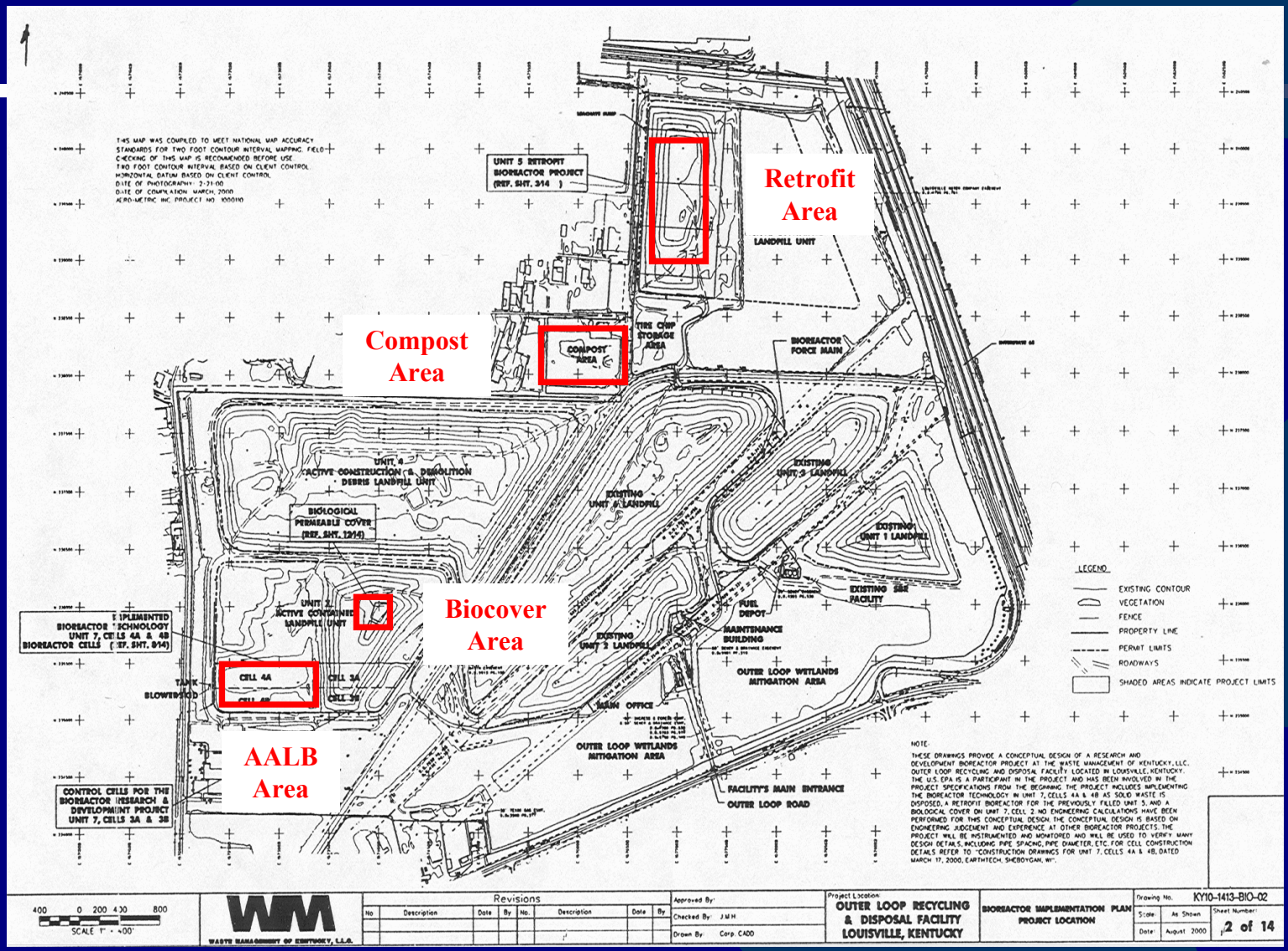
Plot Plan of Bioreactor Field Test



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