



# Subsurface Exothermic Events (SSE) at Landfills

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Office of Research and Development



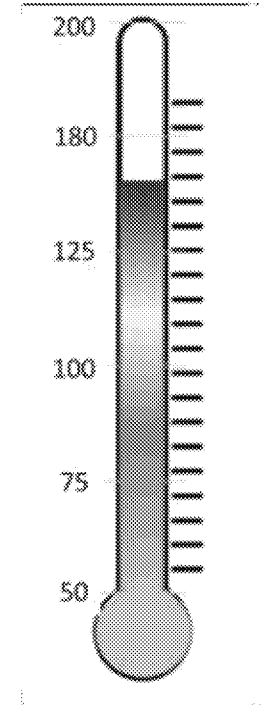
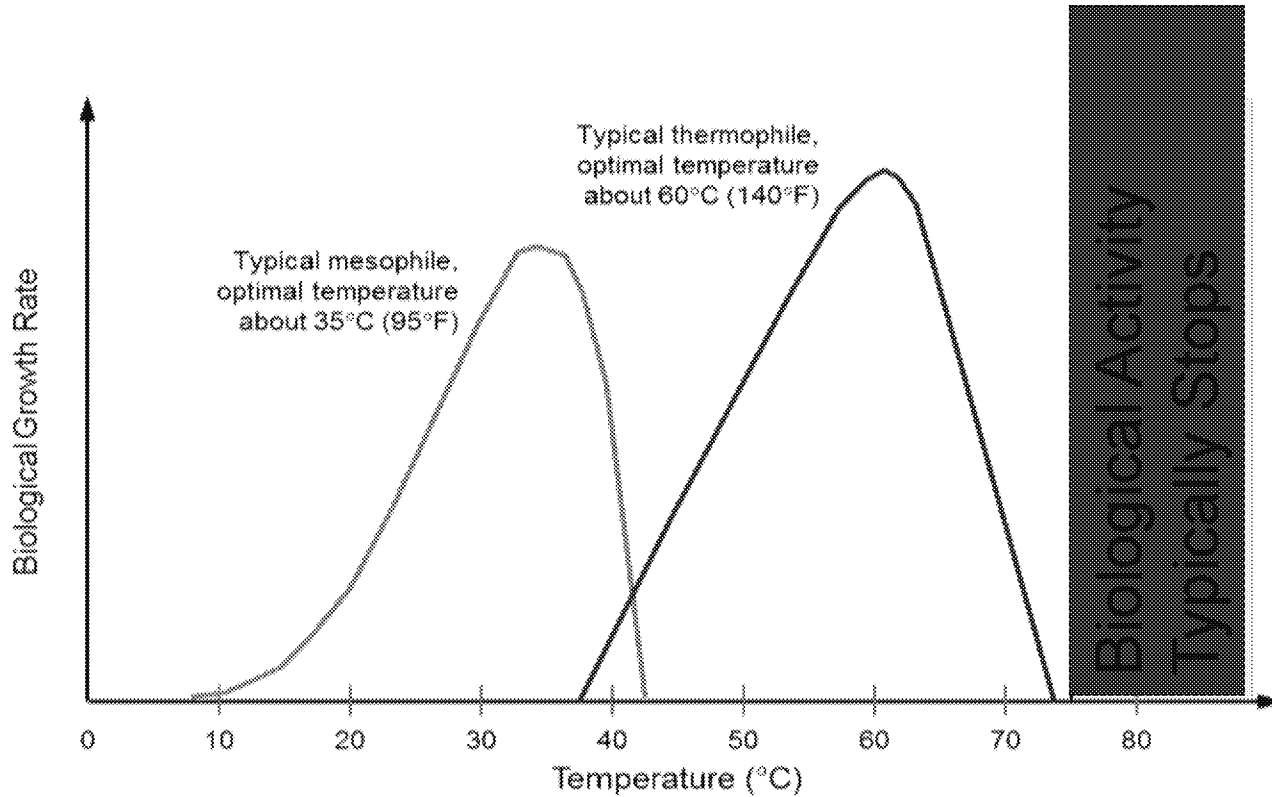
# “Hot” Landfills

*Insert video here*

# Problem

- Some RCRA Subtitle D waste disposal facilities (i.e., municipal solid waste landfills) are exhibiting subsurface temperatures in excess of 100° C
  - Normal operating temperature range 40-55° C
- Leads to excessive uncontrolled emissions, compromised waste management systems, and long term negative impact on human health and the environment
- Considerable uncertainty about the mechanisms responsible for excessive heat generation and accumulation in landfills

# “Normal” Landfill Temperature Range



Operational Waste Temperature Range Reported

# Potential Causes of Subsurface Heating

## Waste Specific

- “Hot” waste
- Ashes and dust
- High organic waste
- Reduced metal
- Aluminum waste
- Shale gas recovery spoils

