



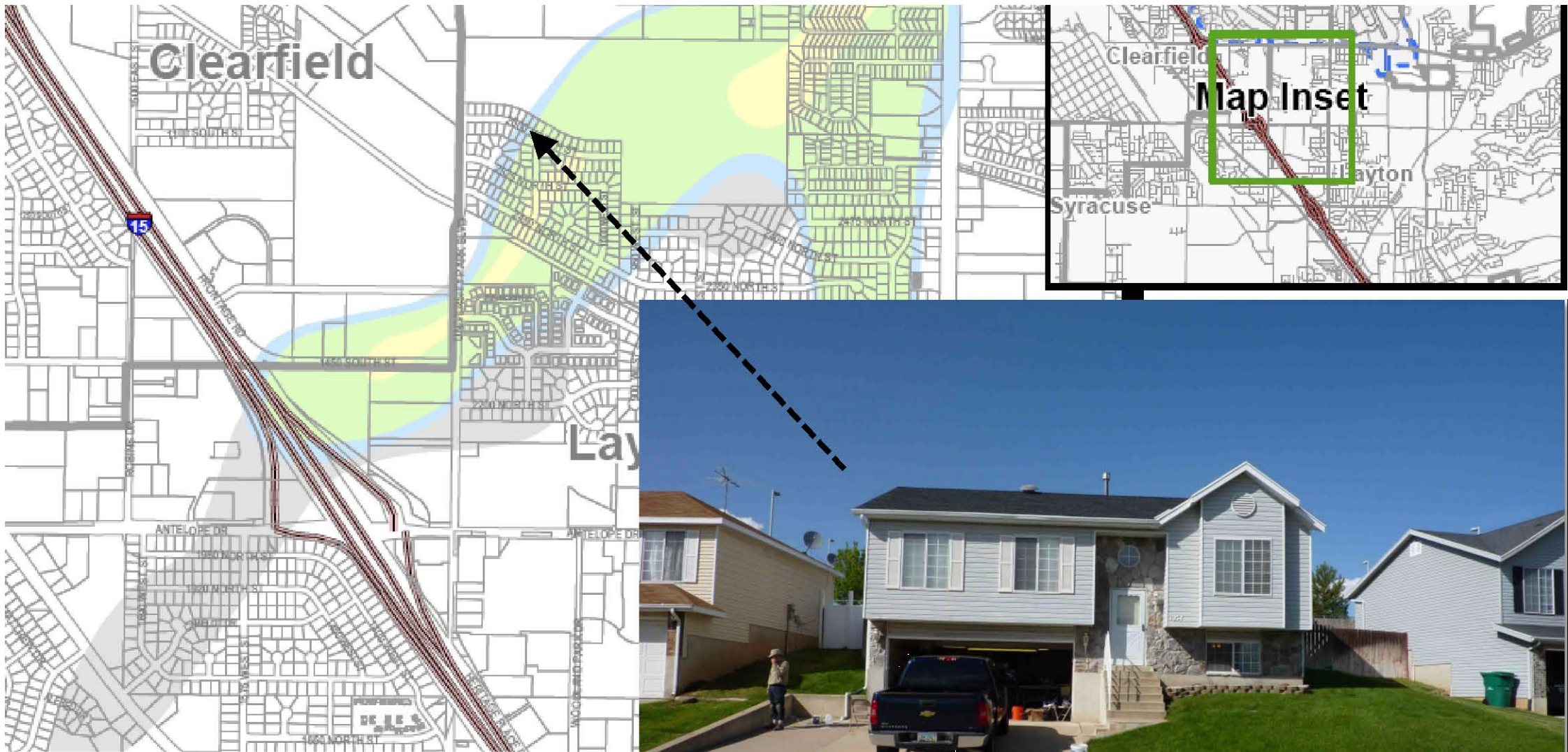
EPA Vapor Intrusion Workshop

Why (When, Where, and How) You Should Continuously Monitor Indoor Radon, Differential Temperature and Pressure During Chlorinated Vapor Intrusion Assessments

