Recycling in Michigan

Michigan 



Biosolids Program
Protecting Michigan's Environment
Ensuring Michigan's Future

The City of Grandville **MOORE & BRUGGINK, INC.**
improving clean water

Why Egg Shaped Anaerobic Digester (ESD)?



- Process
- Footprint
- Cost (life cycle)
 - clearing
 - efficiency
- Client comfort
- Ability to go to Class A



<http://www.mlive.com>

http://www.michigan.gov/images/DVD_cove_r_w_motto_127834_7.GIF

<http://www.mi-wea.org/docs/Hannon%20-%20Grandville%20Digester.pdf>

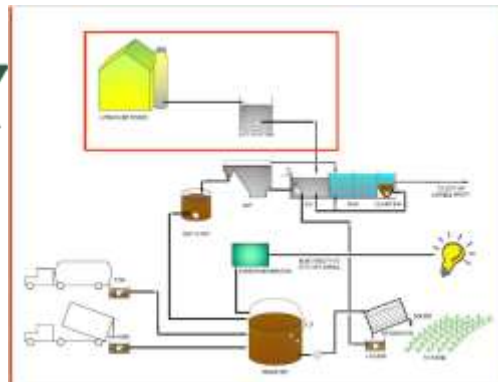
GRAND VALLEY
REGIONAL BIOSOLIDS AUTHORITY



growing Michigan with

CITY OF GRAND RAPIDS

http://www.gvrba.org/sites/default/files/Logo1_1.png



Lowell, Michigan
Biomass to Energy Sweetspot

http://www.mi-wea.org/docs/Williams-Lowell_Biomass_to_Energy.pdf

City of Midland, Michigan
Combined Gas to Energy Facility



http://www3.epa.gov/mop/documents/pdfs/conf/15th/06Tholo_Final.pdf

Utility of the Future



- * Treat water to protect public health and the environment

- * Treat water to protect public health and the environment
- * Recover nutrients
- * Optimize energy efficiency
- * Produce energy
- * Recover heat
- * Water reuse
- * Green infrastructure

MDEQ-WRD/MWEA Collaboration

- * MDEQ-WRD and MWEA workgroup formed
- * MWEA proposal
 - * Establish metrics & baselines
 - * Literature review
 - * Michigan WRRF Recycling Summit
 - * Recognition Program
 - * Outreach Program
- * MDEQ-WRD Grant awarded

MI WW Recycling Metrics

- * Solids
- * Nutrients
 - * Nitrogen
 - * Phosphorus
- * Energy

Please Note

- * The numbers presented today are order of magnitude estimates
- * The values will change as information is collected and methods of analysis are refined
- * Assumptions used to generate the initial estimates are listed and are important to note



Solids

- * Statewide biosolids annual report form information
- * Annual report includes accounting of biosolids generated, land applied, solids disposed of by other means
- * Determine % of total biosolids land applied or processed for other reuse applications (e.g. Detroit BDF project, compost, etc.)



<http://www.wils.com/home/headlines/Authority-Honored-for-Cleaning-Up-Michigan-Landfills-204018441.html>