## Landfill Management

- Moisture management
  - Leachate recirculation, drainage
- Special waste management
  - Placement and compaction
  - Segregation/isolation
- Landfill cover
- Landfill gas management

# Problem Magnitude

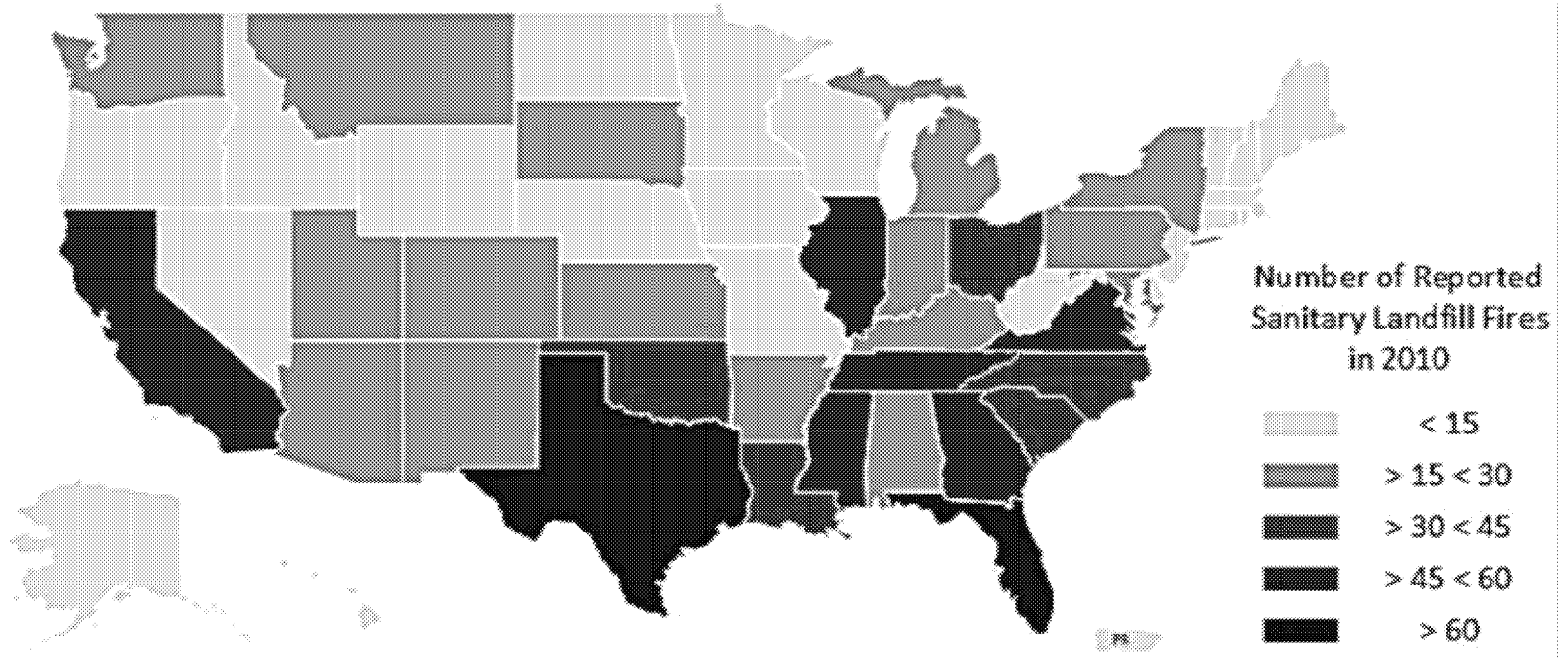
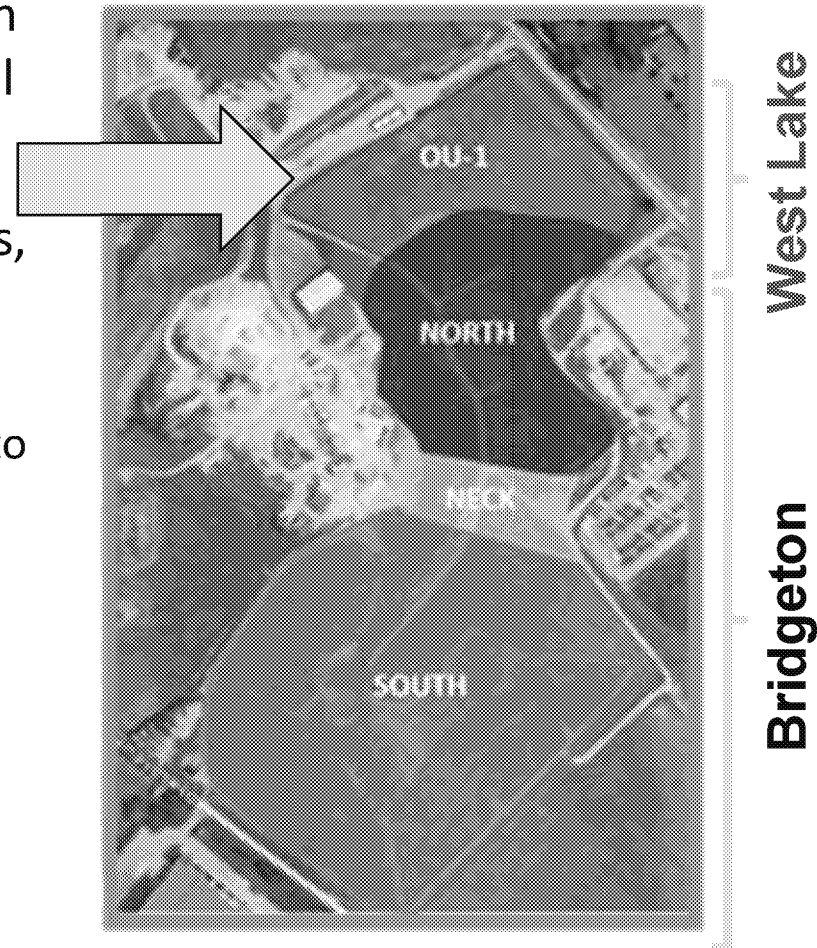


