

# *Increasing LFG Collection Rates Using Gas Well Dewatering Systems: Lessons Learned*

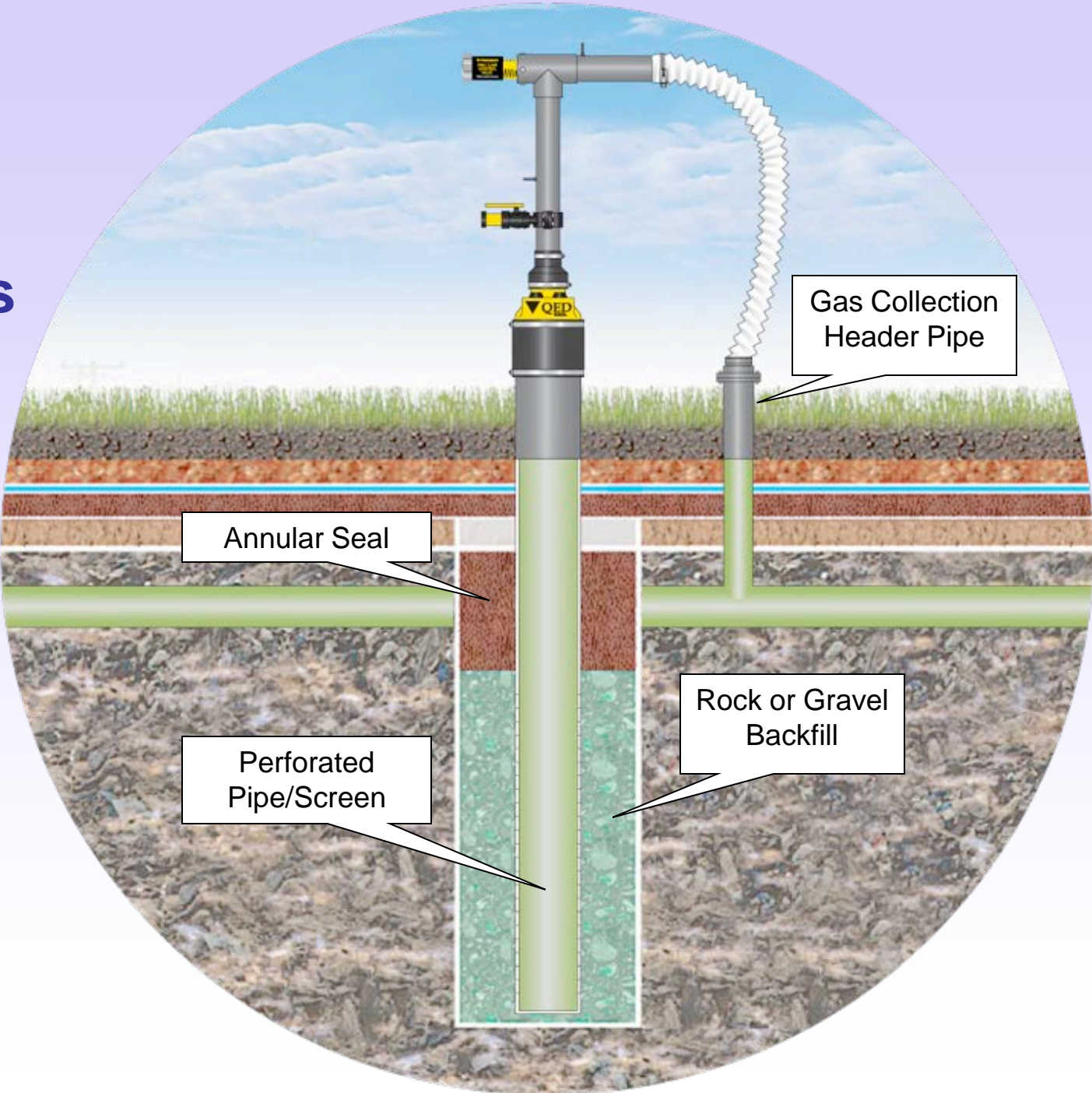
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*QED Environmental Systems Inc.*

