



Climate Change and the Impact on Leachate Management

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The Changing Climate of Solid Waste
and Recycling

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Agenda

- 1. EPA Subtitle D and Code of Maryland Regulations**
- 2. Leachate Management Design**
- 3. Climate Change and Storm Intensity**
- 4. Worcester County Example**
- 5. Design Considerations Accounting for Climate Change**

Section 1

EPA SUBTITLE D AND CODE OF MARYLAND REGULATIONS



EPA SUBTITLE D and Code of Maryland Regulations

- EPA Subtitle D - 40 CFR Part 258.26
 - ◆ Requires municipal landfills to collect and control run-on from the 25-year, 24-hour storm event

- COMAR – Chapter 26.13.05
 - ◆ Landfills shall be designed and operated to not exceed 1-foot of leachate depth over the liner



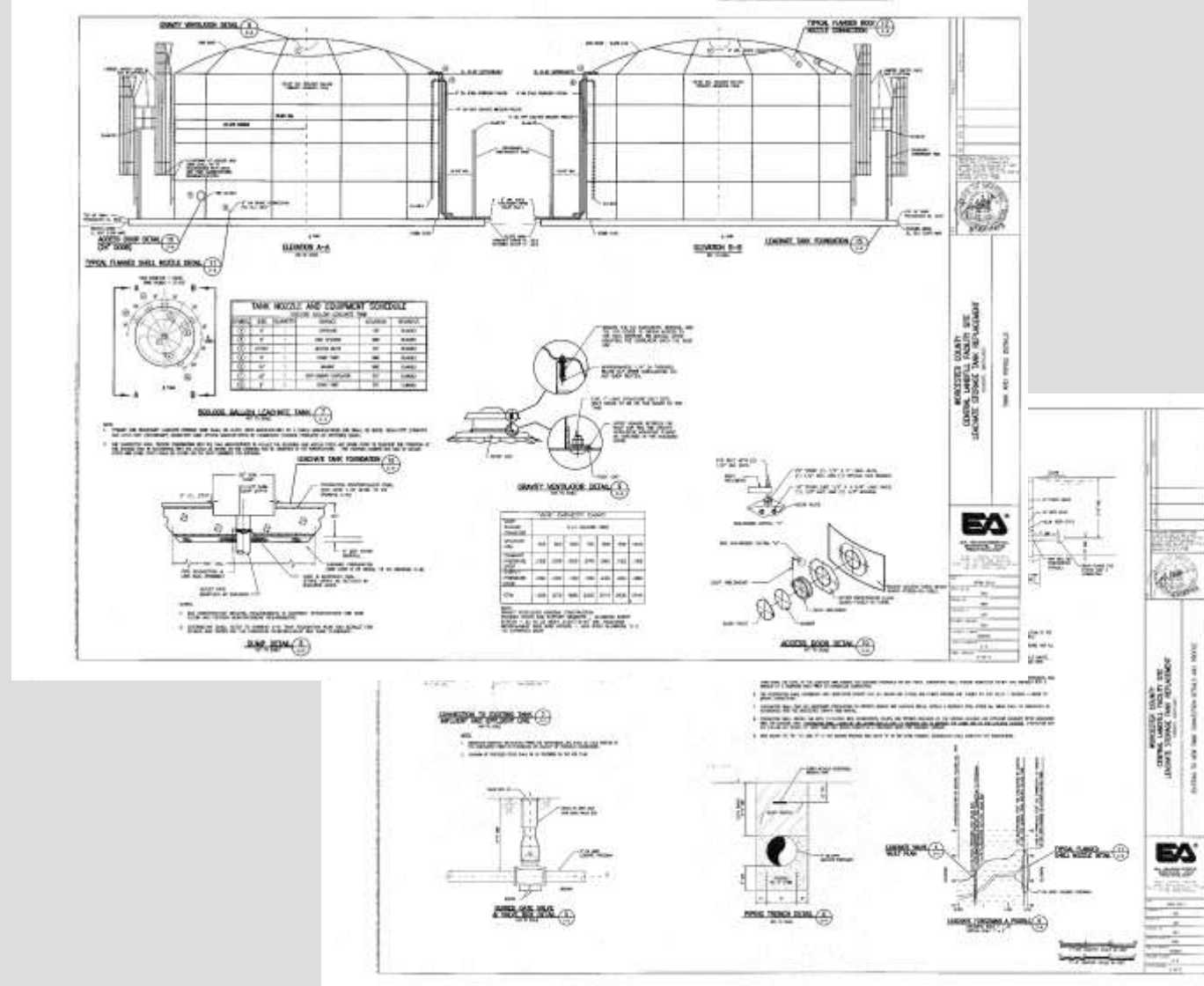