**Observations from Available Data Sets:
Sun Devil Manor (SDM), Layton, UT**

Chase Holton, Ph.D., P.E.(CO, OK), Geosyntec



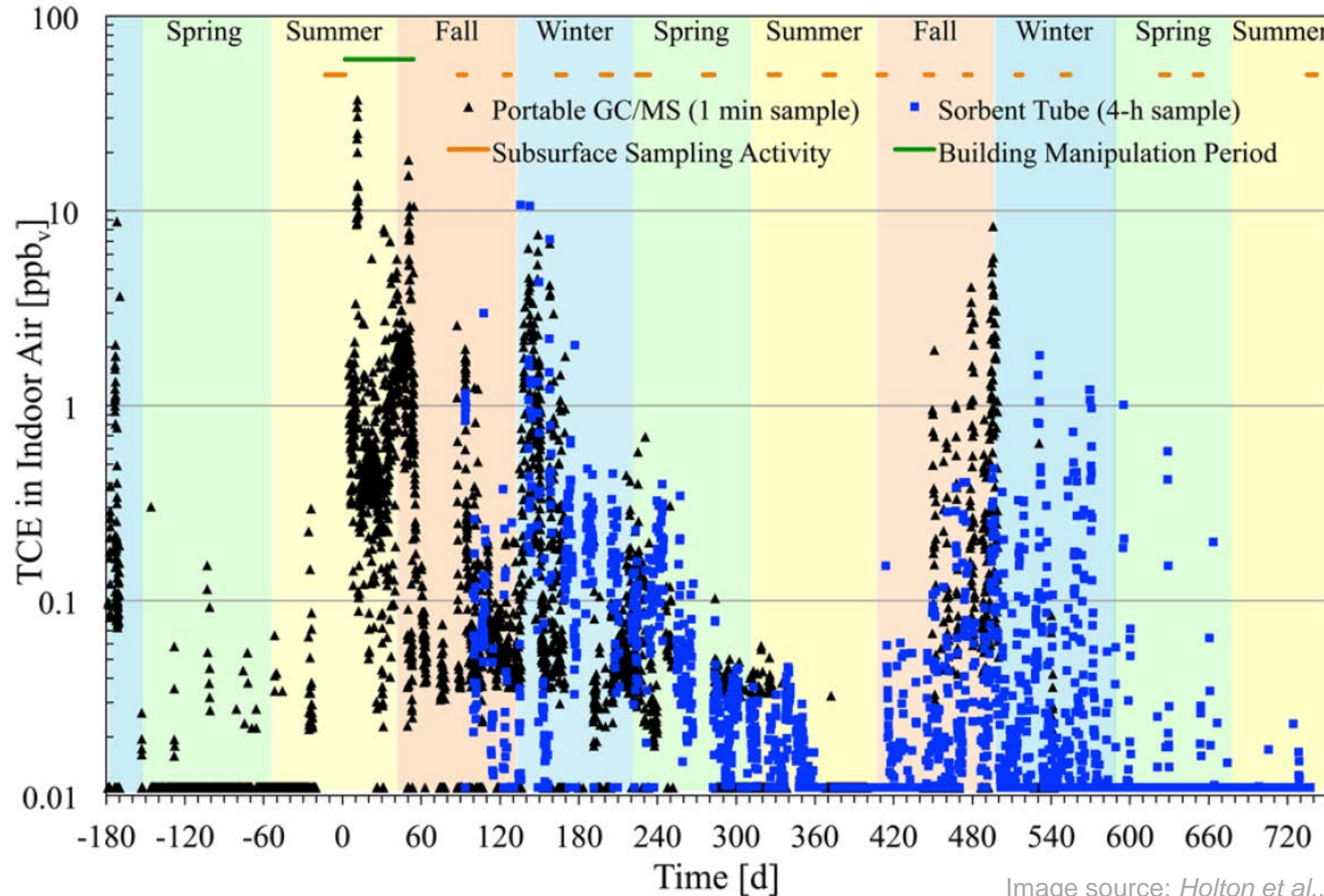


Project ER-1686

Sun Devil Manor, Layton, Utah

Type & Depth to VOC source	Building type & size (ft²)	Foundation	Sub-foundation horizontal permeable	Preferential pipe pathway	Bldg-Climate zone (Temp)	Press./ Wind speed & direction	Intrusion primarily Advect. vs Diffusive
Shallow Soil	Modern sub-urban	Slab-on-Grade	Continuous horizontal/permeable	High	1-3	Low	Advective
Deep Soil	Legacy Urban Multi-Family	Split level	Discontinuous / Impermeable (sandy shallow soils)	Mod. (wood stave sewer has a role)	4	Mod.	Diffusive
Shallow GW	Non-Res. <10k ft²	Full basement		Low	5	High steady direct	50-50
'Deep' GW	Non-Res. >100k	Crawlspace-dirt floor		None	6-8	High varying direction	

