LANDFILL GAS EXTRACTION SYSTEM EVALUATION USING ARCGIS

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OUTLINE

• Landfill Gas 101
• Landfill Gas Extraction Systems & System Maintenance
• Data Evaluation
• ArcGIS Applications
• Work Flow
• GIS Methods
• Next Steps
• Acknowledgements
LANDFILL GAS (LFG) 101

- Generated from the biological decomposition of waste

- General composition:
  - ~50% methane
  - ~45% CO$_2$
  - ~5% other

- Potential issues if LFG is allowed to build up in a landfill:
  - Fire hazards
  - Odor
  - Off-site migration (in older, unlined landfills)
LFG EXTRACTION SYSTEMS

Horizontal Extraction Trench

Vertical Extraction Well
What happens to the gas?

- Utilized in LFG-to-energy facility
- Burned at a flare
SYSTEM MAINTENANCE

• Multiple parameters measured at each extraction well & trench
• System adjusted accordingly
• Data collected weekly
DATA EVALUATION

\[ \text{Energy} = \frac{\text{CH}_4 \%}{100} \times \text{CH}_4 \text{ Heat Content} \times Q \times 1.44 \times 10^3 \]

Where:

- Energy is extraction rate in MMBtu/day
- CH\(_4\) % = Percent methane measured at extraction point or control device
- CH\(_4\) Heat Content = 1,000 Btu/ft\(^3\)
- Q = Landfill gas flowrate in ft\(^3\)/min
DATA EVALUATION (CONT.)
DATA VISUALIZATION USING GIS

Wells: 100-ft radius of influence

Trenches: 50-ft radius of influence
MONTHLY COMPARISON

FEBRUARY 2007

MARCH 2007
OFF-SITE MIGRATION
EVALUATE MULTIPLE DATA SETS

- Low gas extraction & high vacuum
- Low gas extraction & no vacuum
WORK FLOW

Data collected in the field

Data evaluated; Monthly average tables generated and saved to personal geodatabase

Loaded into Microsoft® Access or SQL database

GIS plot updated; pdf generated

pdf uploaded to secure client website
WORK FLOW (CONT.)
WORK FLOW (CONT.)
GIS METHODS (CONT.)
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GIS METHODS (CONT.)
NEXT STEPS

• 3D models of landfill gas extraction systems
• Interactive, web-based applications for our clients
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QUESTIONS?

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