



EVALUATING THE LIMITATIONS OF THE EPA'S GAS MODEL (LANDGEM) AND DEVELOPING AN ALTERNATIVE METHOD FOR LANDFILL EMISSIONS ESTIMATION.

SOLID WASTE DESIGN COMPETITION (SWDC) SWANA's Int'l Student Competition 2022



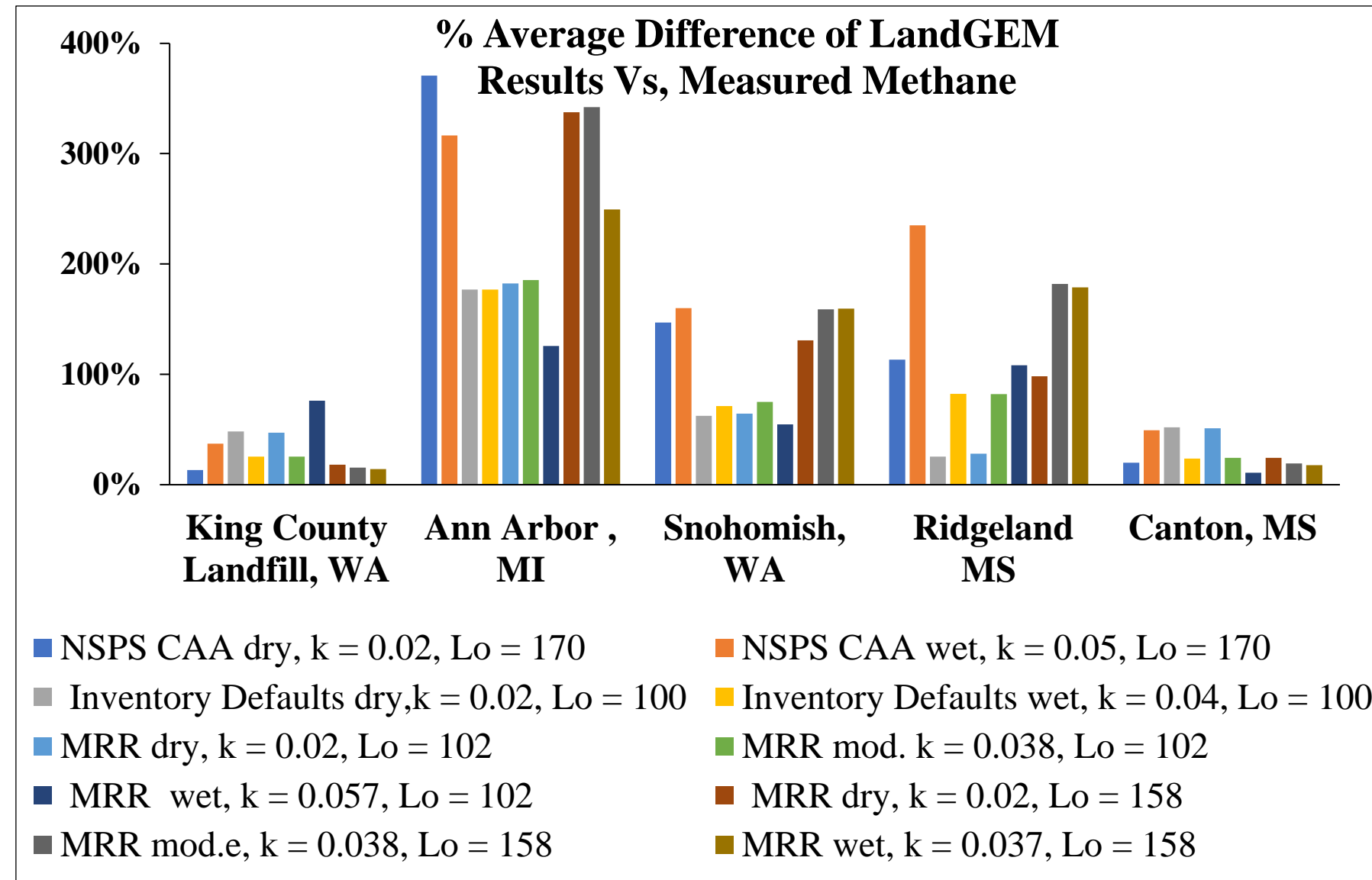
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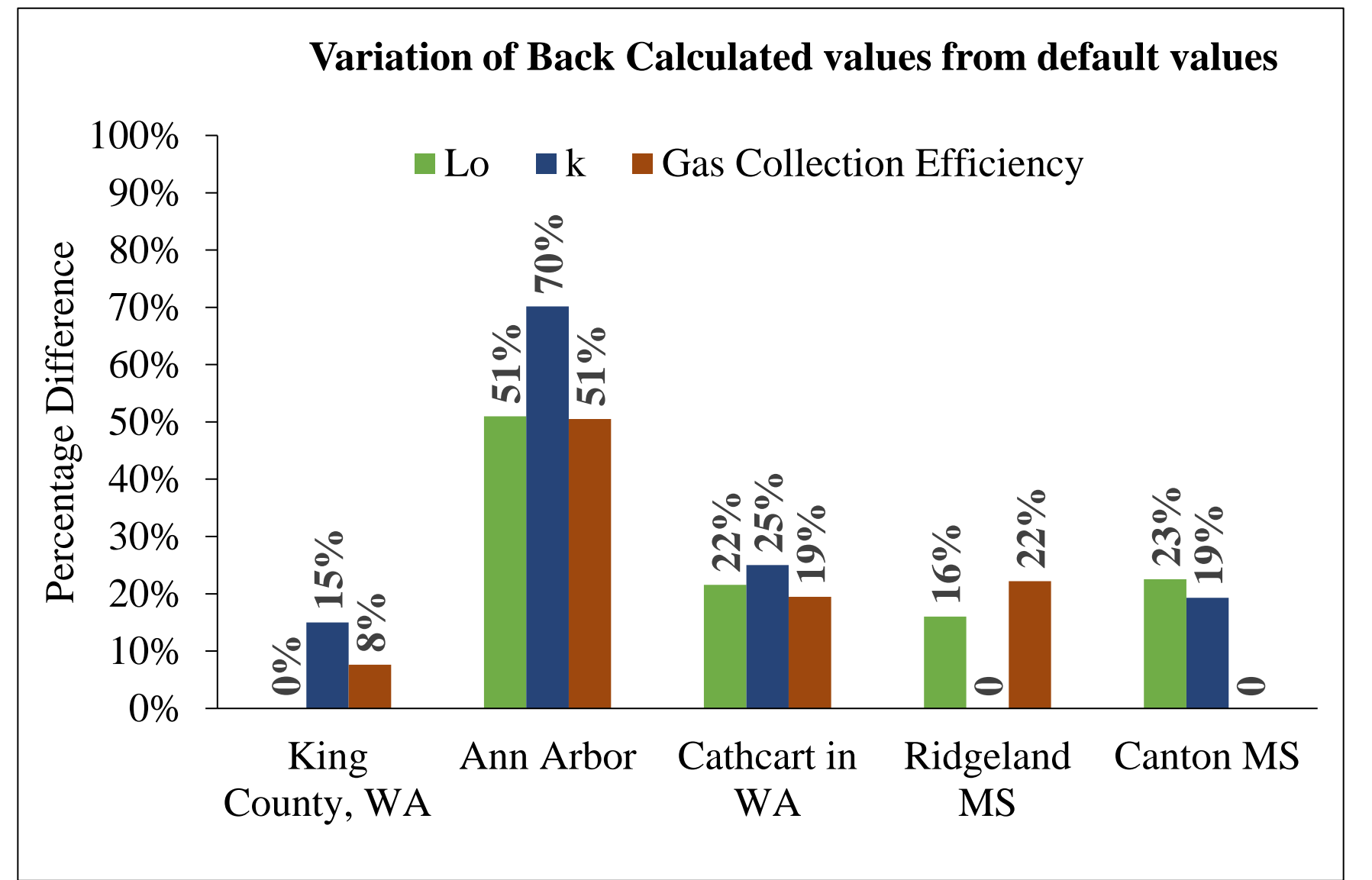
INTRODUCTION