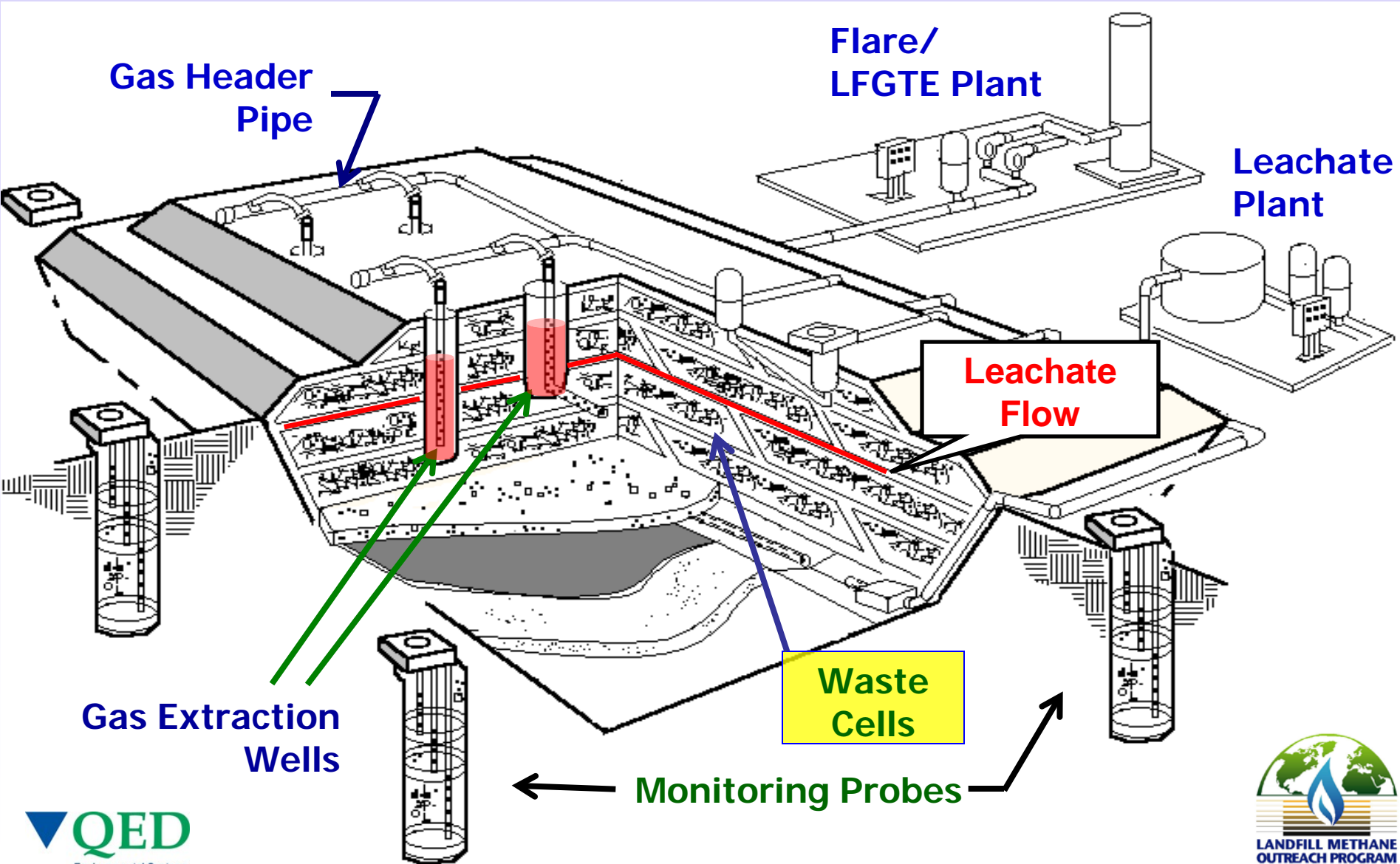
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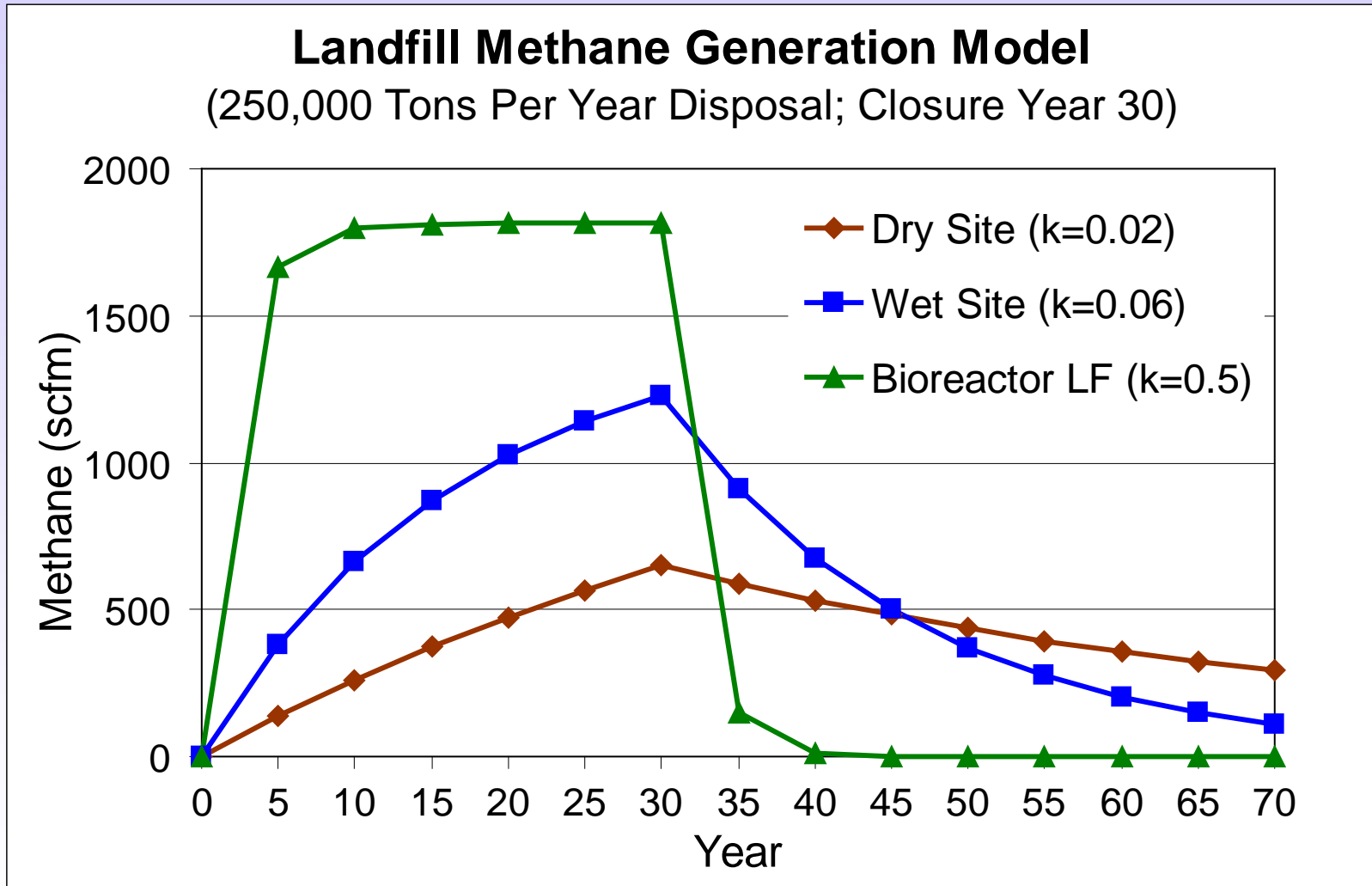
# Typical Landfill Gas Well Components