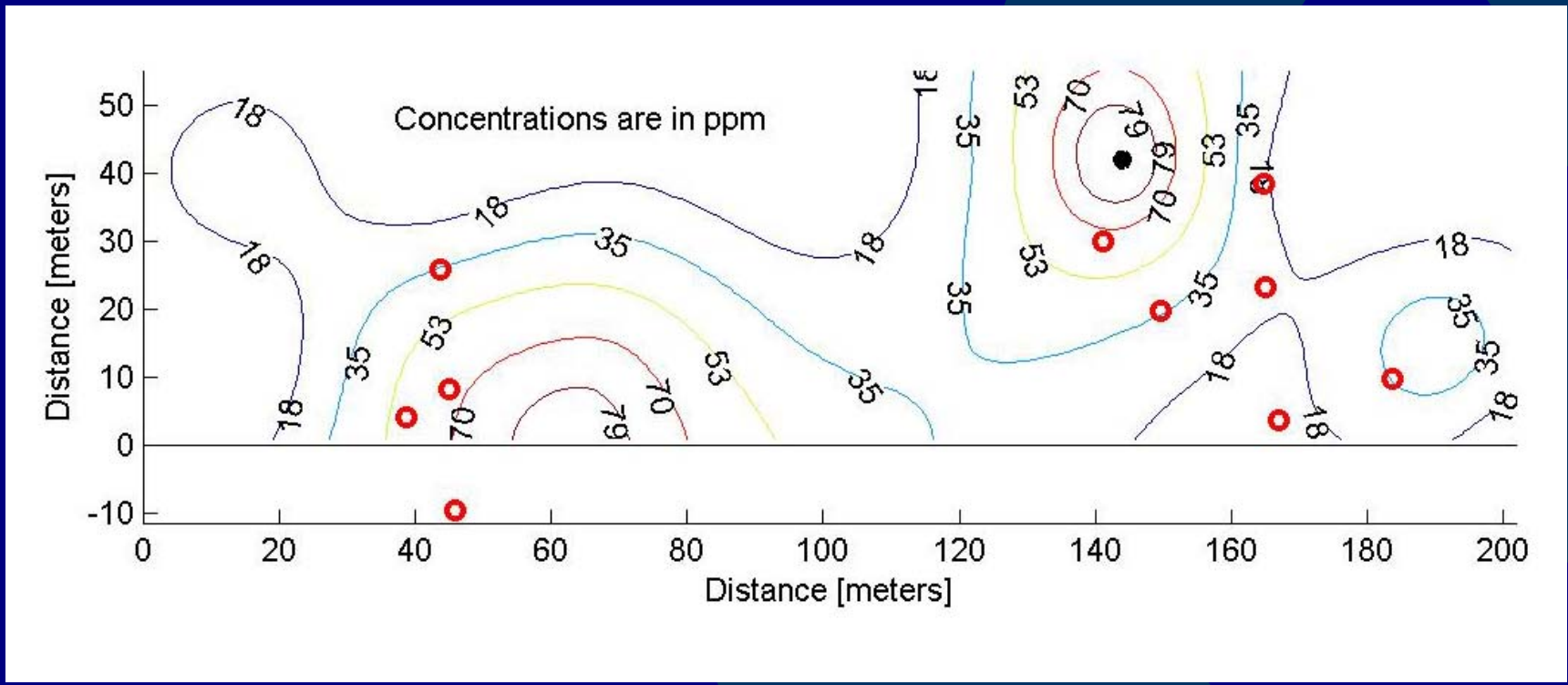
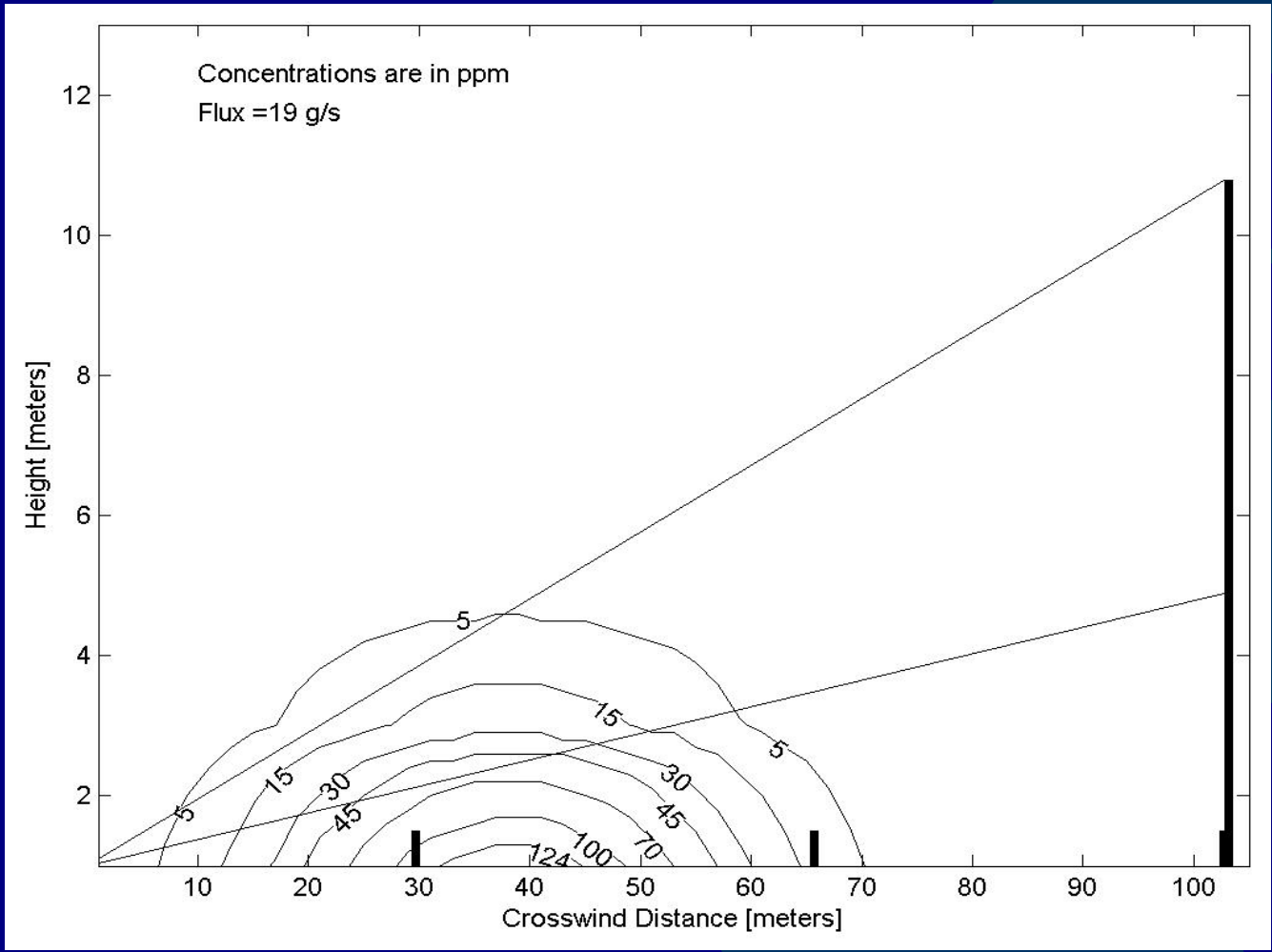
Preliminary Results for Radial Scanning – Methane Concentrations for Unit 5