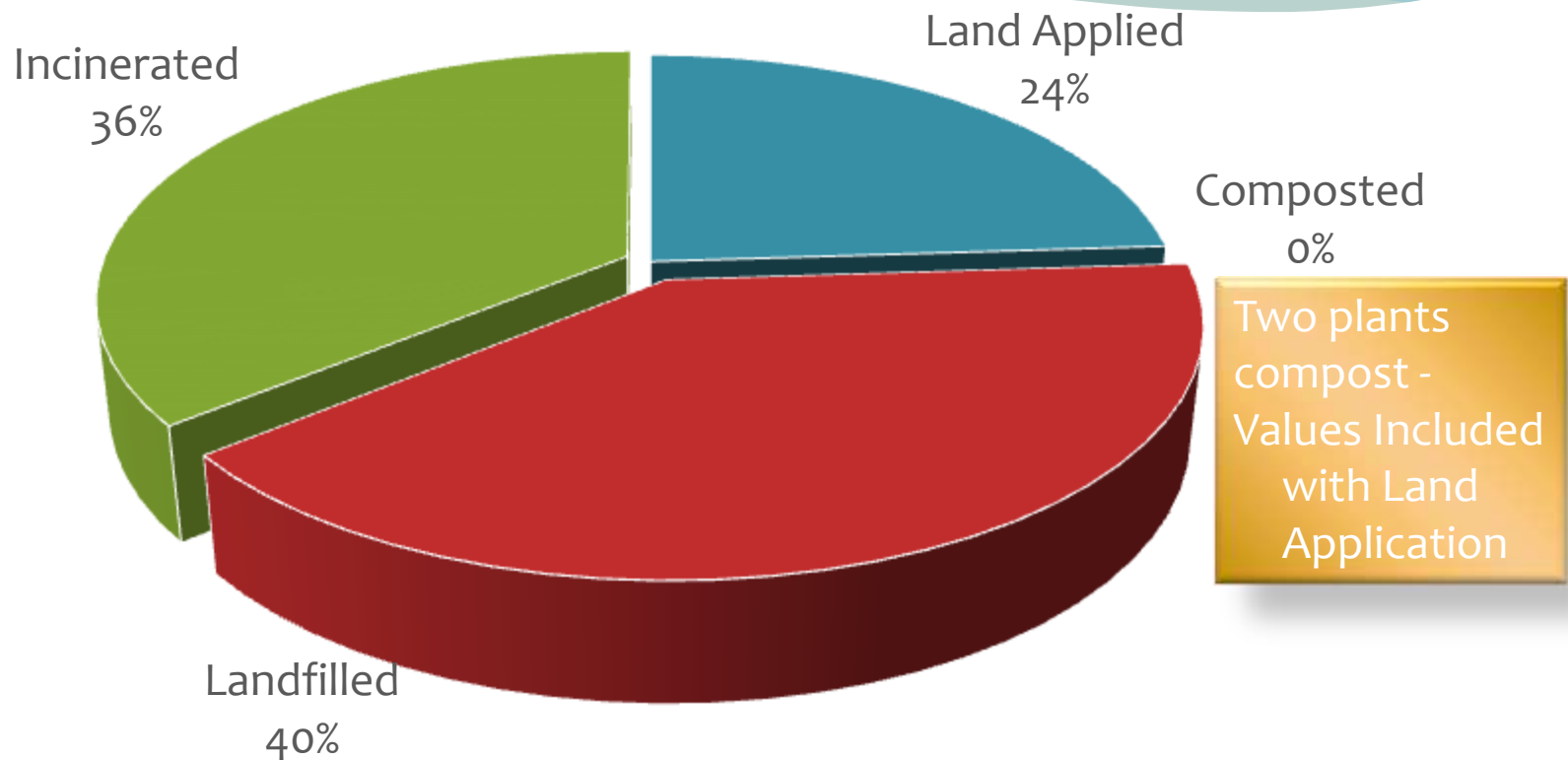


<http://tecalive.mtu.edu/meec/module21/Cost-WW.htm>



Wastewater Solids Handling Techniques

2014



WW Recycling Estimates – Solids

2014 Est. of Biosolids Recycling

Given:

Total Biosolids Land Applied =	80,897 dry tons/year
Total Biosolids Composted =	- dry tons/year
Total Solids Landfilled =	135,622 dry tons/year
Total Solids Incinerated =	<u>120,995 dry tons/year</u>
Total Solids Disposed =	337,514 dry tons/year

Assumptions:

Percent of solids captured via treatment = 90%

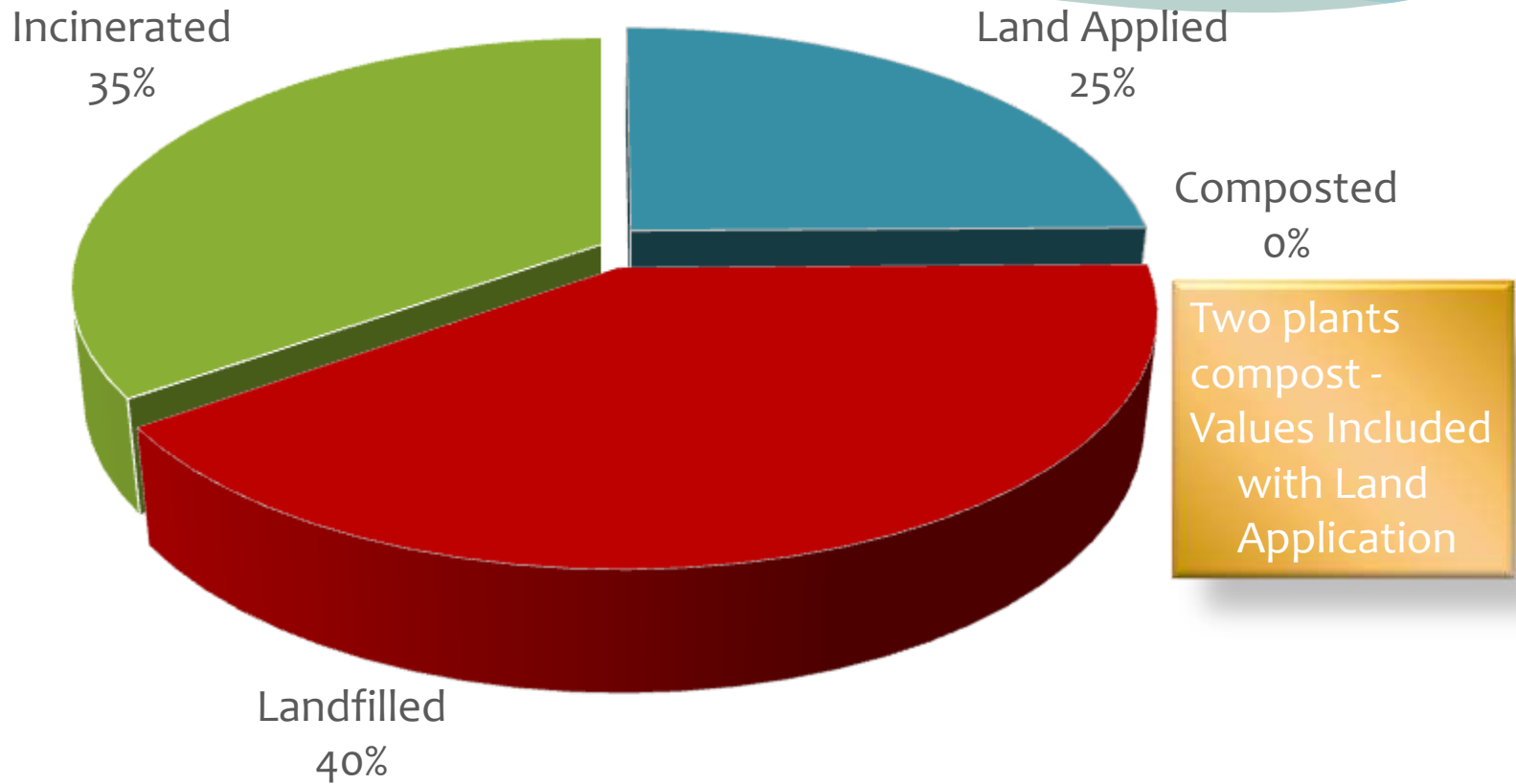
First Estimate (Order of Magnitude):

