Landfill Gas Regulation & Solid Waste Industry

TETRA TECH

Michel Lefebvre

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Just the Facts

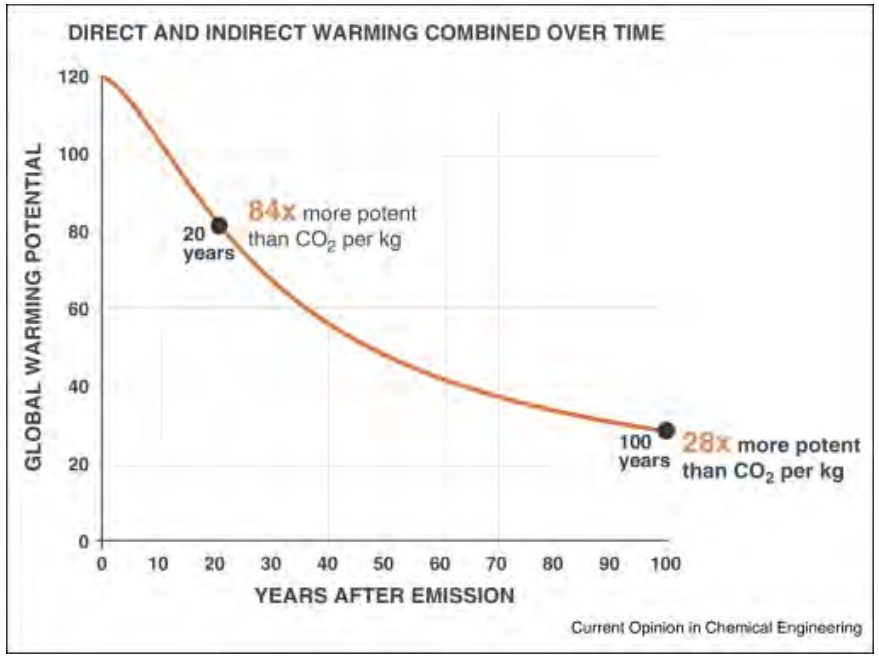
- Landfills contribute about 19 percent of the Canada's total methane emissions.
- This translates to about 2.5 percent of our total GHG emissions.
- Federal government is working to reduce landfill methane emissions through regulations.
- The proposed regulation requires landfills to control methane emissions and detect & repair "leaks".

The Politics

- 2015 Paris Agreement.
- In 2022 the Federal Government published Canada's 2030 emission reduction plan.
- Provided a roadmap to reach its climate commitments
  - Decrease GHG emissions by 40 percent below 2005 levels by 2030.
  - Achieve net zero emissions by 2050

So Why Us?

- Methane is a listed toxic substance under the Canadian Environmental Protection Act.
- It is a potent GHG.
- Methane has a relatively short lifespan in the atmosphere.
- Due to both potency and short lifespan, decreasing methane emissions can bring real and significant near-term climate benefits.



Source: David T. Allen

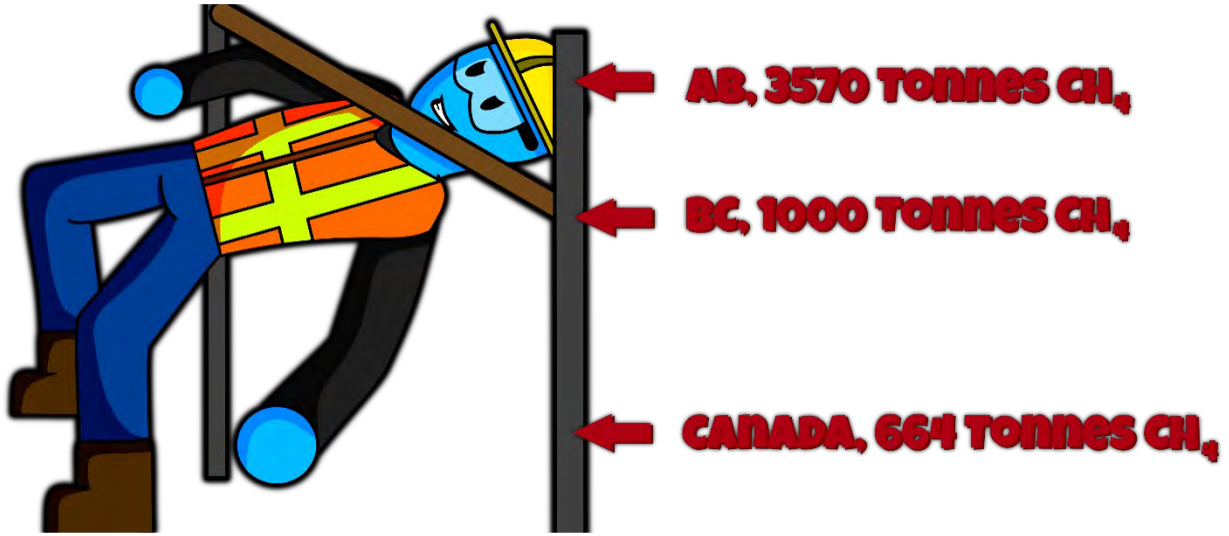
Federal Government approach to meeting obligations