EPA's LandGEM model for estimating landfill gas emission is not representative of the field measured methane emissions. The purpose of the study is to evaluate methane generation rate (k) and potential methane generation capacity (L_o) used in the LandGEM for estimating Landfill Gas (LFG) and methane generation, oxidation, and emissions and to develop an alternate baseline model for calculating methane generation that can be generalized and scaled.

FLAWS IN LANDGEM MODEL



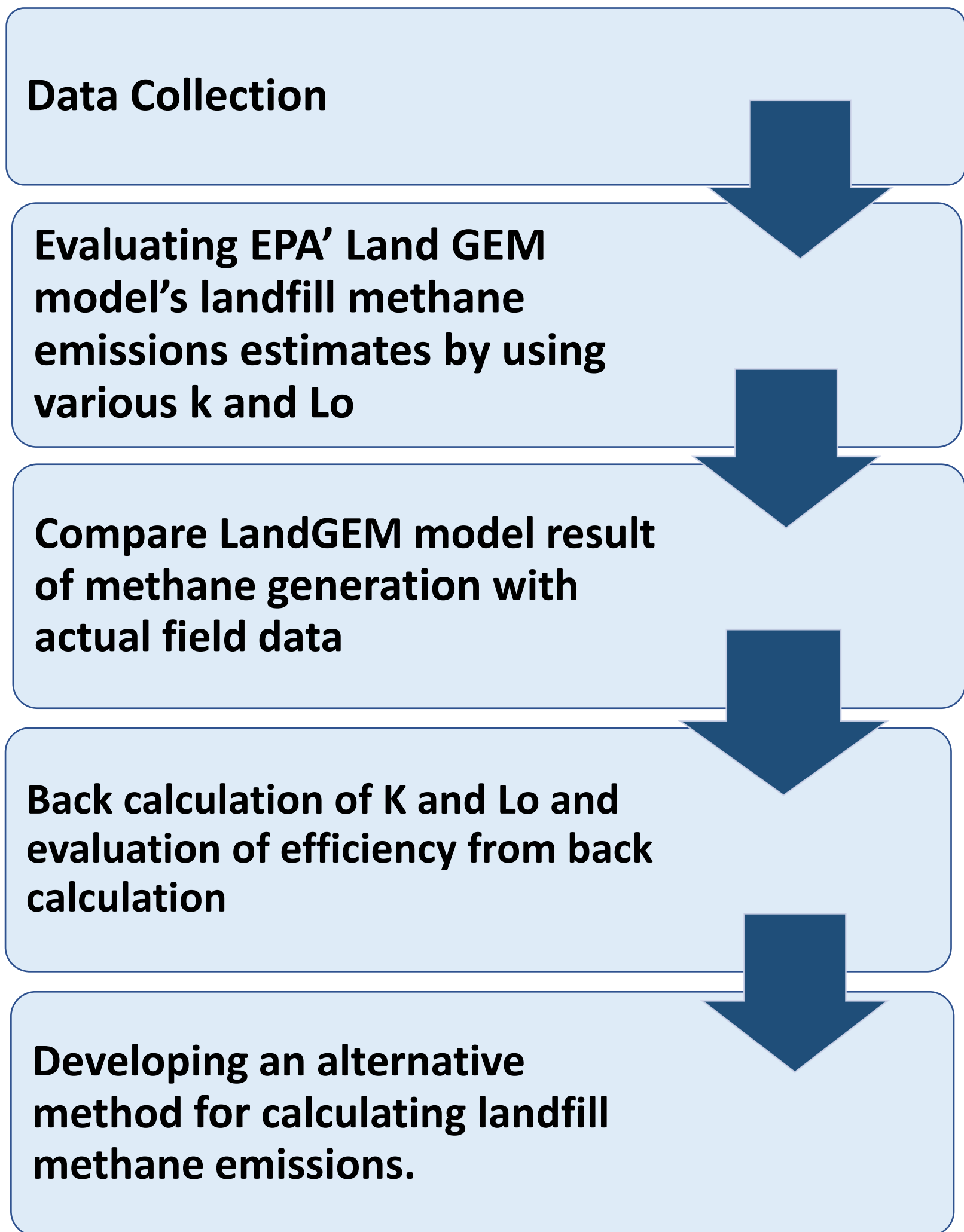
BACK CALCULATION



DISCUSSION & CONCLUSION

LandGEM Model doesn't provide generalizations. Factors beyond wet and dry category k, Lo and waste accumulation in play. Landfill gas collection efficiencies add to the problem. Organic Waste composition has significant impact on methane generation

METHODOLOGY



Landfill Name	Best results	Worst results
KING County Landfill, WA	k = 0.02 & Lo = 170	k = 0.057 & Lo = 102
Ann Arbor, MI	k = 0.057 & Lo = 102	k = 0.02 & Lo = 170
Cathcart landfill, WA	k = 0.057 & Lo = 102 (MRR dry)	k = 0.05 & Lo = 170 (NSPS/CAA Wet)
Ridgeland, MS	k = 0.02 & Lo = 100	k = 0.05 & Lo = 170
Canton MS	k = 0.057 & Lo = 102	k = 0.02 & Lo = 100

ALTERNATE MACHINE LEARNING MODEL

$$Q'_{CH_4} = 31475\alpha - 18180\beta - 914\gamma + 7354\delta - 2210 + 17021$$

Q'_{CH_4} = Methane generated (Mg/Yr) α = Waste in place (Mg/yr) ; β = Organic Waste Concentration (Mg/Yr); γ = k (yr⁻¹) ; δ = Lo (m³/Mg); θ = Avg Rainfall (m)