Total Biosolids Recycled = 80,897 dry tons/year

2014 Est. % Biosolids Recycled = 22%

Wastewater Solids Handling Techniques

2015



WW Recycling Estimates – Solids

2015 Est. of Biosolids Recycling

Given:

Total Biosolids Land Applied =	75,845 dry tons/year
Total Biosolids Composted =	- dry tons/year
Total Solids Landfilled =	123,681 dry tons/year
Total Solids Incinerated =	106,453 dry tons/year
Total Solids Disposed =	<u>305,979 dry tons/year</u>

Assumptions:

Percent of solids captured via treatment = 90%

First Estimate (Order of Magnitude):

Total Biosolids Recycled = 75,845 dry tons/year

2015 Est. % Biosolids Recycled = 22%

Nutrients

- * Estimate nutrient load to municipal WWTPs
 - * Assumptions:
 - * Detroit (~600 MGD) is half municipal discharge in the state... 1200 MGD total
 - * Influent Total Phosphorus (5 mg/L)
 - * Influent TKN (25 mg/L)
- * Estimate nutrient load to receiving water
 - * Assumption: 90% nutrient removal via treatment
- * Estimate the amount of nutrients captured in solids

WW Recycling Estimates – Nutrients

Est. of Municipal WWTP Surface Water Discharges and Nutrient Loadings

Given:

DWSD discharge 600 MGD

Assumptions:

DWSD as a % of municipal surface water discharge
in the state ~ 50%

Influent TKN (est.) 25 mg/L

Influent P (est.) 5 mg/L

First Estimate (Order of Magnitude):

Est. Annual Muni WWTP Surface Water Discharge = 438,000 MGY

Est. Annual Muni WWTP Nitrogen loading = 91,323,000 lbs/yr

Est. Annual Muni WWTP Phosphorus loading = 18,264,600 lbs/yr

WW Recycling Estimates – Nutrients

Nutrient Recycling Rate Estimates – 2014/15

<u>Given:</u>			
2014 Biosolids data:	dt/yr	80,897	Statewide Land App
2015 Biosolids data:	dt/yr	75,845	Statewide Land App
From 2014 Data (statewide averages):			
Nitrogen (N, % of TS)		3.8%	
Phosphorus (TP, % of TS)		1.9%	
<u>Assumptions:</u>			
Percent removal of solids via treatment process =		90%	

WW Recycling Estimates – Nutrients

Nutrient Recycling Rate Estimates – 2014/15

First Estimate (Order of Magnitude):

		2014	2015
Annual Biosolids Land Applied (2014) =	dt/yr	80,897	75,845
Est. Annual Nitrogen Land Applied =	dt/yr	3,074	2,882
Est. Annual Phosphorus Land Applied =	dt/yr	1,537	1,441
Est. Annual Nitrogen Recycled =		6%	6%
Est. Annual Phosphorus Recycled =		15%	14%

WW Recycling Estimates – Nutrients

Nutrient Recycling Rate Estimates – with Detroit BDF

- * Detroit Biosolids Dryer Facility (BDF)
 - * Pelletizes solids from wastewater treatment process
 - * ~315 dtpd capacity
 - * At full operation on a daily basis, the Detroit BDF would more than double current nutrient recycling rates:
 - * Est. Annual Nitrogen recycled from **~6% to ~15%**
 - * Est. Annual Phosphorus recycled from **~15% to ~35%**

Data Discrepancies

- * Actual solids data and associated Phosphorus concentrations show that nutrient loading estimates are ~ 20-25% higher than can be accounted for
- * As actual loading data becomes available, we expect that this discrepancy will decrease

Goals

- * Solid Waste Recycling Goal is to double recycling rate from 15% to 30% in 2 years
- * Wastewater Recycling Goal to be similar?
- * Ultimately, maximize beneficial reuse
- * Continue to promote and encourage such efforts



Thank You

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