EPA

Preliminary Results of Vertical Scan of North Side of Unit 5 – Methane Flux



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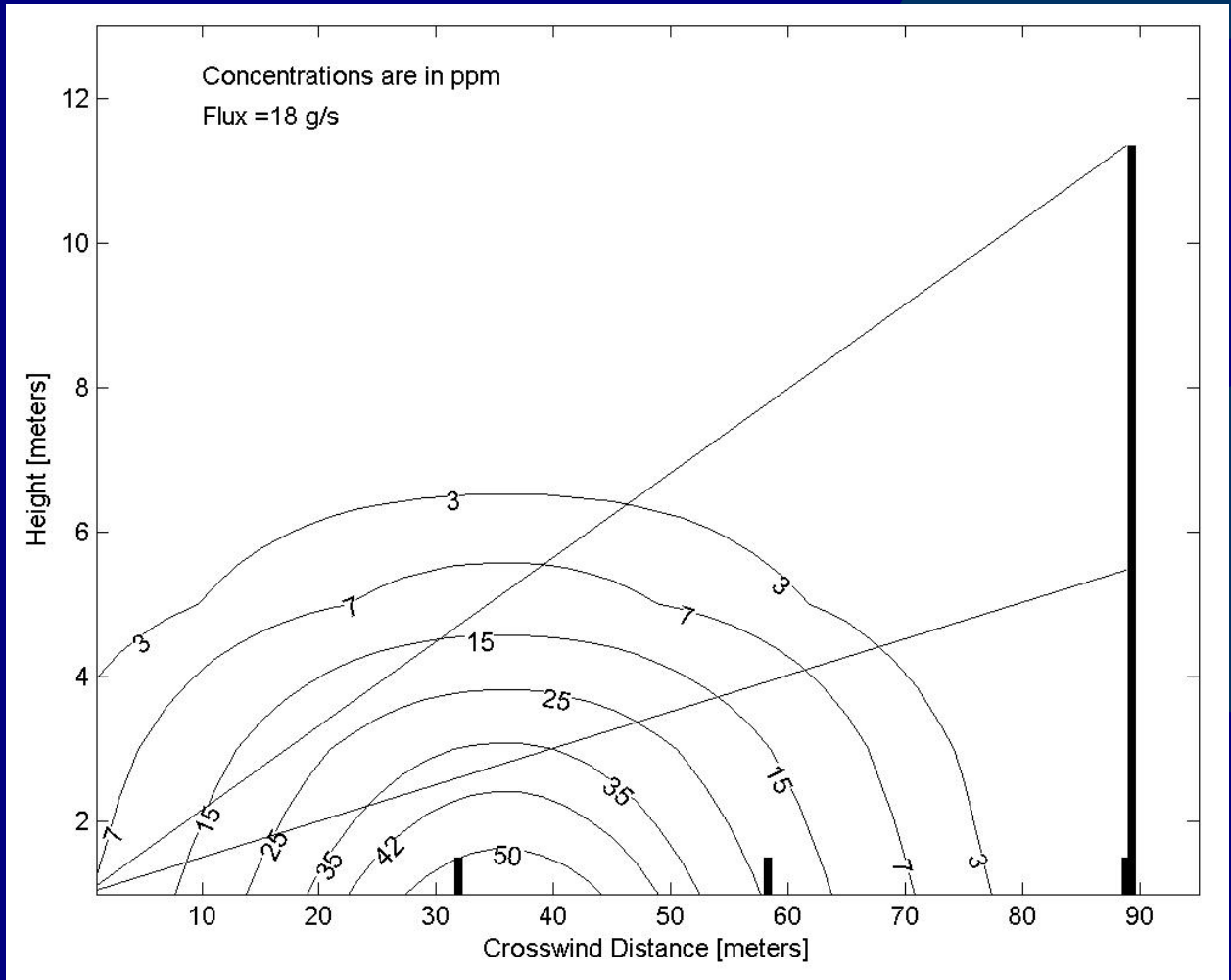
Preliminary Results of Vertical Scan of South