# Leachate Flow in Typical MSW Landfill

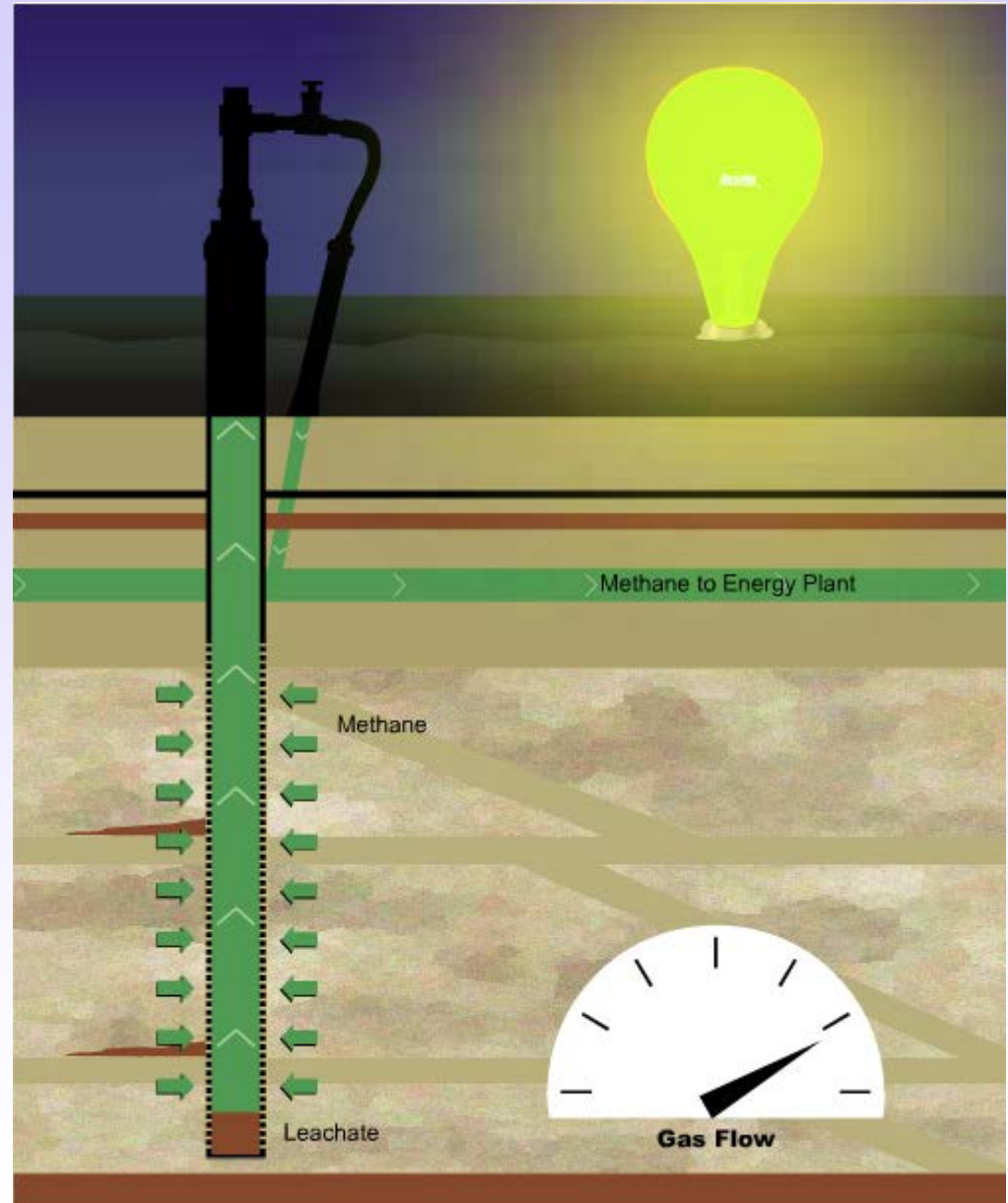


# Moisture Content and LFG Generation



# PROBLEM:

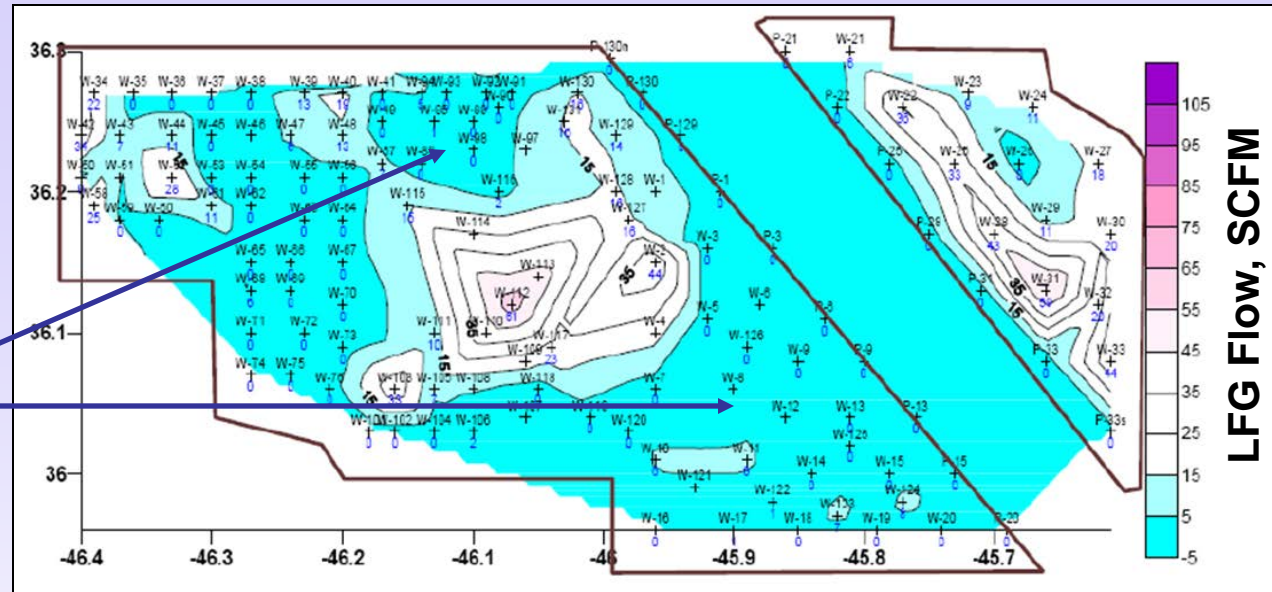
Leachate and condensate accumulate in LFG wells, blocking screen openings and reducing gas flow. Long-term accumulation can clog intake with solids and biomass, leading to permanent reduction in gas flow from the well.



