Jackson Pike (68 MGD)
Southerly (114 MGD)
How does the City process biosolids?
Compost Facility

- Combines biosolids with yardwaste and woodchips to create COM-TIL, a fertilizer and soil amendment
- 130 wtpd
Biosolids Treatment and Disposal

- Incineration
Biosolids Treatment and Use

• Digestion
Biosolids Treatment and Use

- Land Application
Biosolids Treatment and Disposal

- Landfilling
2006 to 2008 Typical Biosolids Distribution

- Jackson Pike produced approximately 40 dry tons of biosolids each day
  - 80% Incinerated
  - 20% Land Applied

- Southerly produced approximately 75 dry tons of biosolids each day
  - 65% Incinerated
  - 35% Composted
Get Green Columbus Action Plan 2010-2015

• Mayor Michael B. Coleman launched the “Get Green Columbus” initiative January 28, 2005

• Created strategic plan in 2010 – Green Memo II
  – Reduce fuel usage and vehicle emissions from City fleet and employees commuting
  – Increase material diverted from waste stream by City operations and increase recycling options
  – Reduce energy usage from City facilities
  – Reduce emissions from City facilities
Columbus Preliminary Emissions Analysis 2007

Emissions By Source

- Wastewater Treatment: 37% in 2006
- Waste Water Treatment
- Building
- Drinking Water Treatment
- Street Lights
- Transportation
- Solid Waste
- Traffic Signs

Wastewater Treatment: 37% in 2006

- Total of 1054 Mayors
- Goal of reducing GHG 7% below 1990 levels by 2012

http://usmayors.org/climateprotection/map.asp
City Facilities Emissions Reductions

- CSO and SSO consent orders required expansion of wet stream processes
- Emissions savings needed to be realized in biosolids processing
- This prompted the City to investigate reducing emissions by generating renewable energy and beneficially reusing biosolids
Solids Master Plan

• A tool that the City uses to help make important biosolids handling decisions for the future
• A detailed investigation of the biosolids processes at Jackson Pike, Southerly, and the Compost Facility
  – Cost
  – Energy consumption
  – Greenhouse gas emissions
City’s Goals

• Broad look at all technologies
• Diverse team to analyze technologies and bring ideas to the table
• Utilize modeling tools to help analyze the options
• Create realistic recommendations for solids handling processes to meet Green Action Plan goals and regulatory requirements
Structure of Project
Solids Master Plan Methodology

Three stages to the Investigation

1. System Characterization
2. Development and Evaluation of Alternatives
3. Recommendation
System Characterization

- Data Collection
  - 2000 Solids Treatment and Disposal Master Plan
  - Draft 2006 General Engineering Report (GER)
  - Historical solids information
  - Plant operation records
  - Field inspections

- Electrical Analysis
  - Connected horsepower
  - Equipment run times
  - Field inspections
System Characterization

- Center for Resilience EcoFlow™ model
- City material flow model creation
  - Operations cost
  - Energy consumption
  - Greenhouse gas emissions
    - Fossil Fuel
    - Biogenic
  - Third party offsets and carbon sequestration
Alternative Development

- 190 total technologies initially identified
- Gathered opinions and information regarding the technologies
- Complete modeling analysis
- Prepare the City for new regulations regarding greenhouse gases
Concept Confirmation Conference 1, October 2008

• Included international wastewater treatment professionals and greenhouse gas emissions experts
• From this meeting the City:
  – Obtained expert reviews and opinions on the current operations
  – Gathered ideas for improved solids processes and operations
  – Acquired biogenic carbon resources for beneficial uses
  – Verified the importance of process diversification
Stakeholders Meetings

• First Stakeholders Meeting February 2009
  – Other departments within the City of Columbus
  – Health departments, county engineers, and farm bureau officials from surrounding counties
  – State and local environmental agencies
  – Citizen environmental groups
  – Local governments from surrounding municipalities and counties
  – Neighborhood associations from areas near the WWTPs and the Compost Facility
  – Local Solid Waste Authority

• Second Stakeholders Meeting June 2009
Alternative Development

• Project Partner Firms
  – Malcolm Pirnie – Emerging technologies
  – CH2M Hill – Incineration
  – URS – Digester gas usage
  – Brown and Caldwell & Burgess and Niple – Composting and Land Application

• Analyzed the current technology in each area
• Generated model input for recommended future technologies
Alternatives

- Emerging technologies
  - Sludge Minimization
  - Digestion Modifications
    - Acid Phase Digestion at Jackson Pike
    - Thermophillic Digestion at both plants
  - Phosphorus Recovery
Alternatives

- Incineration
  - Fluidized bed incinerators
  - Upgrades to the existing incinerators
  - Heat drying at Southerly
Alternatives

• Digester gas usage
  – Maximize use of raw biogas
    • Incineration Fuel
    • Boiler Fuel
    • Reduce Flaring
  – Cleaning to engine quality
    • Cogeneration and combined heat recovery
  – Cleaning to pipeline quality
    • Sell to pipeline
    • CNG facility for vehicles
Alternatives

- Composting
  - Odor reduction improvements
    - Additional bulking agent
    - Additional biofilter/aerated curing
    - Covers
  - Methods to move processes indoors
    - Tunnel Composting
    - Mixing Upgrades
  - Automate Temperature Control
Alternatives