Side of Unit 5 – Methane Flux



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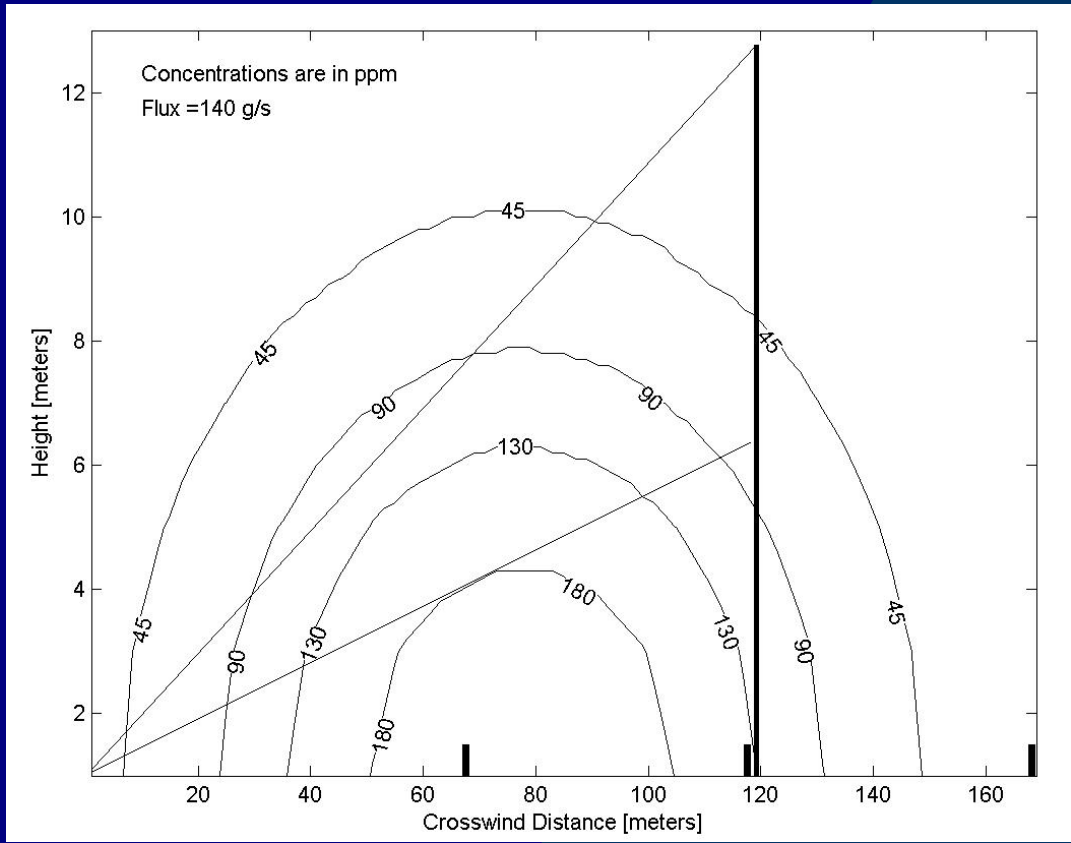
Preliminary Results from OP-FTIR Measurements on South Side of Active Site - Methane Flux