- It’s the carrot or the stick.

How Low Can You Go?

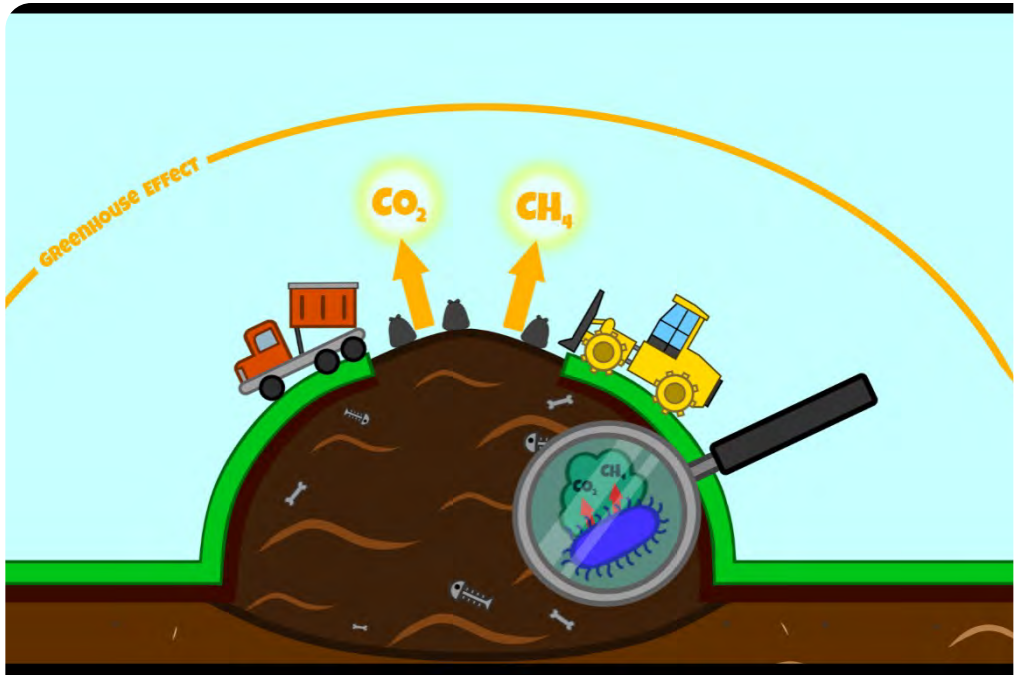
- Alberta Technology Innovation and Emissions Regulation (TIER):
- 100, 000 Tonnes eCO2

  - 21 GWP – 4,762 T Methane
  - 25 GWP – 4,000 T Methane
  - 28 GWP – 3,570 T Methane
  - 31 GWP – 3,225 T Methane
  - 84 GWP – 1,190 T Methane



How to Get There (from Here)

- Active LFG Collection Systems
  - Well established technology.
  - Collection efficiencies greater than 50 percent possible.
  - Established Protocols.
- Passive Systems
  - Evapotranspiration Landfill Biocovers (ETLBC)
  - Bio-widows
  - Methane oxidation rates greater than 60 percent reported.
  - Season efficacy ?
  - No established protocol.
- Organics Diversion



Speedbumps Along the Way

- Active Gas Collection - Prime Directive!!
- Landfill Design and Operations
- How to measure net emissions

LFG 101 – Prime Directive!!