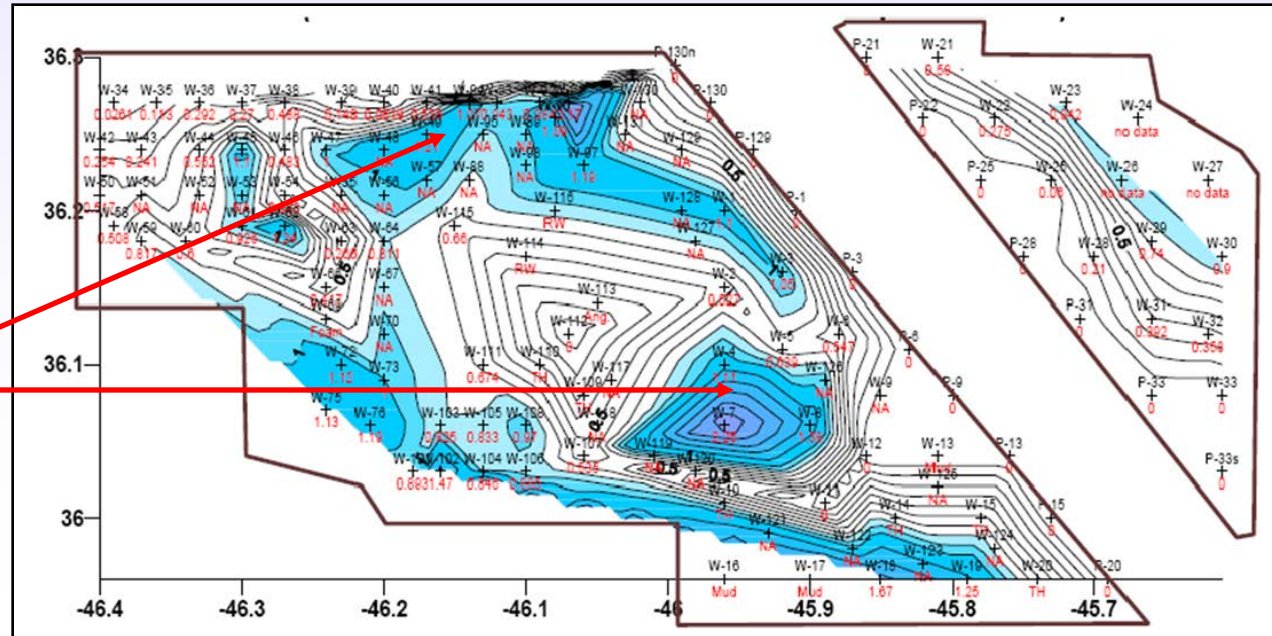
# Gas Flow vs. Liquid Levels in Wells (Clarke, 2007)