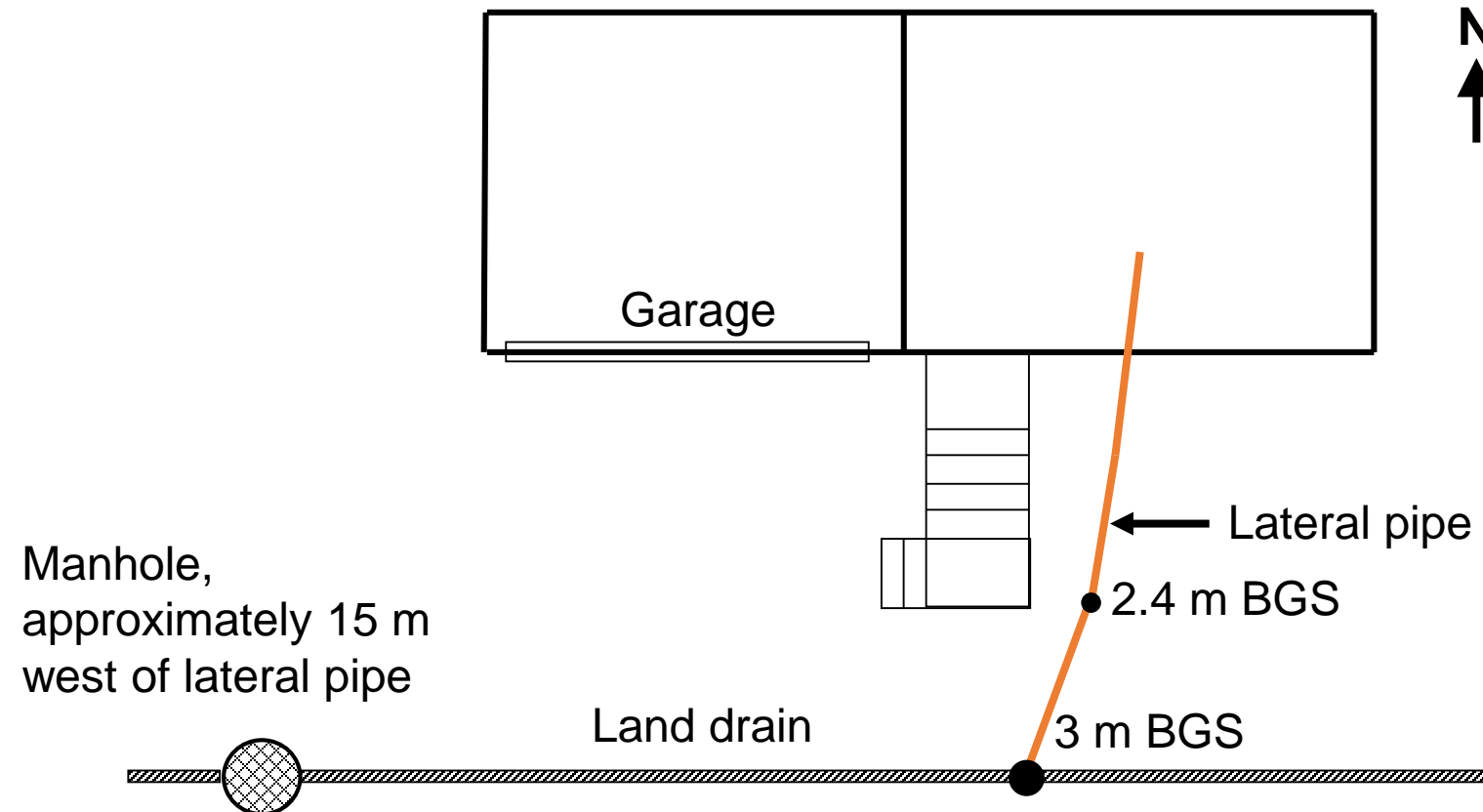
Indoor Air TCE Concentrations



- Indoor air TCE concentrations varied over 3 orders of magnitude
- Two recurring behaviors observed; active and inactive VI