Section 2

LEACHATE MANAGEMENT DESIGN



Leachate Management Design

- Leachate Generation Calculation
 - ◆ HELP Model
- Leachate Storage
 - ◆ 20 Days storage based on HELP Model
- Leachate Collection
 - ◆ Sand/Pea gravel
 - ◆ Conveyance piping
- Transmission
 - ◆ Pump Stations
 - ◆ Force main



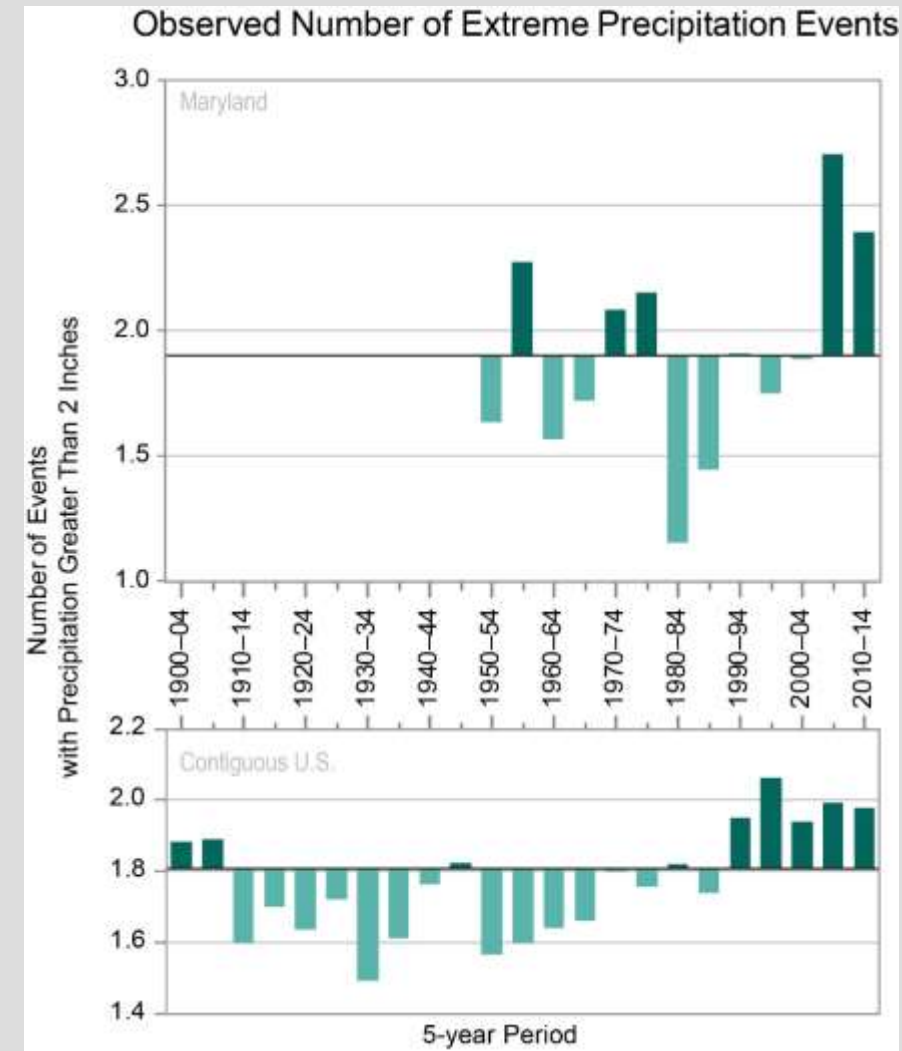
Section 3

CLIMATE CHANGE AND STORM INTENSITY



Climate Change and Storm Intensity

- Increase in Annual Average Precipitation
 - ◆ As warming continues precipitation (rain and snow) will continue to increase
- The Chesapeake Bay area is the third most vulnerable area to sea level rise in the United States.
- Increase in Extreme Precipitation Events (> 2-inches)
 - ◆ Greater intensity and more frequent
 - ◆ 100-year rain storm event is predicted to occur every 20 to 50 years by the end of the century.



