

# METHANE REDUCTION FIELD TRIAL RESEARCH – WATERLOO REGION

2024 Canadian SWANA  
Conference

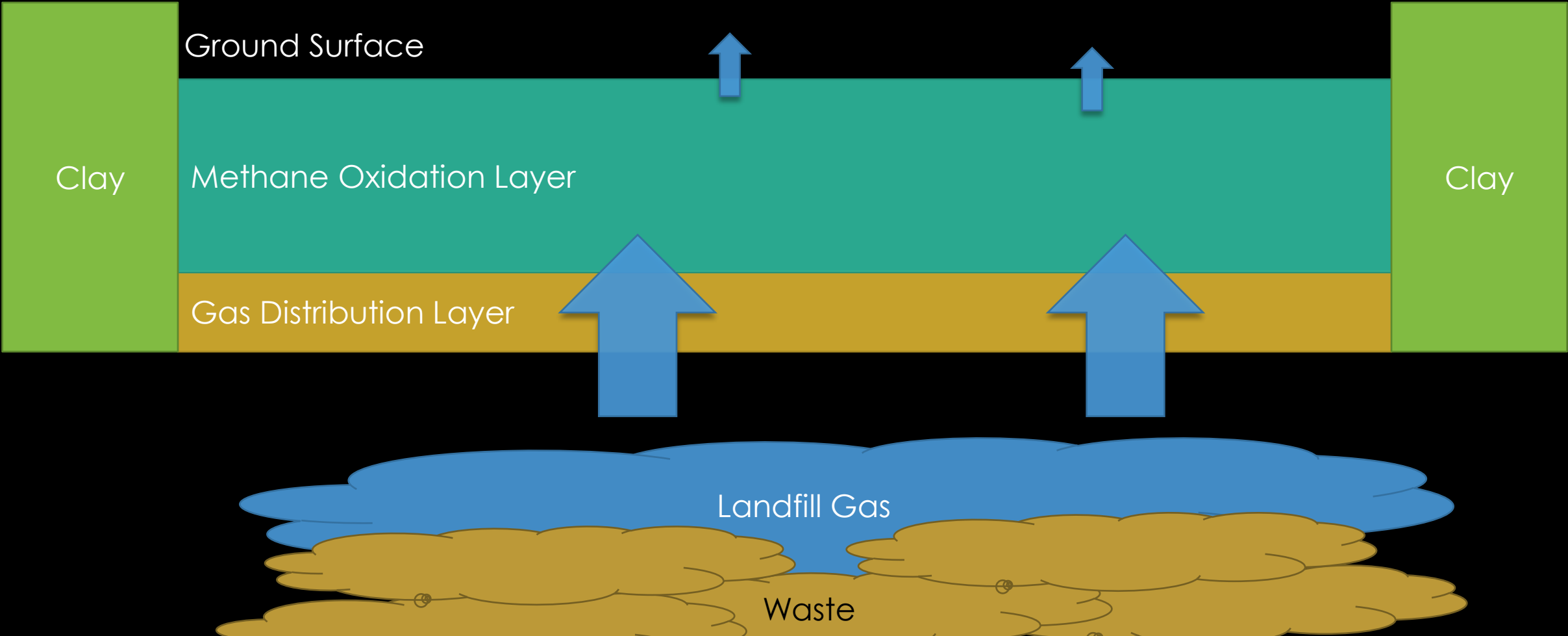
April 5, 2024



# REGION OF WATERLOO

- Region of Waterloo Population 630,000
- 1 active large Municipal Landfill & 5 closed Landfills
- Conducted 2 Biosystem field trials to reduce methane emissions: 1 at a closed site to treat low quality gas & 1 at an active landfill to reduce fugitive emissions and odours around leachate cleanout
- Natural occurring microbes (methanotropic bacteria) colonize the methane oxidation layer to oxidize the methane into  $\text{CO}^2$  and  $\text{O}^2$
- Funding received from NSERC, ECCC, and in-kind contributions from the Region & private consultant