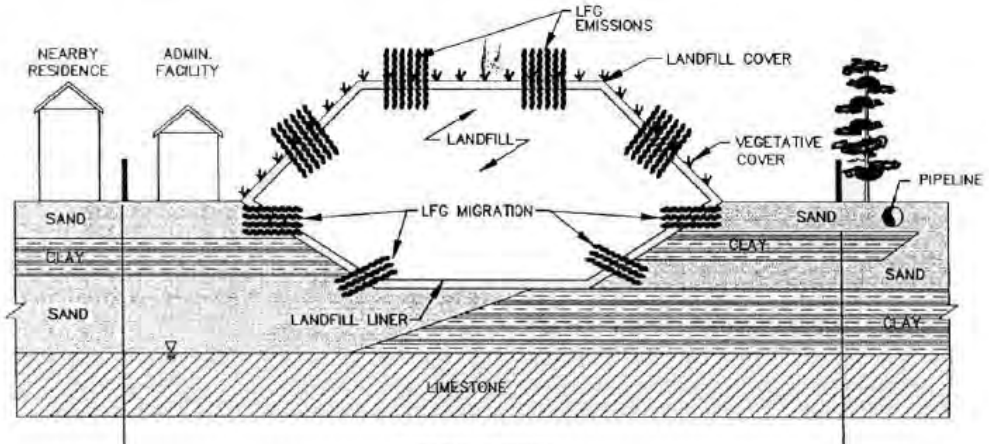
- Never take more than the landfill has to give you!!

Design Factors

- Older landfills may not be engineered.
- Landfills seldom designed with active LFG collection in mind.
- Landfill operations can adversely impact the ability to capture gas
  - Geometry (shallow, narrow, etc)
  - Contaminated soils
  - Placement of C&D
  - Firebreaks
- Balancing Act – OH&S and Environmental Regs

The (other) Inconvenient Truth

- Landfills vent / “leak”
- We need them to leak



Source: SWANA

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How Do We Measure Emissions

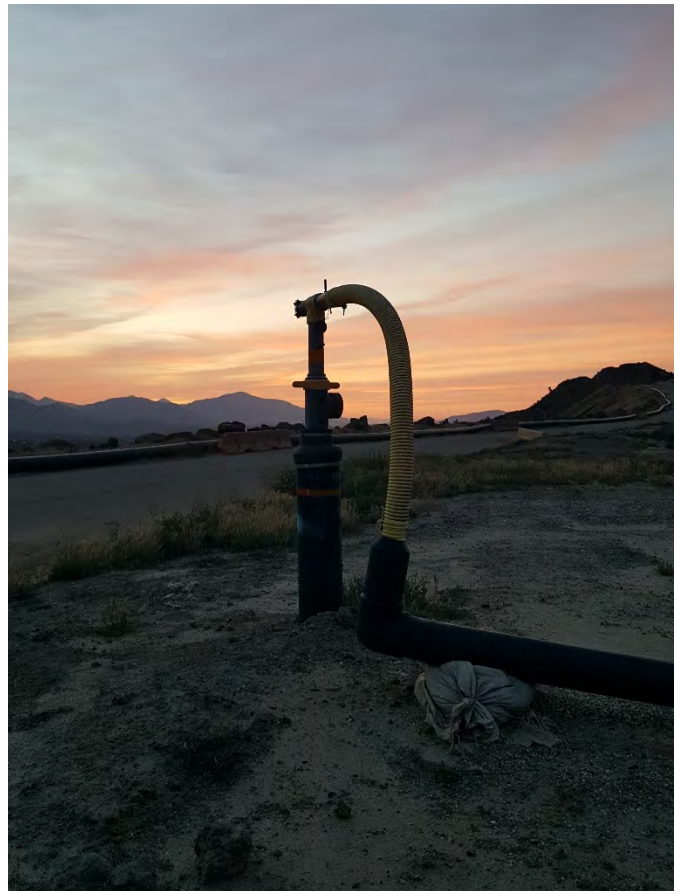
- In the end, we want to reduce methane emissions.
- Question is how to reliability measure emissions from our landfills?