**White Areas =  
Gas flow**

**Blue Areas =  
Low/no gas  
flow**



**Blue Areas =  
High Liquid  
Levels**



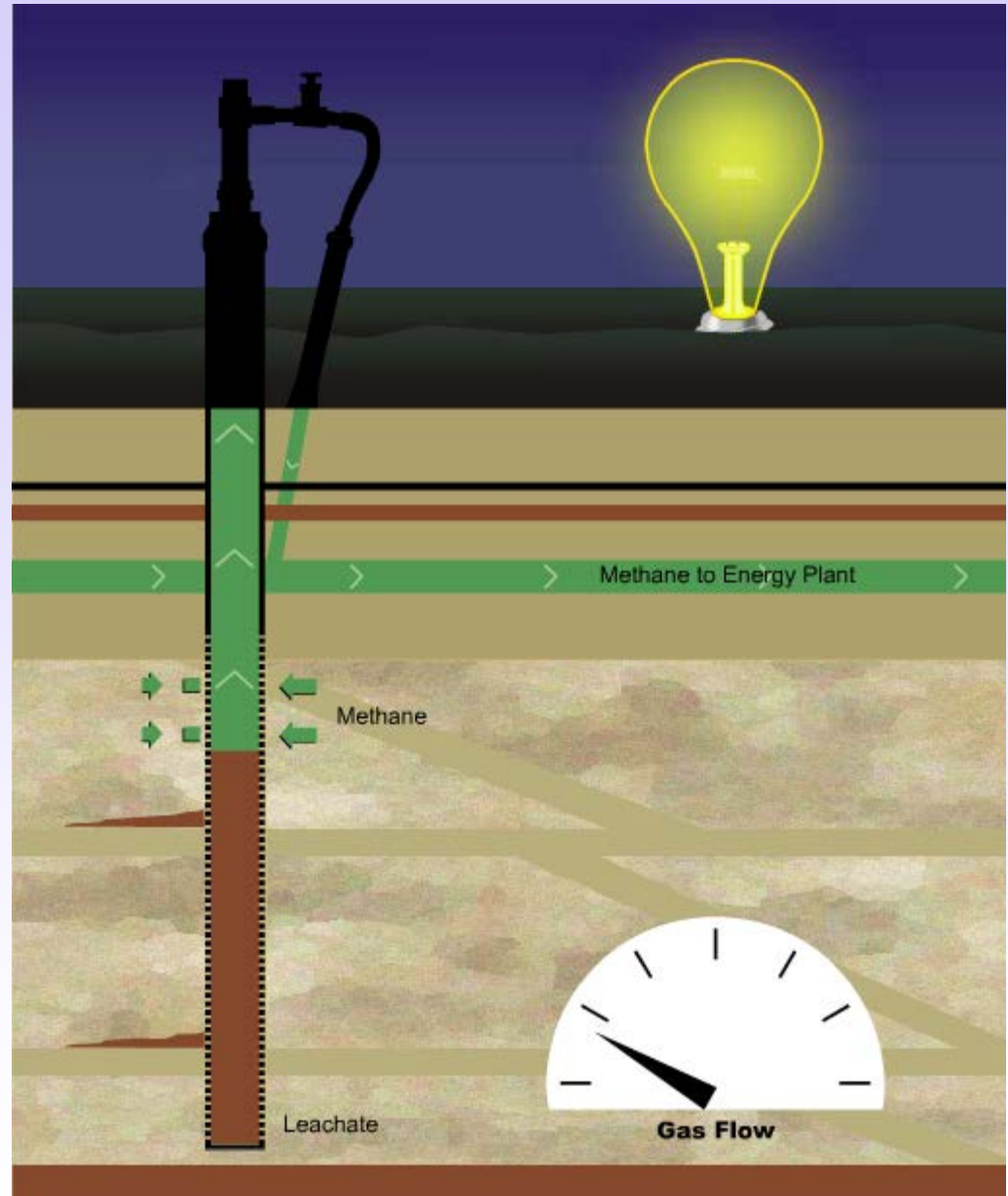
Liquid accumulation in LFG wells and within the surrounding waste results in high shut-in gas pressures, leading to leachate seeps or blow-outs while reducing gas flow rates from the wells



# SOLUTION:

Installing a dedicated pumping system prevents liquid accumulation for maximum gas flow and long-term viability of the LFG well.

The pump should only operate when liquid accumulates from precipitation, leachate recirculation, and wet waste.