- 25 of 723 days (3.5%) contribute 50% of total exposure over this time frame (t = 0 to 723)*

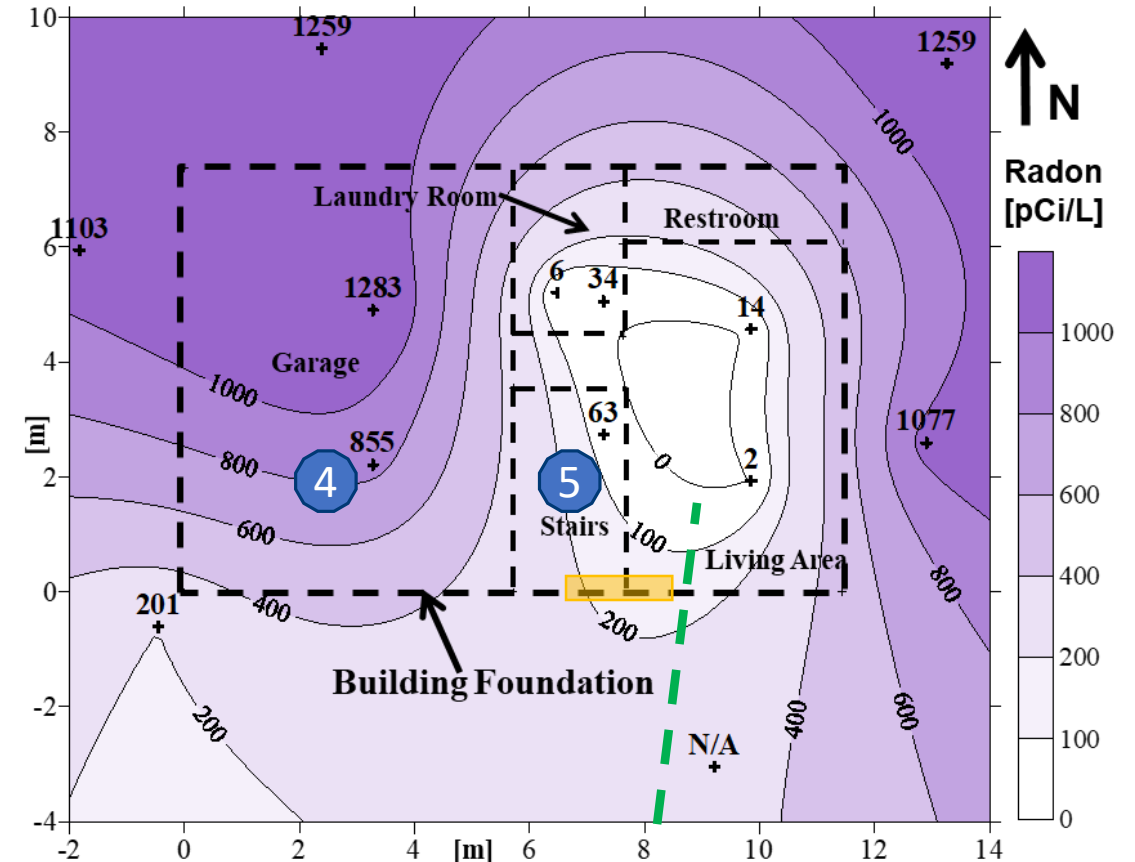
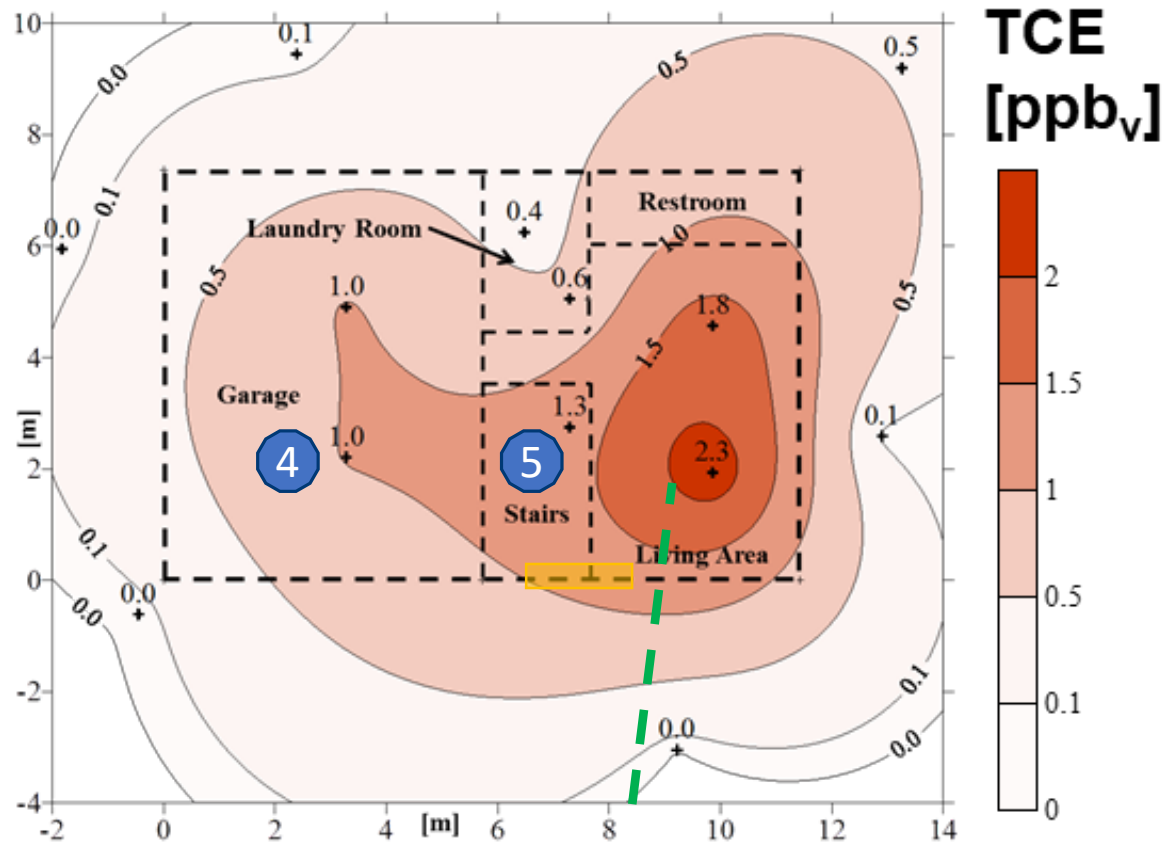
Preferential Pathway