Emission Sources

Area Source

Emission Sources

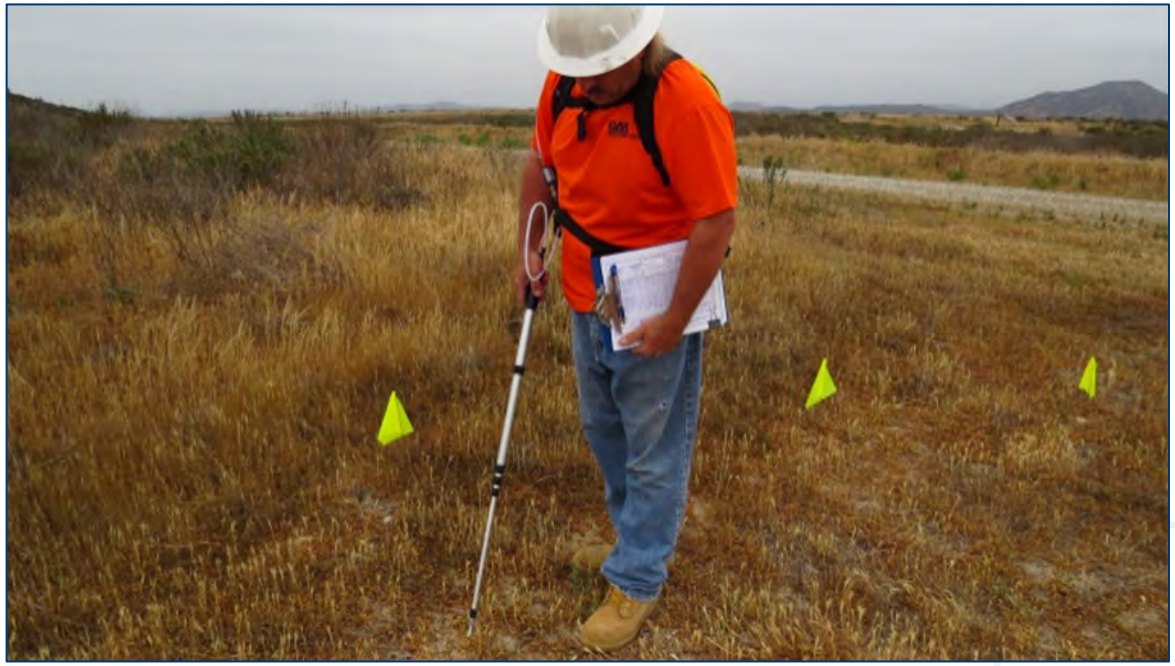
Point Source



Current Industry Standard - SEMs

- Measure methane concentration in PPM

- Pros
  - Precise
  - Versatile – any site, any terrain
  - Multiple Senses
    - — Smell, sight, hearing
- Cons
  - Labor intense
  - Time consuming
  - Weather dependent (snow, rain, etc.)