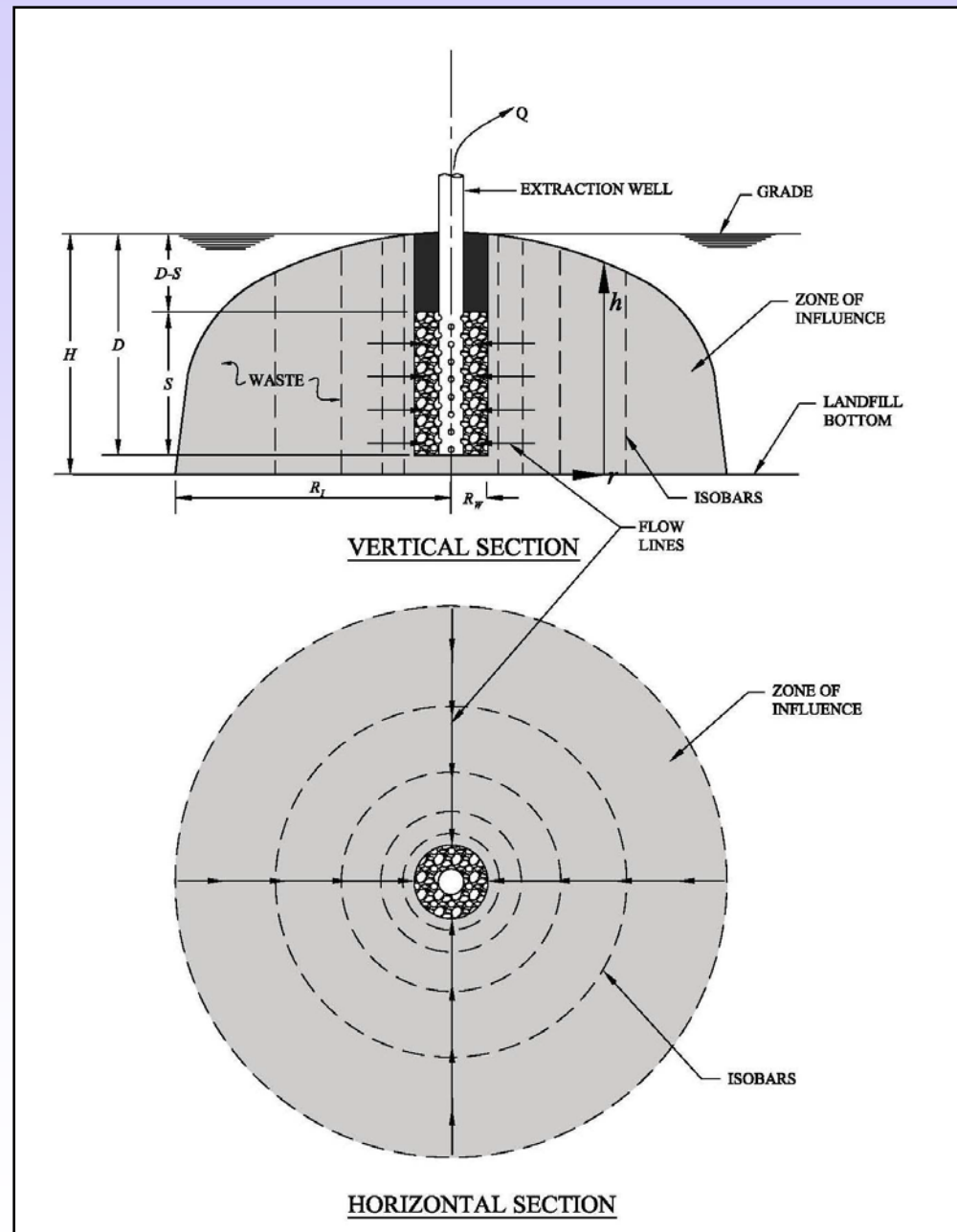




# Zone of Influence

Leachate accumulation reduced gas flow in the lower portion of the well, effectively shortening the length of the well intake and reducing the zone of influence in the waste