- Lateral pipe connected to impacted storm drain system terminates below floor slab
- “Pipe Flow” VI



Soil Gas TCE and Rn Concentrations

Subslab soil gas



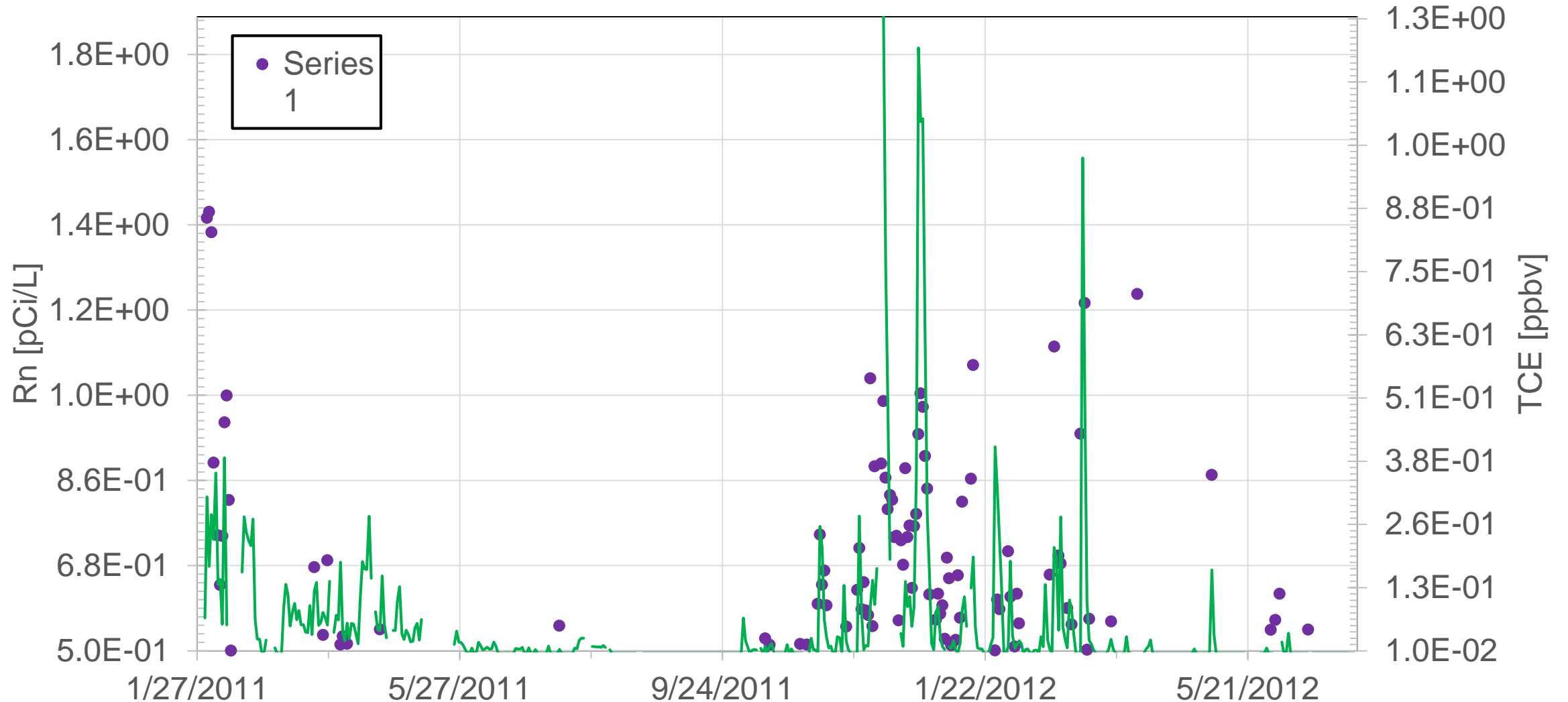