Rovers/Robots

- Uses point sensors, passive and active imaging
- Evolving market

https://www.specializedroboticsolutions.com/

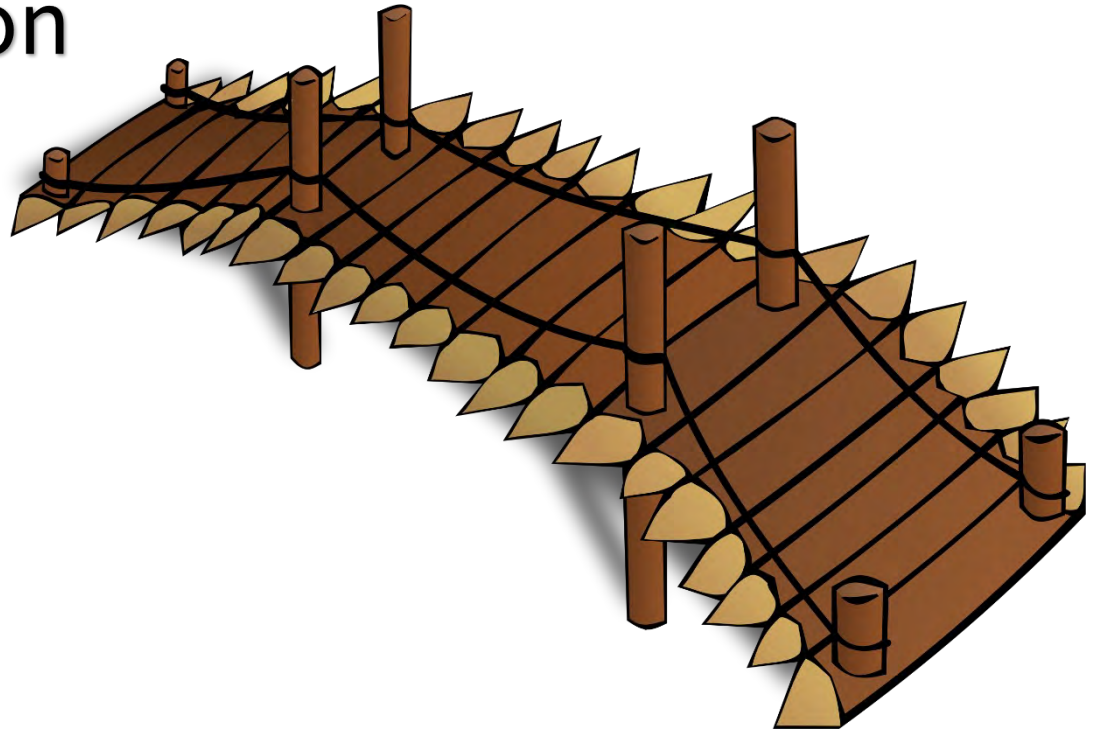
Rovers/Robots – Pros and Cons

- Pros:
  - Safer for LF workers
  - Customizable platform – build the rover you want

- Cons:
  - Unpredictable terrain on landfills