Runkle, J., K. Kunkel, D. Easterling, B. Stewart, S. Champion, R. Frankson, and W. Sweet, 2017: Maryland State Climate Summary. *NOAA Technical Report NESDIS 149-MD*, 4 pp. Figure 4

Section 4

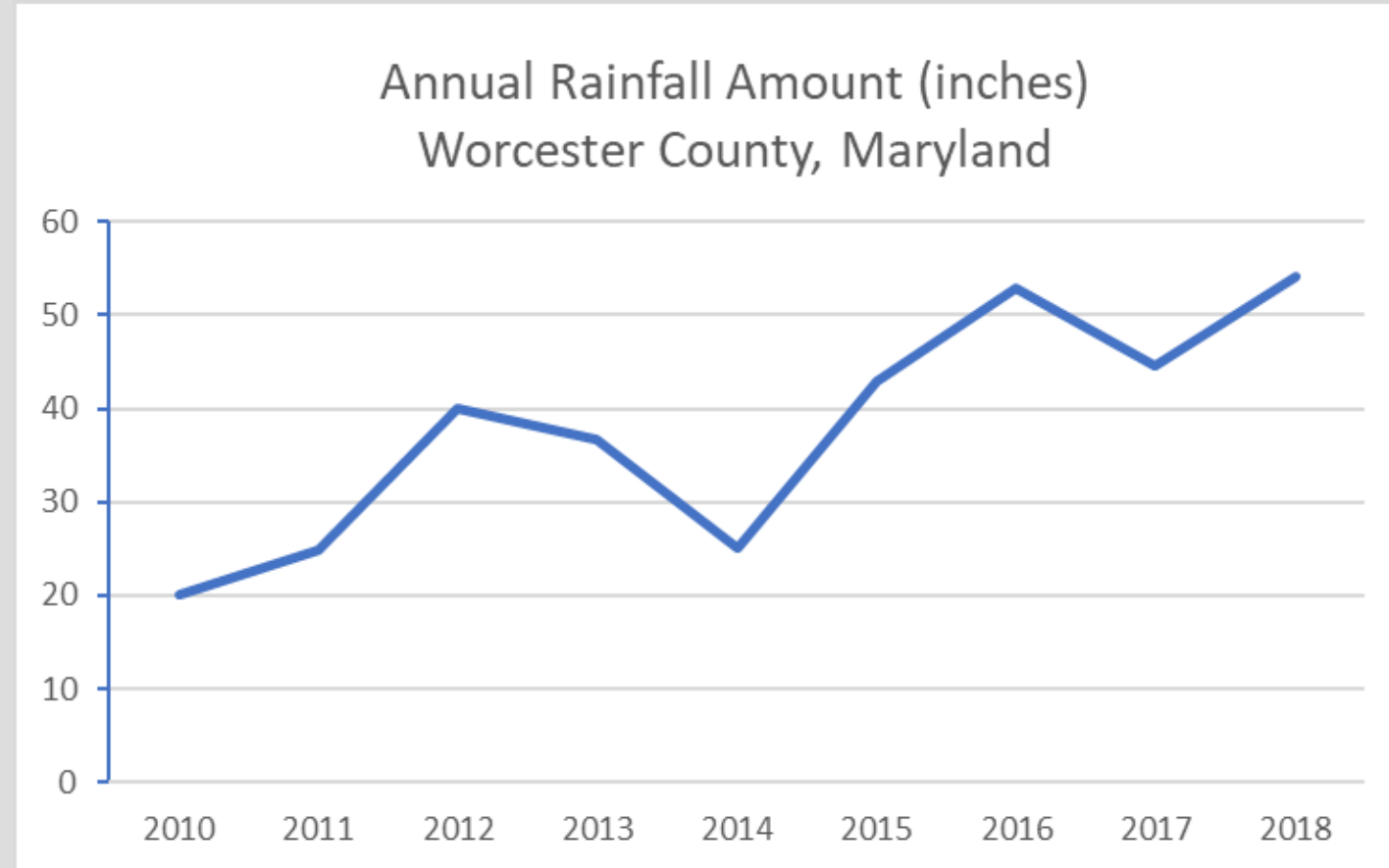
WORCESTER COUNTY EXAMPLE



Worcester County Example

Cumulative Rainfall

- Approximately an 80% increase in annual rainfall amount comparing the three-year timeframes of 2010-2012 to 2016-2018
- The Worcester County Central Landfill Facility is considered a bioreactor landfill. Each cell is built and operated with leachate recirculation
- Landfill 'saturation' is becoming more common with more frequent and intense rainfall events.