Dewatering the well and surrounding waste can increase the zone of influence with no increase in vacuum, reducing the risk of air infiltration and maintaining gas quality



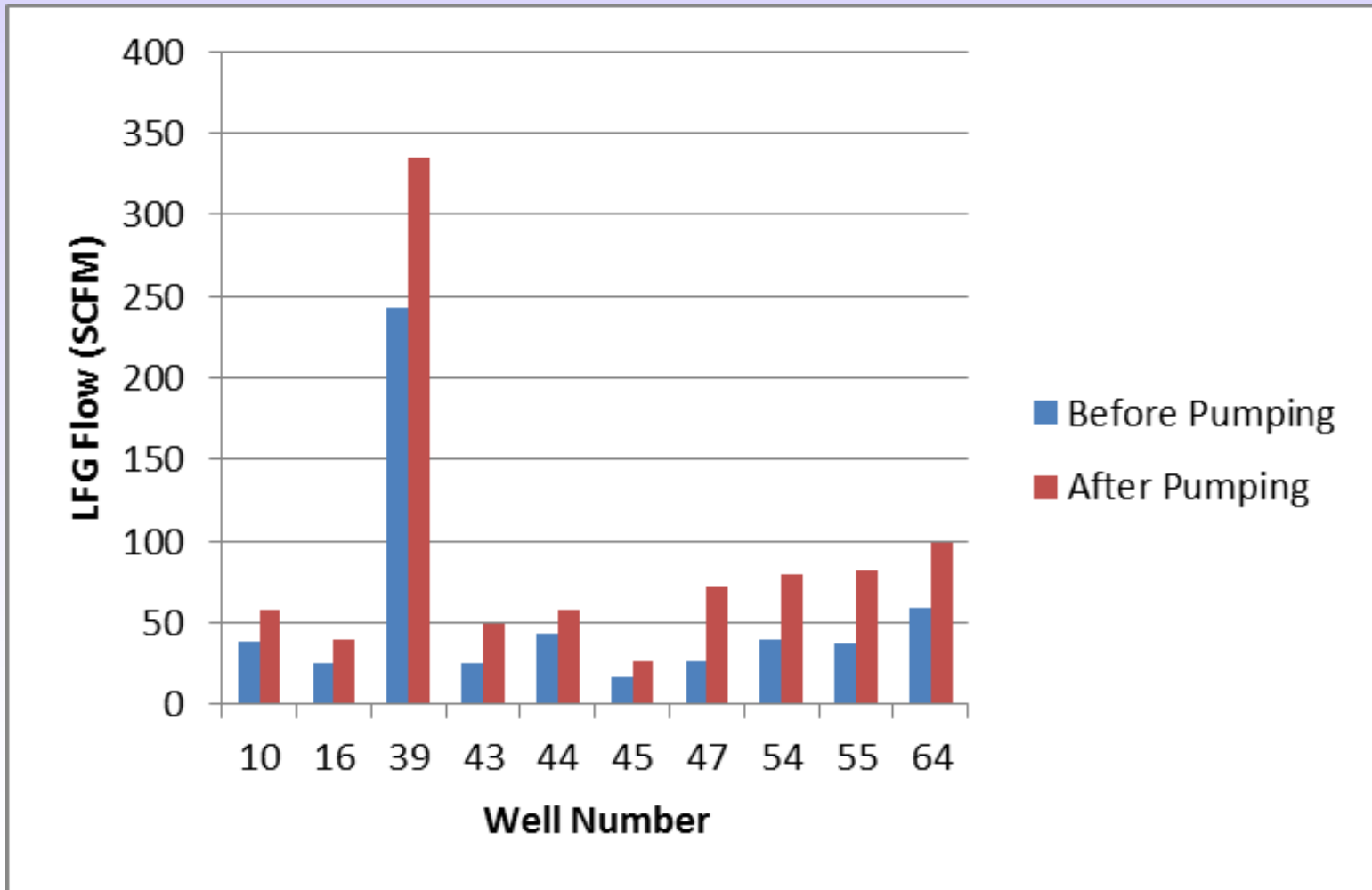
# LFG Collection Improvement Gramacho Landfill, Brazil