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Update to EPA's Landfill Gas Emission Factors (AP 42)

- Plans to have update by Spring 2004; will include emission factors for bioreactor operations in addition to updated data for conventional landfilling operations for
  - » Use in State emission inventories and obtaining air permits
  - » Use in MSW Decision Support Tool (includes conventional and bioreactor landfills)
- Results will also be used in evaluating residual risk for landfills as specified in CAA Section 112 (f)

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Update to EPA's Municipal Solid Waste Decision Support Tool

- Municipal Solid Waste Decision Support Tool (MSW DST) provides holistic approach to evaluation of solid waste management
  - » Evaluates life-cycle environmental tradeoffs (multi-media, multi-pollutant) including potential benefits of recycling and energy recovery
  - » Includes analysis for all waste management processes – collection, transportation, recycling, composting, combustion, landfilling
  - » Includes capability for evaluating full costs of existing program and options to minimize costs and/or environmental burdens
  - » Helps communities to evaluate new technologies and have basis of comparing them to existing technologies in use
- Software is set up to enable states/communities/others to evaluate existing infrastructure and options for environmental and economic improvements
- Used in over 30 studies in various states, communities, and regions

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Types of Questions Answered Using the MSW-DST

- What are the cost and environmental benefits of a municipality's recycling programs?
- Which strategy best minimizes GHG emissions for a given budget?
- What is the difference in cost and environmental tradeoffs using a landfill bioreactor (or other technology) versus what is currently used?
- What are the cost and environmental aspects of recycling versus composting corrugated containers?

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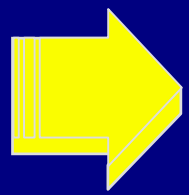
Complex Solid Waste Decisions Being Evaluated

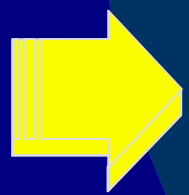
How do we ensure

- Cost efficient waste management?
- Meeting state mandated recycling goals?
- Continued improvement of the environment?
- Fast, objective analysis of options?
- Best privatization bids?



Environmental Aspects

- Local air quality impacts
- Energy consumption and offsets
- Greenhouse gas emissions
- Benefits from materials recycling



Economic/Social Aspects

- Municipal budgets
- Need for new facilities
- Household convenience

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Case Studies Using MSW DST*

- Anderson County, South Carolina
- Atlanta, Georgia
- Great River Regional Waste Authority, Iowa
- Lucas County, Ohio
- Madison, Wisconsin
- Minneapolis, Minnesota
- Portland, Oregon
- Seattle, Washington
- Spokane, Washington
- State of California
- State of Georgia
- State of Washington
- State of Wisconsin
- Subbor – ETV GHG Center
- U.S. Conference of Mayors – U.S. GHG Study
- U.S. Navy Region Northwest
- Vancouver, Canada

*Many other case studies are under consideration and are being funded through participating organizations……

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Conclusions

- Ongoing research to evaluate bioreactors to document potential environmental benefits and/or burdens
- Will result in credible, objective, and peer-reviewed data and information
- Will use results to update –
  - » AP42 LFG emission factors for use in State emission inventories and obtaining air permits
  - » Defaults in MSW DST for conventional landfilling and bioreactor operations
- Results will also be used in evaluating residual risk for landfills as specified in CAA Section 112 (f)

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