<https://www.wunderground.com/weather/us/md/ocean-city>

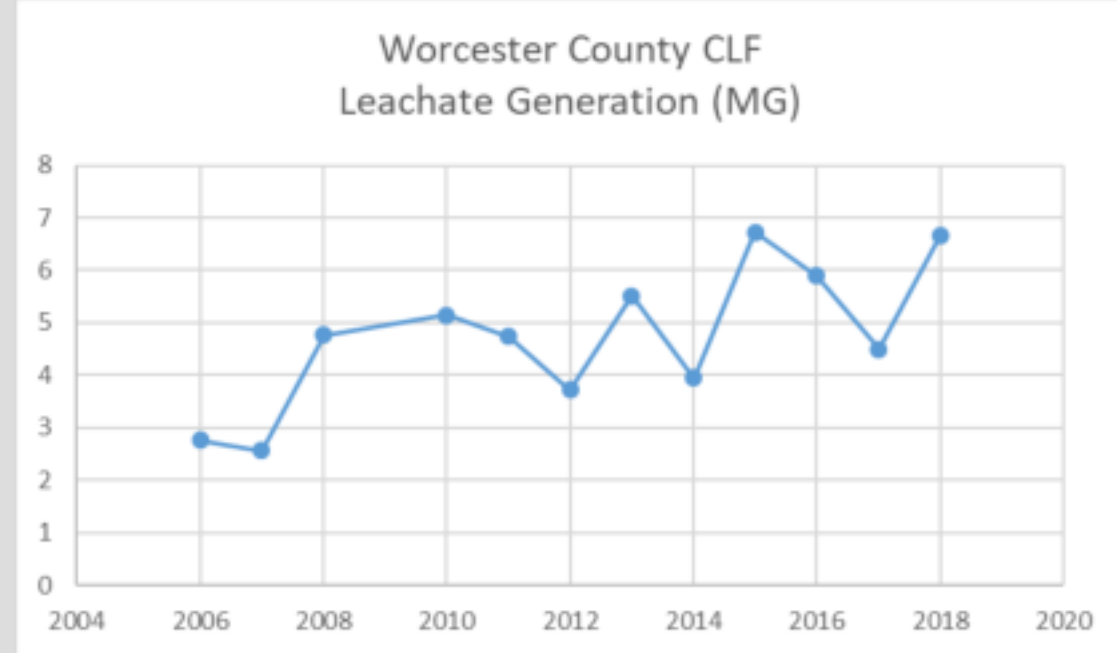
Worcester County Example (Cont.)

Operational Challenges

- ◆ Increased Leachate Hauling
- ◆ Limits on Leachate Recirculation

County Next Steps

- ◆ Offsite Leachate Management
 - Connect a Leachate Force Main to a WWTP
- ◆ Onsite Leachate Management
 - Vertical Expansion of the Storage Tank
- ◆ Limits on Leachate Recirculation
 - Maximize Leachate Recirculation During Dryer Months



Section 5

DESIGN CONSIDERATIONS ACCOUNTING FOR CLIMATE CHANGE



Design Considerations Accounting for Climate Change

- Think about going above the 25-year, 24-hour storm event.
- Leachate Generation Calculation
 - ◆ HELP Model
 - Limited Maryland cities of Synthetic Precipitation Data
 - Consider utilizing the 'Create/Edit' Precipitation Option
- Leachate Storage
 - ◆ Worcester County Leachate Tank storage based on 20 Days
- Leachate Collection, Force Main and Pump Stations sized with adaptability.

Summary

- ✓ **More Frequent and Intense Rainfall Events are Occurring and Can be Anticipated to Continue**
- ✓ **This Change in Our Climate has as a Direct Impact on Leachate Generation**
- ✓ **Increased Leachate Generation Results in Operational Difficulties and Leachate Handling**
- ✓ **Offsite Leachate Management can be Costly**
- ✓ **Leachate Management Starts with Volume Calculations (HELP Model). Utilize Precipitation Trend Data and Design the Collection, Conveyance and Storage System accordingly**

Thank You!

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