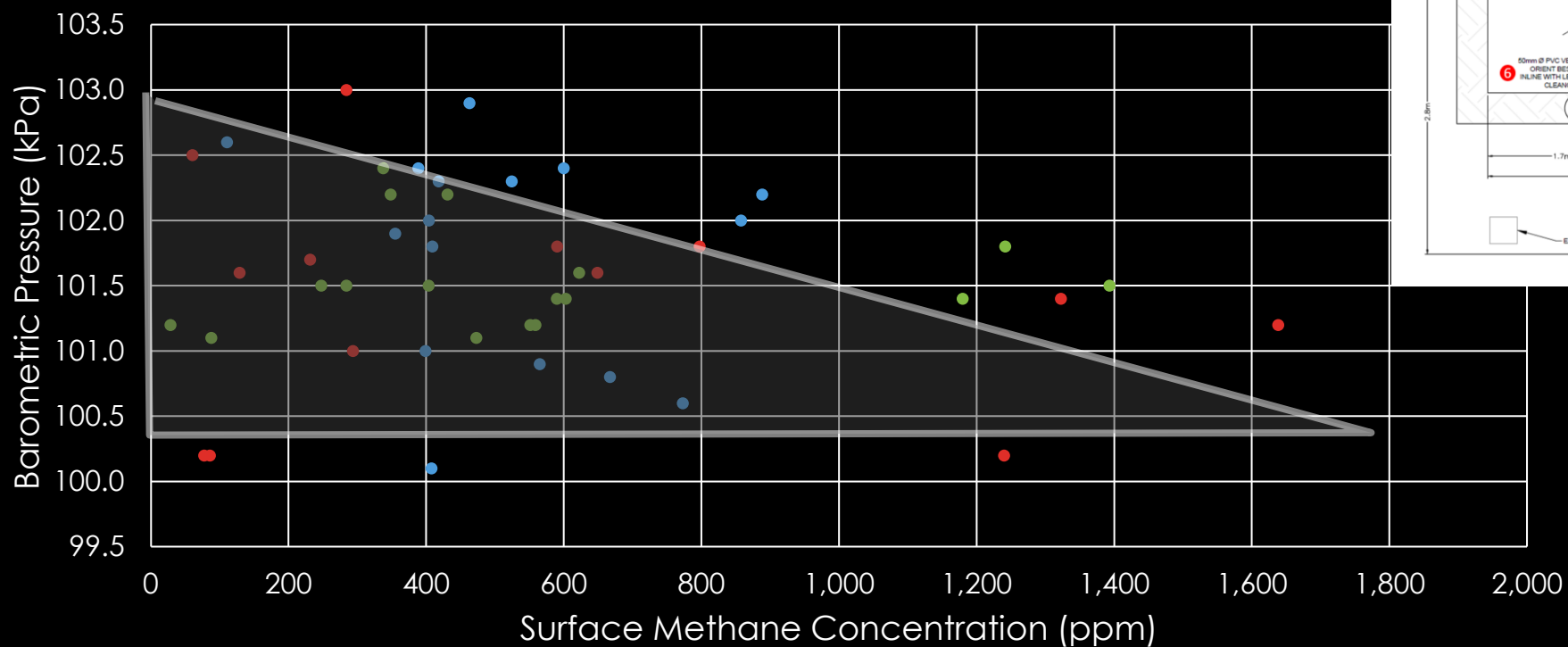
# WATERLOO BIO WINDOW SCHEMATIC



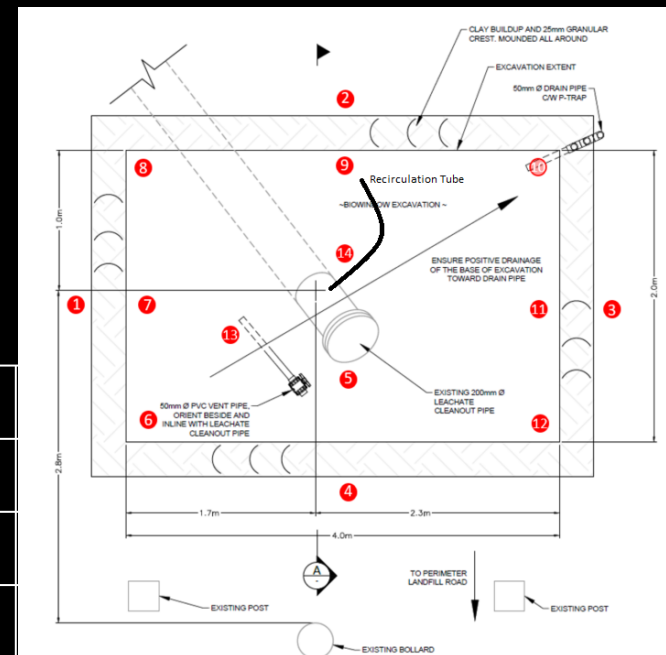
# WATERLOO BIO WINDOW



# INITIAL DATA



• Winter - 2023 • Spring - 2023 • Summer - 2023

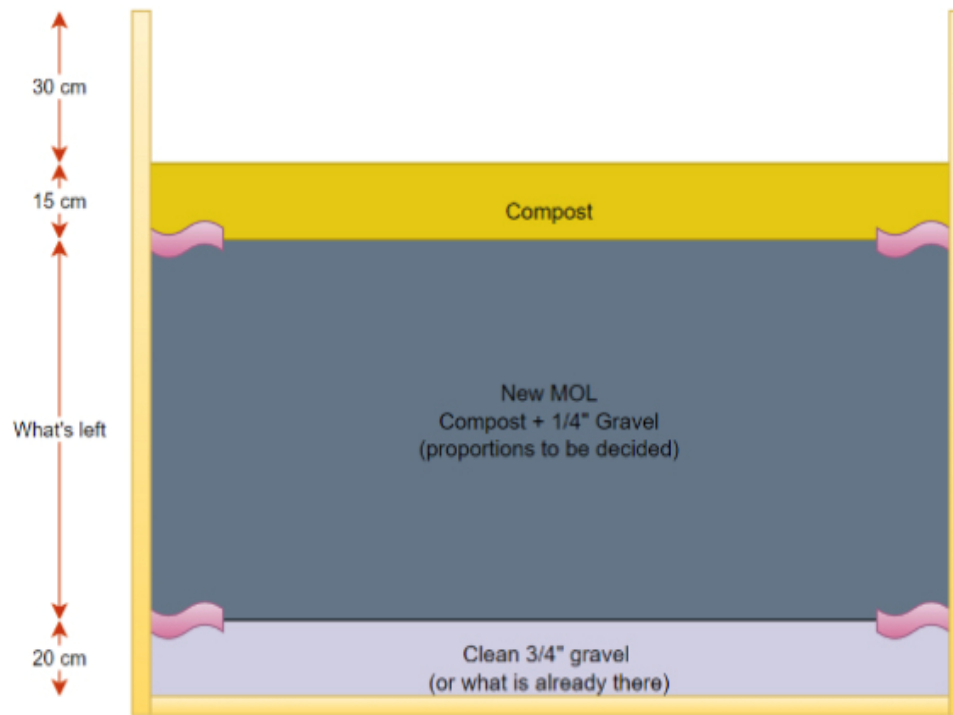


# SOME LESSONS LEARNED


- Updated design after several months to incorporate landfill gas directly from the leachate cleanout
- Passive System - low installation and maintenance costs – approx. 5k
- Appreciable reduction in methane – up to 70% reduction and corresponding reduction in anecdotal odours
- Potential for occlusion (plugging)
- Variability in flow and gas quality not monitored at Waterloo therefor difficult to calculate absolute reduction rates
- Cold weather appears to impact the methane reduction bacteria/ efficiencies

# KITCHENER BIO FILTER DESIGN

- MOL Material  
1:1 Compost /  $\frac{1}{4}$  "Chip Stone
- 15cm Vegetative Layer  
5m<sup>3</sup> Compost
- 55cm MOL  
18m<sup>3</sup> Compost  
18m<sup>3</sup> Chipstone
- 20cm GDL  
Material Recycled



Note the absence of filter sand, as opposed to all the other concepts

: Membrane/Bentonite, to force gas migration towards the middle of the MOL (prevents sidewall leakage)

# KITCHENER BIO FILTER



- Three lfg extraction wells feed into the raised & heated bio filter
- Passive system
- Tested various MOL mixes
- 98% reduction in methane on average
- Efficiency drops in colder temps



# KEY TAKEAWAYS & NEXT STEPS

- Very positive results overall
- For Kitchener, feasibility of treating additional lfg to examine the maximum volume that the biosystem can process
- Currently signed agreements with two Universities and private sector consultant to continue the bio window research at Waterloo
- Continue research to explore ways to improve design efficiency: size, thickness, improve measurements of lfg loading & corresponding emissions, etc.
- Also evaluate impacts of winter/wet conditions
- Use information from the bio window study to design re-grading around leachate manholes as well as other landfill cap protrusions to treat & reduce lfg emissions

# QUESTIONS