Land Drain Lateral Pipe ✓

Crack/Slab Gap

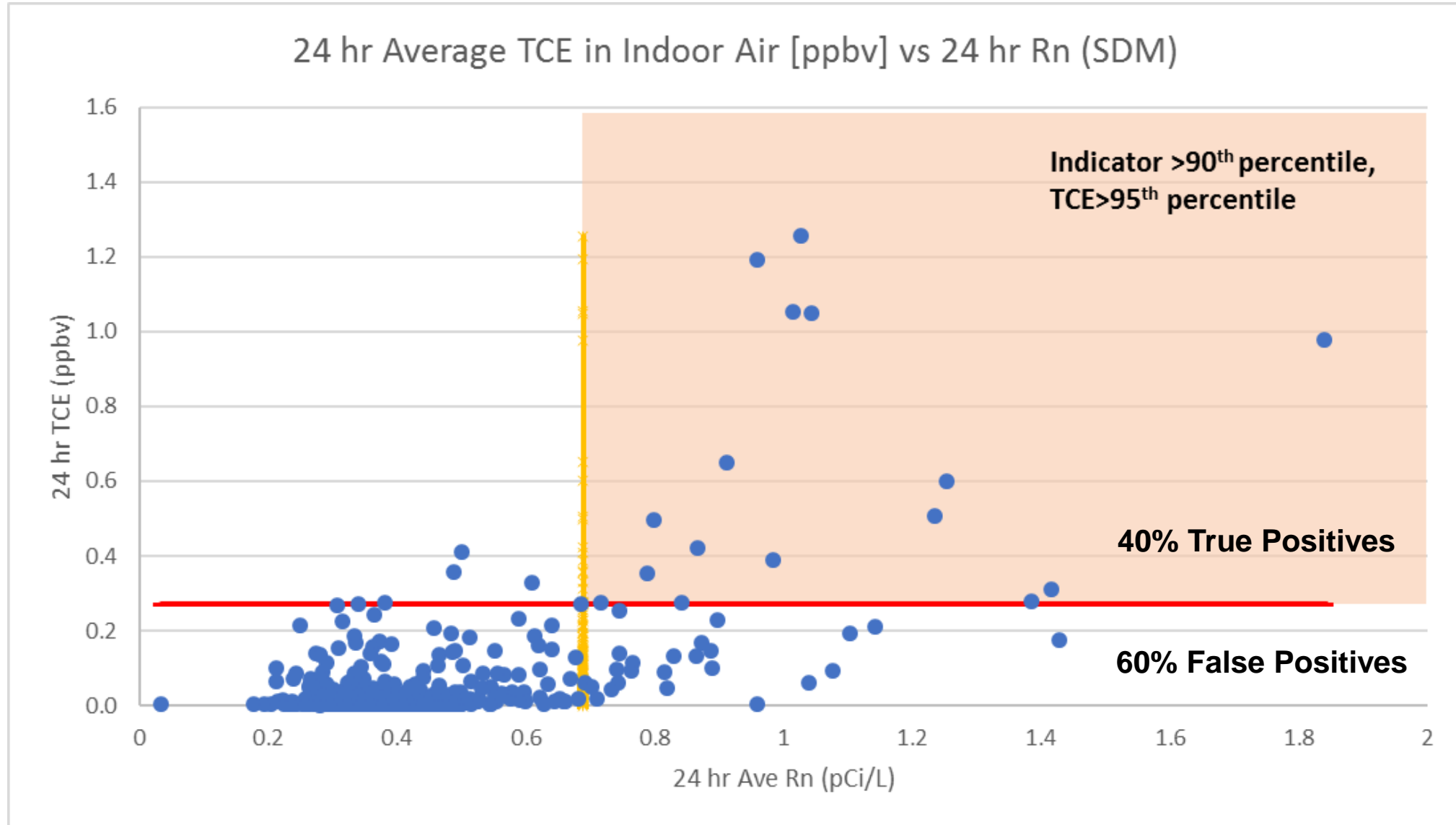
Sampling Location



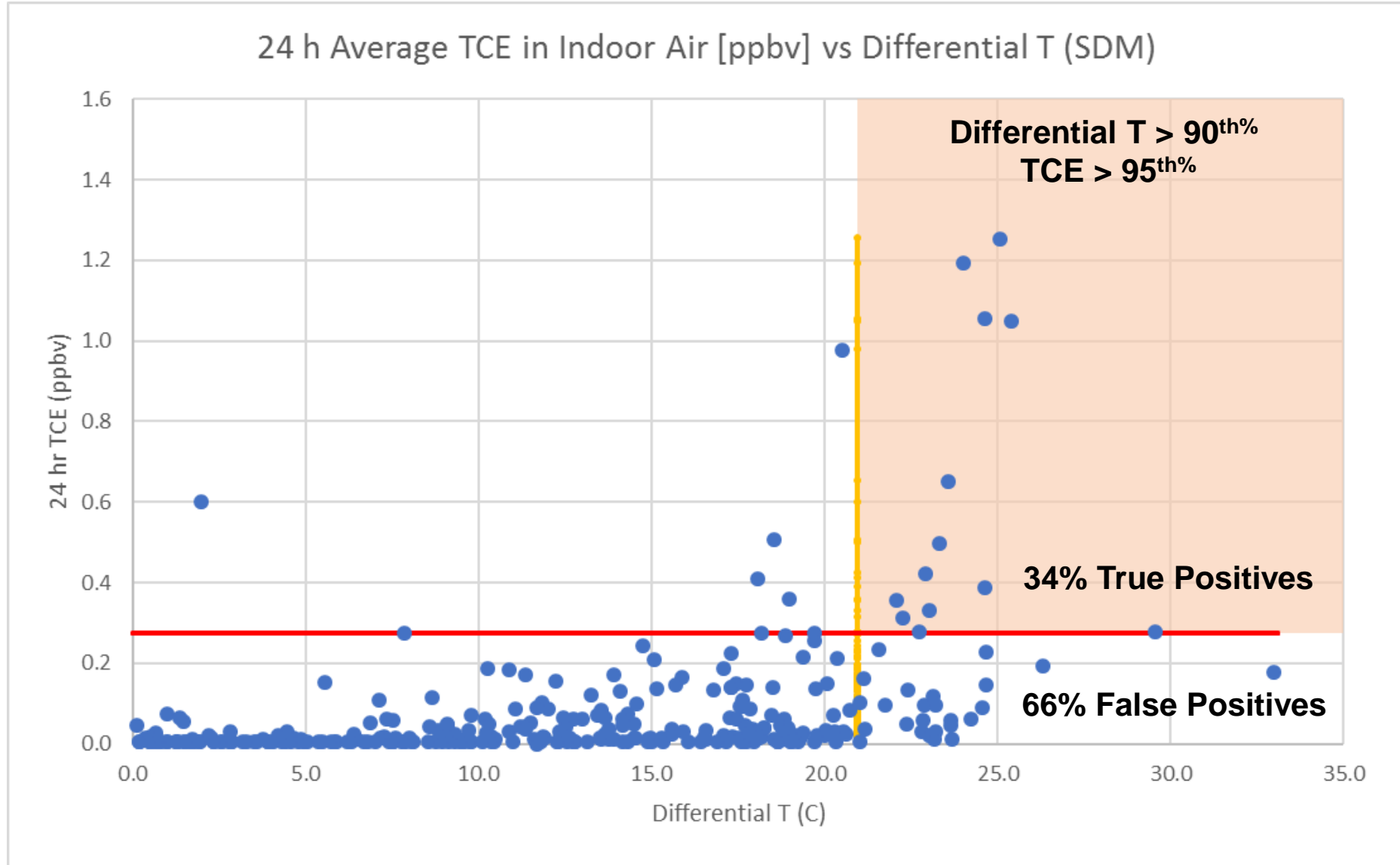
Indoor Air TCE and Rn Concentrations



Indicator: Radon