- Land Application
  - Liquid Land Application
  - Cake Land Application
Concept Confirmation Conference 2, March 2009

- Reviewed selected alternatives and preliminary modeling results
- Helped refine recommendation strategies, in particular the Triple Bottom Line analysis
STUMP Recommendations

Emphasize Utilization/Maintain Diversity

- Increase Land Application
  - Low O&M cost
  - Low GHG emissions
- Decrease Incineration
  - Process should be maintained to provide autonomous solids disposal
  - Used on an as-needed, seasonal basis
- Sell or use digester gas raw, strive for full utilization
- Maintain the Compost Facility to continue WWTP operational diversity
- Use landfilling for emergencies
- Explore third party beneficial uses
City Status at the Drafting of the 2009 STUMP

• City in the middle a wet weather expansion at the treatment plants
• Utilizes STUMP recommendations as guidance
  – Get more out of current equipment
  – Explore low cost and no cost alternatives
What happened since the STUMP was submitted?
Changes in Emissions Regulations

• Congress has not passed GHG cap-and-trade regulations
• Congress has not required a wholesale shift to renewable biofuels

• Sewage sludge incinerators reclassified as solid waste incinerators
• Incinerators subject to Maximum Achievable Control Technology (MACT) regulations
Incineration Improvements

- Operational improvements made at Jackson Pike (2010)
  - Incinerator Rx
  - 30% decrease in fuel usage
  - 8% reduction in electricity usage
  - Implement operational improvements at Southerly
- MHF Rehabilitation Project underway
  - Improvements to meet MACT regulations
  - Continue use of existing MHFs
Incinerator Ash Regulations

- Incinerator ash historically stored in lagoons
- NPDES permits will have lower copper and mercury limits effective August 1, 2013
- City is switching to trailer and roll-off containers for ash dewatering, transport and direct utilization
- Discontinue use of ash lagoons at both WWTPs
Phosphorus Regulations

• WWTP Effluent Phosphorus
  – Still no WWTP effluent phosphorus limits
  – Need to be prepared

• Land Application Phosphorus
  – OEPA implemented P-Index for land application
  – P-source coefficient needed specific to biosolids
Pilots for Phosphorus Recovery

• OSTARA
  – Pilot at Southerly in Spring 2012
• Multiform Harvest
  – Scheduled Pilot at Jackson Pike in October 2012
• WERF study aimed at nutrient recovery
  – Battelle Bio-P process will be tested at Jackson Pike if selected
2011 Land Application RFPs

- New Land Application Contract
  - Improved incorporation equipment
  - Utilizes As-Applied Mapping
- Land Application Regional Storage RFP
- Innovative Reuse of Biosolids RFP
Third Party Innovative Reuse

• Ohio Mulch
  – Creates a renewable wood source with rapid growth hybrid poplar
  – Reclams strip mine land
  – Utilizes Class B cake
  – Immediately incorporated and trenched
  – Haul costs less than liquid land application

• Quasar
  – Accepts all sludges for high solids digestion
  – Diverting yard, food, and animal waste from landfill
  – Currently generating local green electricity
  – Ultimately utilized to fuel a green CNG facility
Digester Gas

- Natural gas prices are down about 50% from prices used in the STUMP
- High prices for renewable energy in recent years were driven by potential regulations in California
  - California regulations currently not driving renewable energy prices up
  - Chicago Climate Exchange (CCX) closed December 31, 2010
- Recent power outages at the plants have renewed interest in cogeneration as a means of providing an internal source for WWTP electricity
- Biogas Utilization RFP
**Digestion Optimization**

- City is moving toward digestion of all sludge (Primary and WAS)
  - Jackson Pike is now successfully digesting all sludge
  - Southerly optimization is focusing on methods to digest all WAS
- WERF Digester Foaming Study
  - Examining causes of foaming at both Jackson Pike and Southerly WWTP
Compost Facility

- Increased use of digested sludge has reduced odor complaints
- Composting continues to provide beneficial use and diversity
- Recent shift to selling compost wholesale has boosted revenue and reduced the cost of the process
- Tarps were tested but not practical for Columbus operation
Landfilling

• Costs have increased - now the costliest disposal option
• Less MSW to area landfills means fewer landfills can accept biosolids
  – City-wide recycling program
  – City-wide yard waste collection
• Landfilling increasingly not an option for regular disposal of biosolids
Resulting Current Biosolids Breakdown (past 12 months)

- Jackson Pike produced approximately 26 dry tons of biosolids each day
  - Land Application: 27%
  - Incineration: 13%
  - Composting: 28%
  - Third Party: 32%

- Southerly produced approximately 46 dry tons of biosolids each day
  - Incineration: 62%
  - Composting: 31%
  - Third Party: 7%
STUMP Team

• Malcolm Pirnie/ARCADIS
  – Cosmo Bertino, PE
  – Kathleen Smith, PE, PMP
  – Dan Gernant, PE
  – Eric Auerbach, PE

• Ribway Engineering Group
  – Debby Evans

• The Ohio State University Center for Resilience
  – Dr. Joseph Fiksel
  – Dr. Kieran Sikdar
  – Dr. Emrah Cimren
  – Dr. Mark Posner

City of Columbus Wastewater Treatment Section
My Sincere Thanks To All!