  - Landfill equipment present
  - Cost and accessibility
  - Weather (snow) limitations

The Quandary

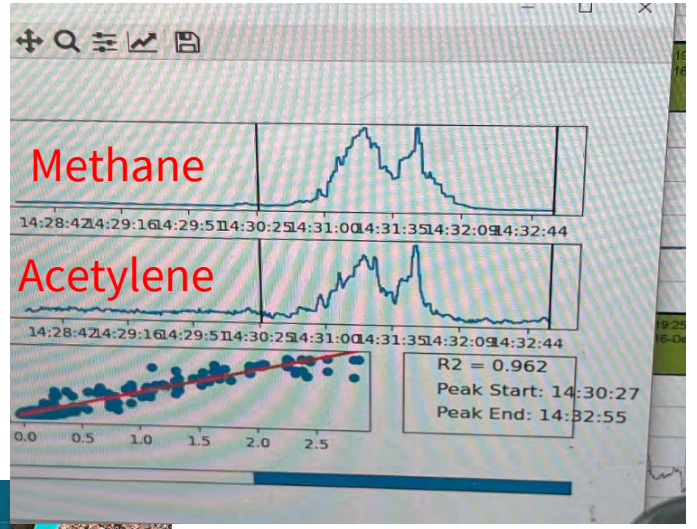
Methane Concentration (PPM)



Methane Emission Rate (Flux)

Tracer Method

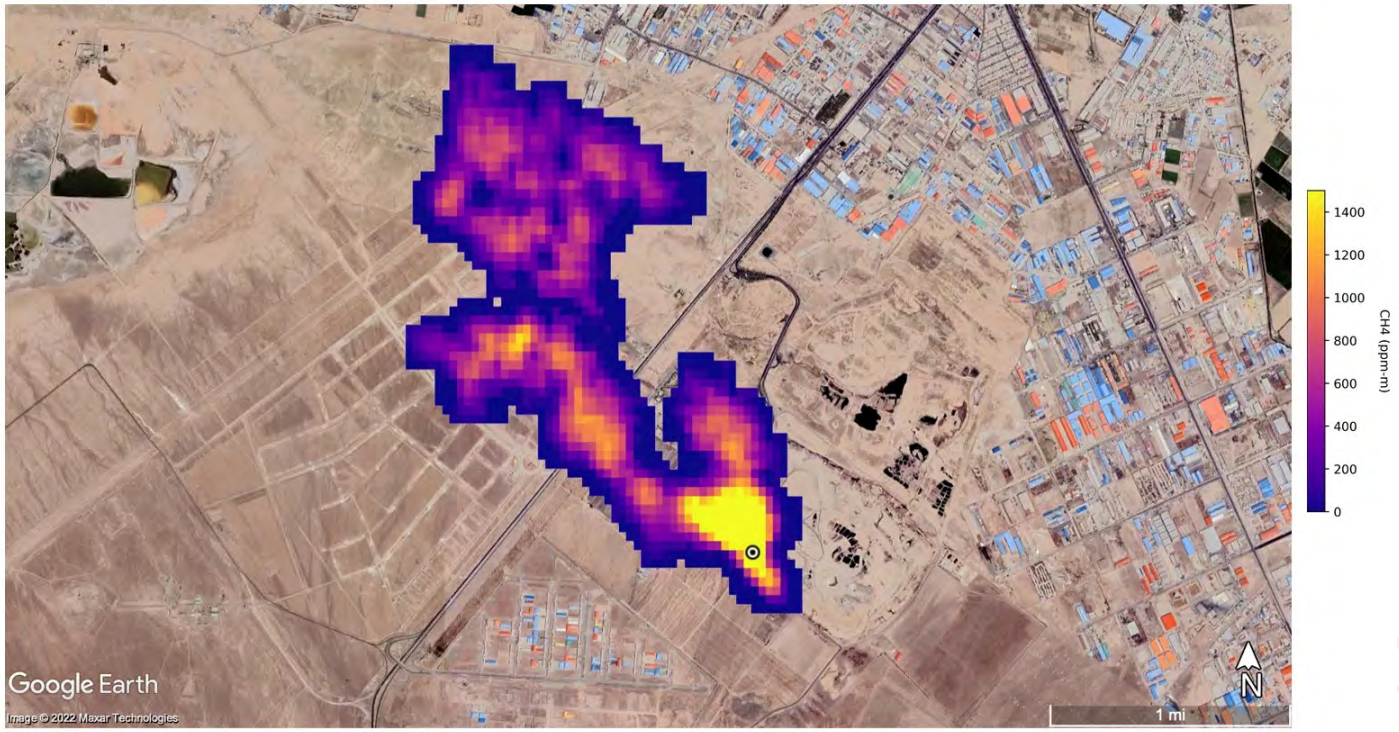
- Tracer gas – Acetylene
- Mobile lab collecting plume data
- Goal is correlation