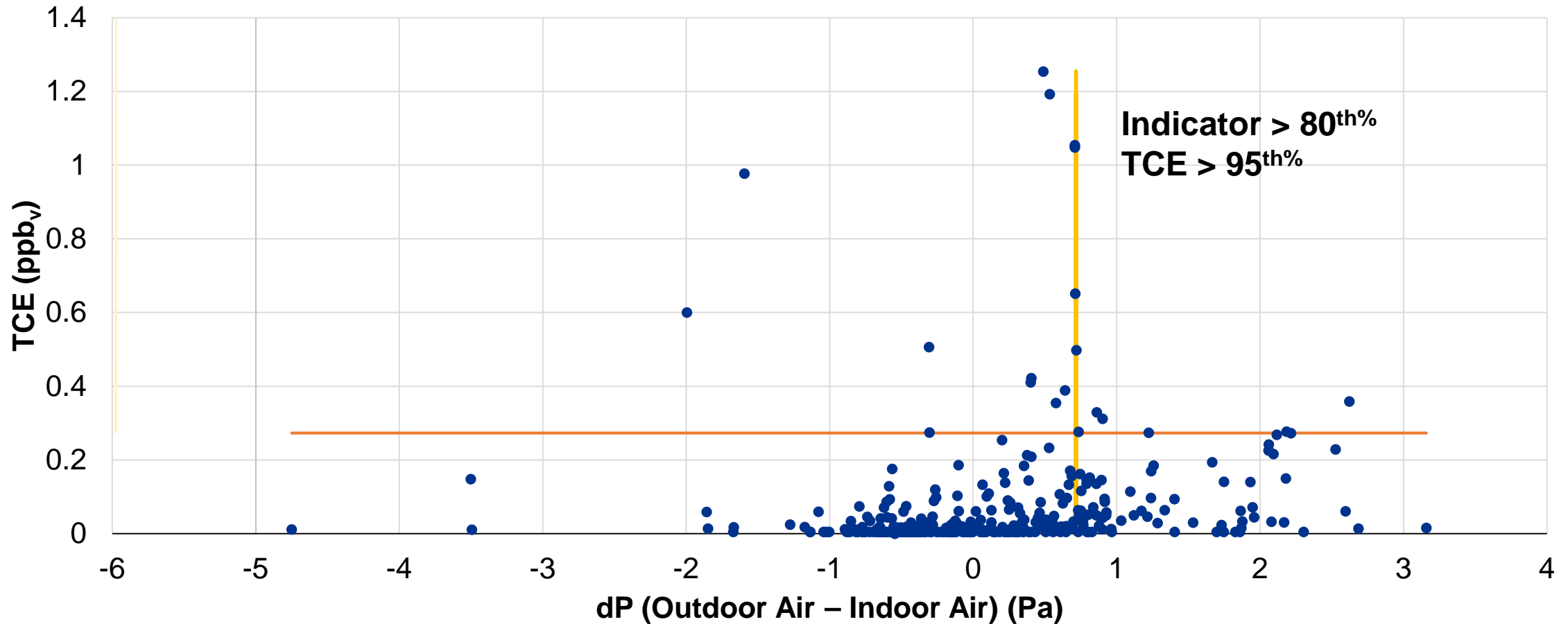


Indicator: Differential Temperature

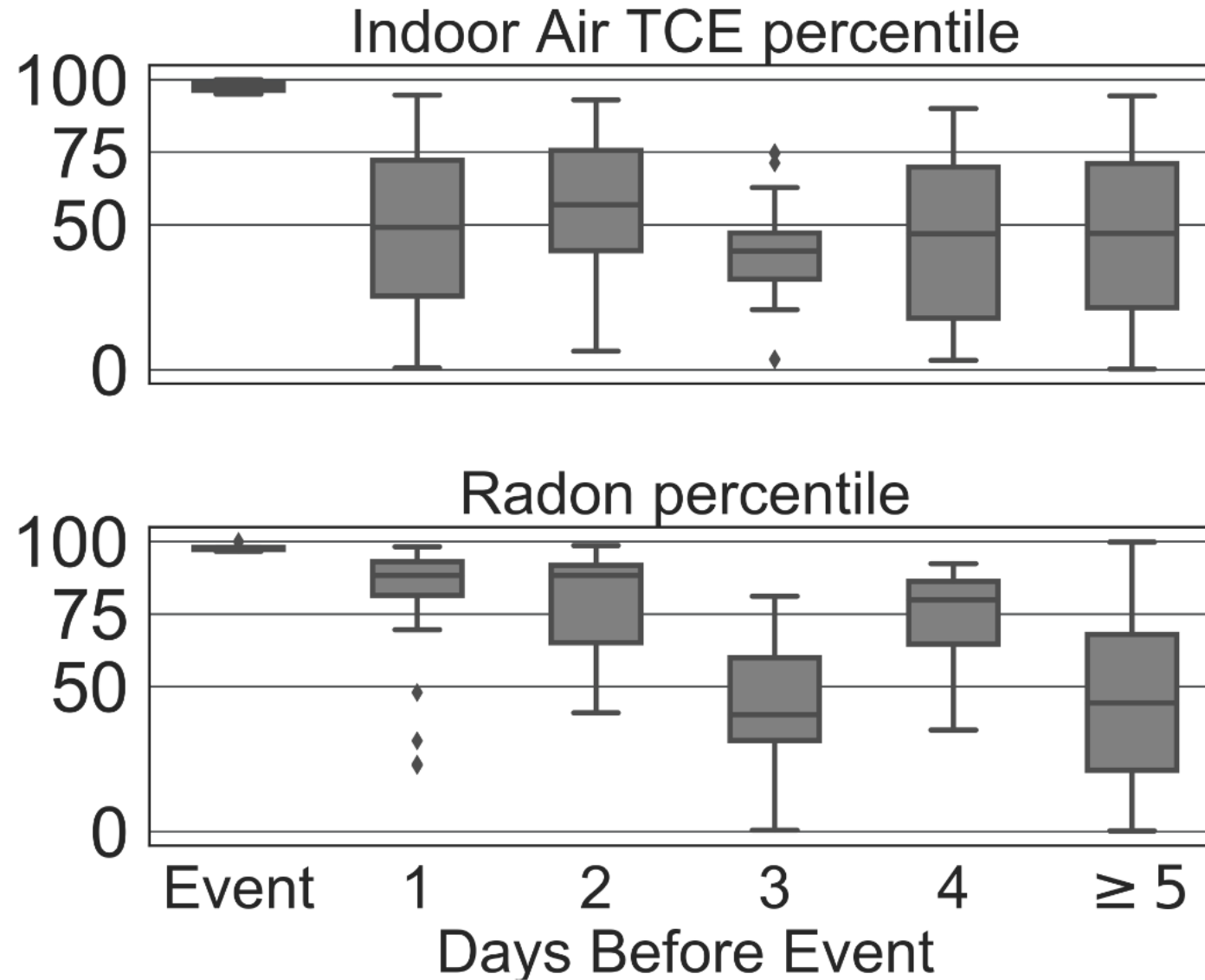


Indicator: Differential Pressure

24-h Average Indoor Air TCE vs. dP (Outdoor Air – Indoor Air)

