Solids Master Plan

City of Battle Creek, Michigan

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City of Battle Creek

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Jones & Henry Engineers, Ltd.
Agenda

- Past Planning
- Current Situation
- Pilot Testing
- Temporary Approach
- Future
Prior Studies

- Mid 1970
- Mid 1990
- 2007
Alternatives for Solids Process/Management

- Make no change to present practice
- Land apply year round
- Dewater/landfill year round
- Land apply liquid in summer and dewater/landfill in winter
- Aerobic digestion, dewater, and landfill year around
- Privatization
## Potential Changes – Present Worth

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<td>$41,949,000</td>
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6-Mar-07
Job # 008-6009.002

- **Green**: Low Cost
- **Yellow**: Second Low Cost
# Potential Changes – Present Worth w/o Incinerator Rehab

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Currently the City of Battle Creek

- Thickens sludge to 10-12% for land application
- Dewaters sludge to 20-25% for incineration
- As you can see we have an exceptionally high BOD Averaging 650mg/L
- Economical to run – problem with multi hearth incinerator is efficiency
- Too expensive to improve efficiency; $2-3 million cost for repair a 50 year old incinerator
- Allowed to operate until March 2016
- Shut down permanently
Battle Creek has land applied and incinerated solids since 1993
8 months out of the year we land apply
4 months out of the year we incinerate
Waste solids were handled this way until March 2016
Historical Projections

The graph shows the flow (mgd) projected from 1977 to 2020.

- Y-axis: Flow (mgd)
- X-axis: Years (1970 to 2020)

The line indicates an increasing trend in flow from 1977 to 2020.
Historical Projections

![Graph showing historical projections for flow (mgd) over years from 1970 to 2020. Two lines depict 1977 and 1994 projections. The flow increases steadily over time.]
Historical Projections

- 1977 Projections
- 1994 Projections
- Current

Flow (mgd) vs. Years (1970 to 2020) graph.
Characteristics - P/WAS Ratio

**FIGURE 4**

PWAS Sludge Ratio By Percent Cake Solids

\[ y = 0.091x - 0.89 \]
Battle Creek Solids

- Winter => Incinerate
- Summer => Liquid Land Application
Centrifuge Thickening/Dewatering
Thickened Sludge Transfer
Liquid Land Application

Lime Stabilization
Liquid Land Application

Biosolids Storage
Liquid Land Application
Incineration

Incinerator
Required upgrade
- Air emissions
- Age
Not cost effective
Different approach
Sustainability
2012 we started looking at alternatives
We liked land application – too much storage required
Pilot Testing

- Started looking at drying system
  - Beta test performed in Singapore for several years
  - Started discussing the potential use of drying system with the help of Jones & Henry guiding us
  - Drying system manufacturer claimed they could dewater 20% of sludge to 70%
  - Performed demonstration at their factory using our sludge mixed with sawdust
- Set up pilot over several months unfortunately they could not meet our expectation, project was terminated April 2015
Considered pelletizing
Considered land application
Liked gasification (Pyrolosys)
- Pyrolosys is elevating the water temperature to the point of combustion, but restricting oxygen
- Flare gas, burning to make steam, electricity to make heat
- Hydrocarbon gas is scrubbed to remove CO₂
High BOD – Related to Btu/lb
2014-2015 we visited 3 different Pyrolosys processes in Oregon, California, and Indiana
Other drying processes could have been looked at but we were on a time limit
Pilot testing ended April 2015
New system needed by November 2016
Jones & Henry already performed predesign work on cake hauling
Battle creek has a site that cake could be discharged into trucks
Jones & Henry started design
Should be easy project
Project issues:
- Cold weather
- Can run cake fast
- What to do with full trucks
- Multiple gravel trains/freezing
- Land fills open 7:00 am to 5:00 pm
- Must mix with MSW
- Could only haul until 3:00 pm/40 hours total
Sludge Cake Hauling Project

- Centrifuges do not dewater well when they are first started
- Hydraulic operated cake pumps push cake to distribution conveyors
- Jones & Henry designed locations to drain liquid from cake pumps until centrifuge seals
- Getting too much wet sludge in the trucks we found the best way to drain through truck trailer gate
• When Jones & Henry designed the location of the drop chutes the contract hauler provided dimensional information
• Must move some chutes

• Process designed to operate automatically, after initial start up the drop chutes will open and close as needed to fill trailer

• Jones & Henry designed cake pumps to operate one at a time capacity large enough if a second cake pump is run it must run in manual mode

• After running a season we may want to run 2 cake pumps in auto
When the process was ready to run the PLC programming was not complete
Cake pumps had their own PLC operating system
Pumps would shut down because of alarm
No interlocks with other equipment
No alarms on computer
Cake pumps shut down, feed pump and centrifuge did not
- We installed a 650,000 gallon storage tank with recirculation mixing to mix primary and secondary sludge prior to dewatering
- After the PS was built the tank was filled with water and hydraulically tested/drained
- A week of low temperatures caused the discharge lines to freeze
Not a sustainable approach to solids disposal – 5 years

Over next 5 years develop concept for a long term solution

Jones & Henry approached us with the idea of a regional approach

Already had two meetings with Kalamazoo
Questions