Well	LFG Flow (SCFM)		Change in LFG Flow	
	Before Pumping*	After Pumping†	SCFM	%
10	39	58	20	51%
16	25	40	15	59%
39	243	335	91	38%
43	25	49	24	95%
44	43	58	15	35%
45	17	27	10	61%
47	26	73	46	176%
54	40	79	39	99%
55	37	82	45	120%
64	59	98	39	66%
<b>TOTAL</b>	<b>554</b>	<b>898</b>	<b>344</b>	<b>62%</b>

\* Average of 6-8 flow measurements taken over 30 days (August 2009)

† Single flow measurement taken after dewatering (October 2009)

# LFG Collection Rates Before and After Installation of Well Dewatering Pumps



# Economics of LFG Well Dewatering

- 70-foot well
- 50 feet of slotted pipe
- 30 feet of liquid in well reduces open screen area to 20 feet
- Landfill gas well dewatering pump system at cost of \$3,300 would have payback of about 6 months

# Benefits of LFG Well Dewatering

- Maximize gas collection rates
  - Increase revenues where gas is utilized
  - Reduce fugitive emissions through cap
  - Reduce odor issues
- Reduce liquid accumulation in collection system piping
- Maintain steady operation of power generation systems and flares
- Prevent damage to blowers, engines and flares
- Increased useful life of LFG wells by reducing clogging and encrustation of well screens



## Winnebago County Landfill

# Winnebago County – LFGE System

- Closed 110 acre municipal/industrial waste landfill in Wisconsin
- Gas collection system installed in 1990 with LFG used to generate electricity on-site
- 34 electric submersible pumps installed in vertical “dual-extraction” leachate/LFG wells failed in one year due to leachate foaming overheating pump motors
- In 1995, the County replaced electric pumps with air-powered automatic pumps

# Winnebago County – LFG Dewatering System Improvements

- Air-powered pumps reduced liquid levels in LFG wells by 60% due to higher reliability & lower downtime
- Methane gas production flow rates increased 20-25%, increasing electricity generation and revenues
- Methane gas system compressor station reliability increased due to prevention of flooding in dropout tanks
- Improved gas flow and drier gas has reduced downtime of electric generation facility



# Springhill Regional Landfill Florida



# Springhill Regional LFGTE System

- \$7 million LFGTE plant running 6 Caterpillar generators, capable of producing 4.8 MW electricity to supply 4,000 homes
- In 2006, LFG collection system was only producing enough gas to run 2 of the 6 engines, reducing output to 1.6 MW
- Consultant determined that LFG wells were “watered in”, reducing gas flow from wells
- Leachate temperature exceeded 140° F and was corrosive due high dissolved sulfur dioxide, making dewatering a greater challenge

# Winnebago County – LFG Dewatering System Improvements

- Between August-October 2006, air-powered automatic dewatering pumps were installed.
- By November 2006, the LFG collection system output was returned to original design levels, an increase of nearly 200% over previously reduced levels
- All six generators were back on line within three months, producing 4.8 MW of power
- Liquid levels in LFG wells continue to be maintained with limited downtime for routine pump maintenance

# Summary

- LFG wells frequently accumulate leachate/condensate that can greatly reduce gas collection rates
- Dewatering systems can maintain reduced liquid levels, restoring gas flow and collection system efficiency
- Where gas is utilized, dewatering systems can pay for themselves in as little as 6 – 12 months with only 5 – 10 SCFM gas flow increase per well
- Results will vary based on liquid level, clogging by solids and bio fouling, type and age of waste and other factors
- **Next steps** – developing predictive tools and field testing protocol to determine which wells would be best candidates for dewatering

# Questions?

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