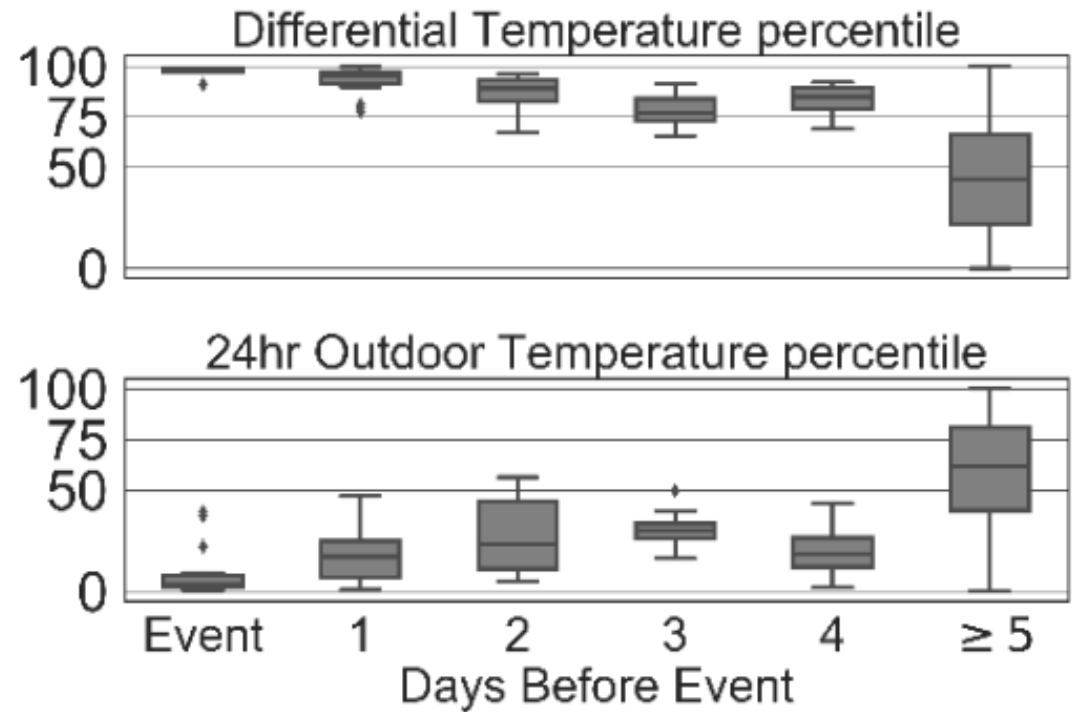
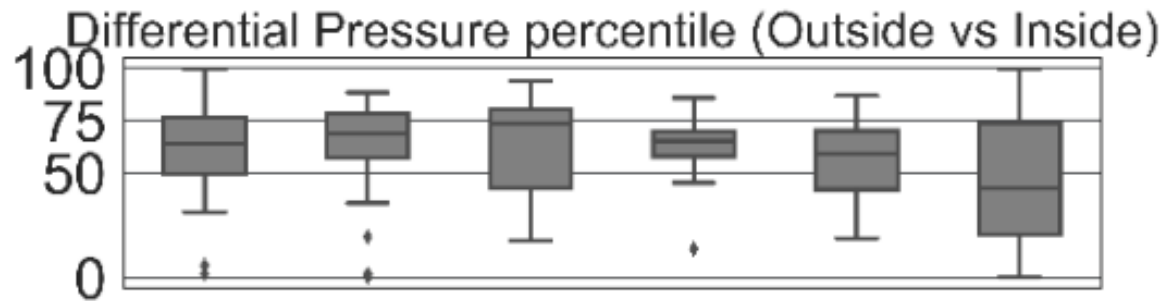
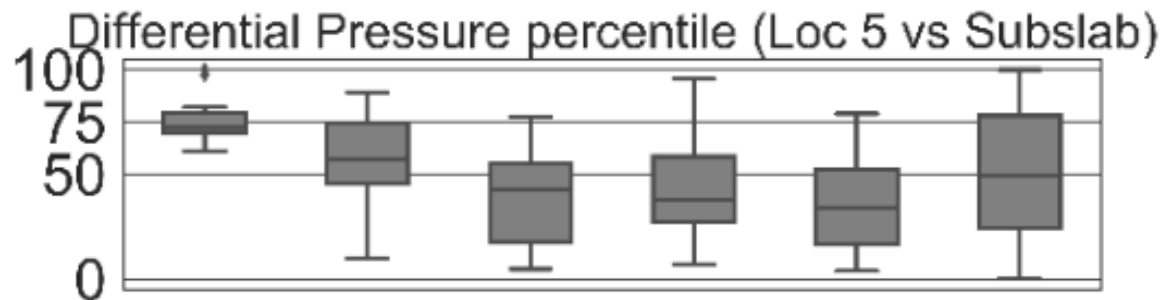
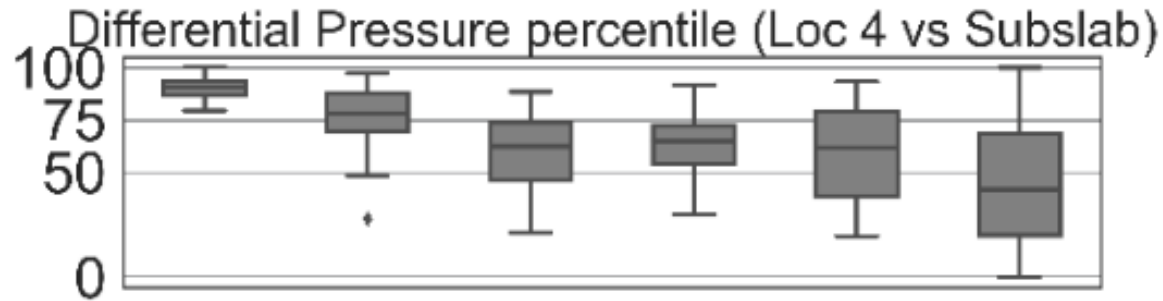


SDM 5+ Days Before Event: Boxplots



*Data set includes 342
VOC data points,
composite 24-hour
periods*

SDM 5+ Days Before Event: Boxplots



*Data set includes 342 VOC data points,
composite 24-hour periods*

Summary

- Long-term high-frequency sampling at SDM showed...
 - Indoor air TCE concentrations varied over 3 orders of magnitude and showed seasonal variability
 - High probability for false negative conclusions about VI occurrence
- Evaluation of select ITS metrics at SDM showed...
 - Guided sampling approaches using representative indicators can reduce potential for false negatives and the number of samples required to characterize the RME

Questions?

Thank you,

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