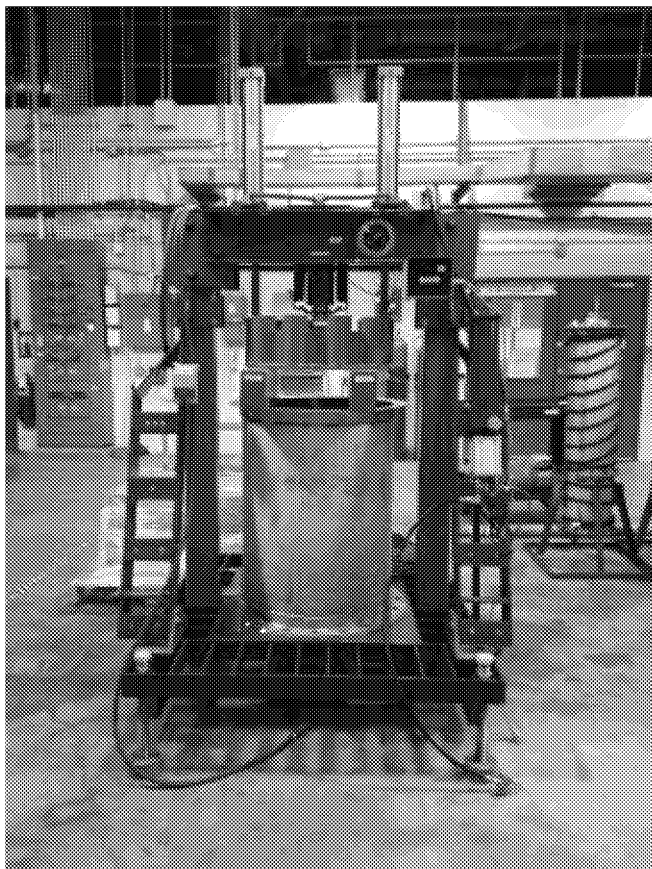
Figure from Powell et al. 2016. *Nature*

# US EPA/ORD Technical Support

- In 2010, ORD assisted Region 5 and Ohio EPA in implementing a remedy for Countywide landfill
- For past 4 years, ORD has evaluated landfill temperature and gas data at landfill in St. Louis, MO adjacent to Superfund landfill (West Lake)
  - Indications that reaction may be dissipating
  - Monthly, quarterly and annual reports provided to region and state, and publicly available
- New Ohio EPA request to analyze similar data at 8 Ohio landfills experiencing SSE
- Region 4 has requested a discussion on hot landfills during their upcoming Solid Waste Directors' meeting



# Hot Landfill Research Needs



- In 2017, ORD convened workshop with international experts to discuss causes and solutions and develop key science gap areas needing research
  - Impact of temperature and pressure on possible pyrolytic reaction
  - Industrial waste compatibility
  - Moisture management
- Synthesis paper developed, to be submitted shortly for external peer review and publication
- Has shaped ORD research direction
  - Bench and pilot scale landfill research simulators modified to allow control of temperature and pressure in deep landfills
  - Testing theories of possible reaction types
  - Specific remedies can then be developed



# Impacts of ORD Efforts

- ORD assisted in providing the first successful remedy for a hot landfill (Countywide Landfill, Sparta, OH)
- ORD assistance continues to inform region and state decisions on managing the West Lake/Bridgeton, MO landfill SSE event
- ORD's unique role is assimilating and disseminating information derived from working with these problematic sites nationwide
  - Enables US EPA to assist those responding to new SSE events with knowledge and experience
- Based on ORD technical support and scientific leadership, we have informed new research directions and advanced the state of the science for hot landfills



# Contact

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