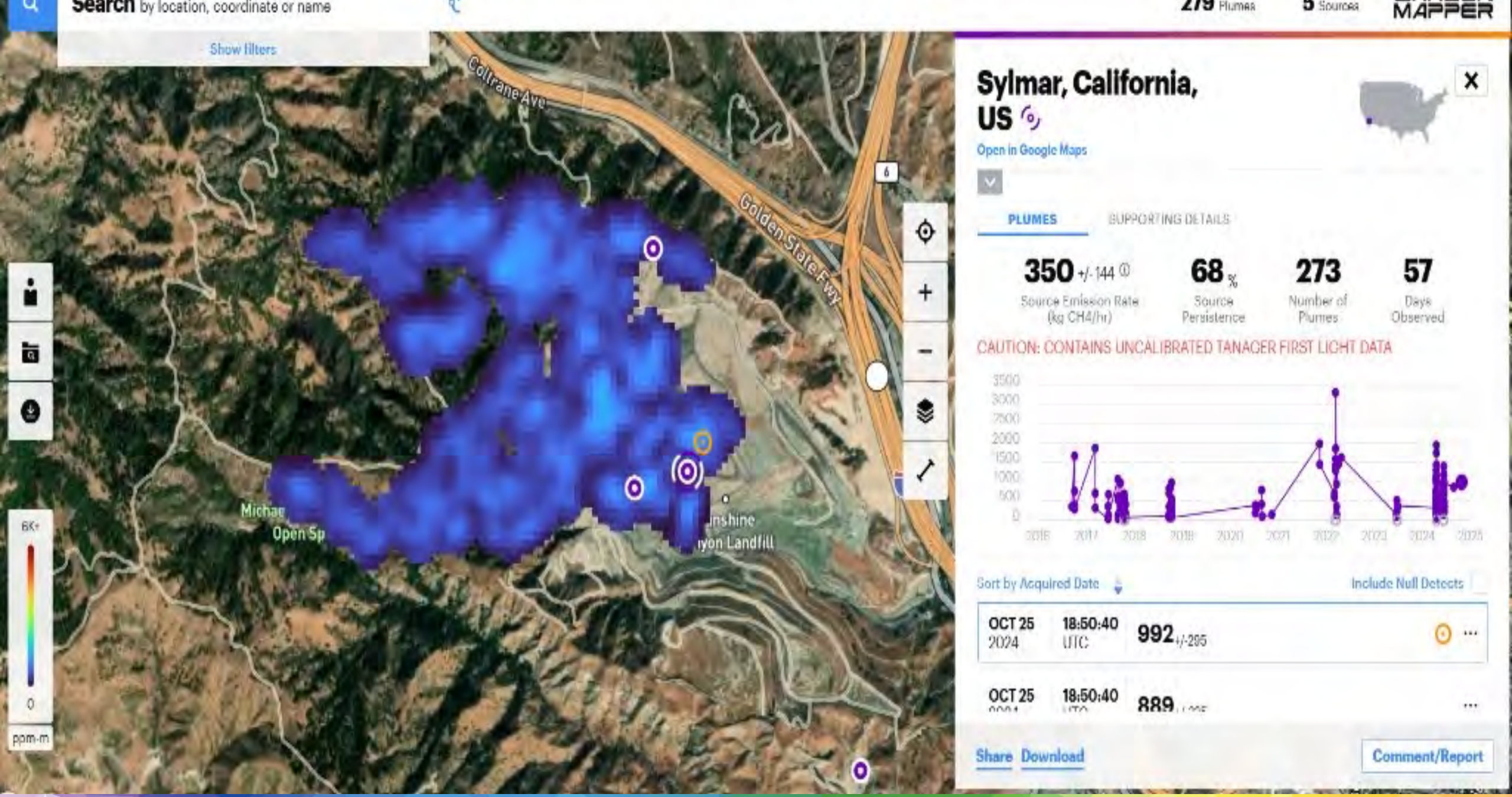


Trucks - Pros & Cons

- Pros:
  - Repeatable at all landfills
  - Accurate
    - Considered the gold standard
- Cons:
  - Weather dependent
  - Frequency of scans
  - Costly – time consuming
  - Difficult to pin-point sources

Satellite Imagery

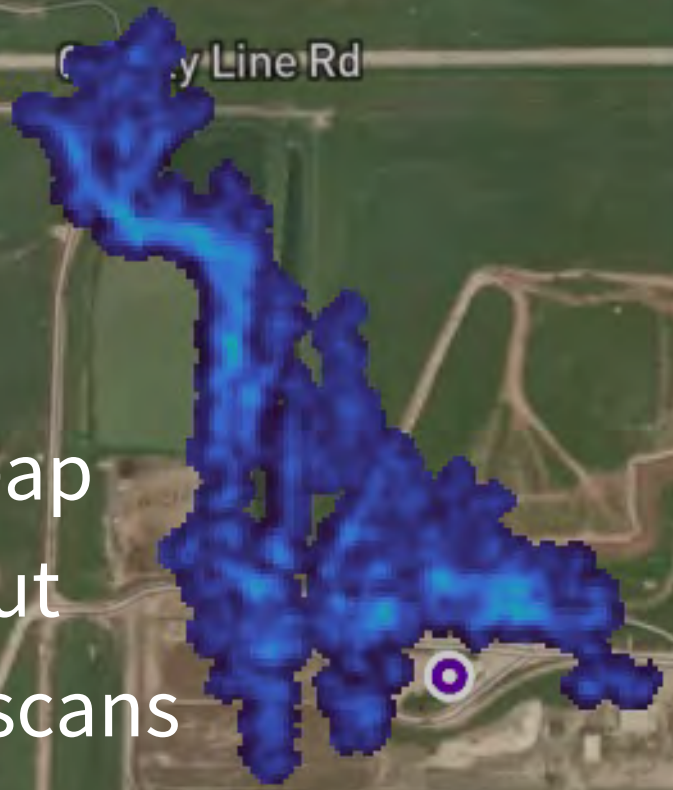



Search by location, coordinate or name
279 Plumes
5 Sources
MAPPER
Show filters
Coltrane Ave
Golden State Fwy
6
Michae
Open Sp
inshine
iyon Landfill
6K+
0
ppm-m
Sylmar, California, US
Open in Google Maps
PLUMES
SUPPORTING DETAILS
350 +/- 144
Source Emission Rate (kg CH4/hr)
68 %
Source Persistence
273
Number of Plumes
57
Days Observed
CAUTION: CONTAINS UNCALIBRATED TANAGER FIRST LIGHT DATA
3500
3000
2500
2000
1500
1000
500
0
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Sort by Acquired Date
Include Null Detects
OCT 25 2024
18:50:40 UTC
992 +/-295
OCT 25
18:50:40
889
Share
Download
Comment/Report

Satellites – Pros and Cons

Pros:

- Quick
- Relatively Cheap
- Low labor input
- Frequency of scans



Cons:

- Clouds? Forget it
- Static measurement – one point in time
- Scans not available at night

So Whats Next?

Next Steps

- Wait and see what happens at the federal level
- Ongoing development of methane measurement technology
  - Don’t count on the USEPA leading the charge.
  - Emissions measurements need to be accurate, robust, and economical (good, fast and cheap).
- Need for a biocover protocol.


Thank You