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THE UPS AND DOWNS OF PASSIVE VAPOUR INTRUSION MITIGATION SYSTEM DIAGNOSTICS

Darius Mali

SABCS – September 28th 2023

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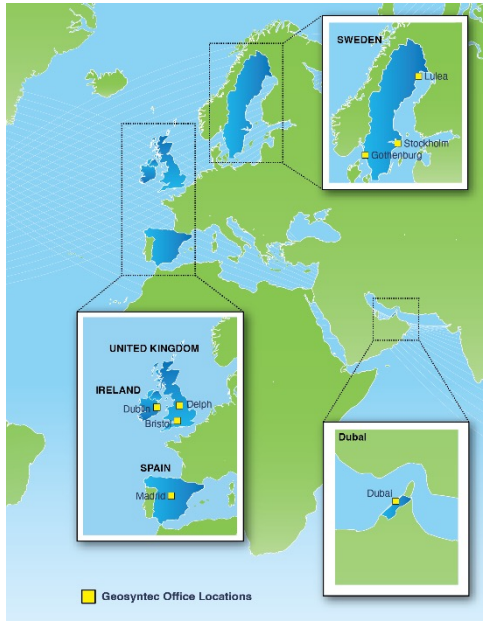


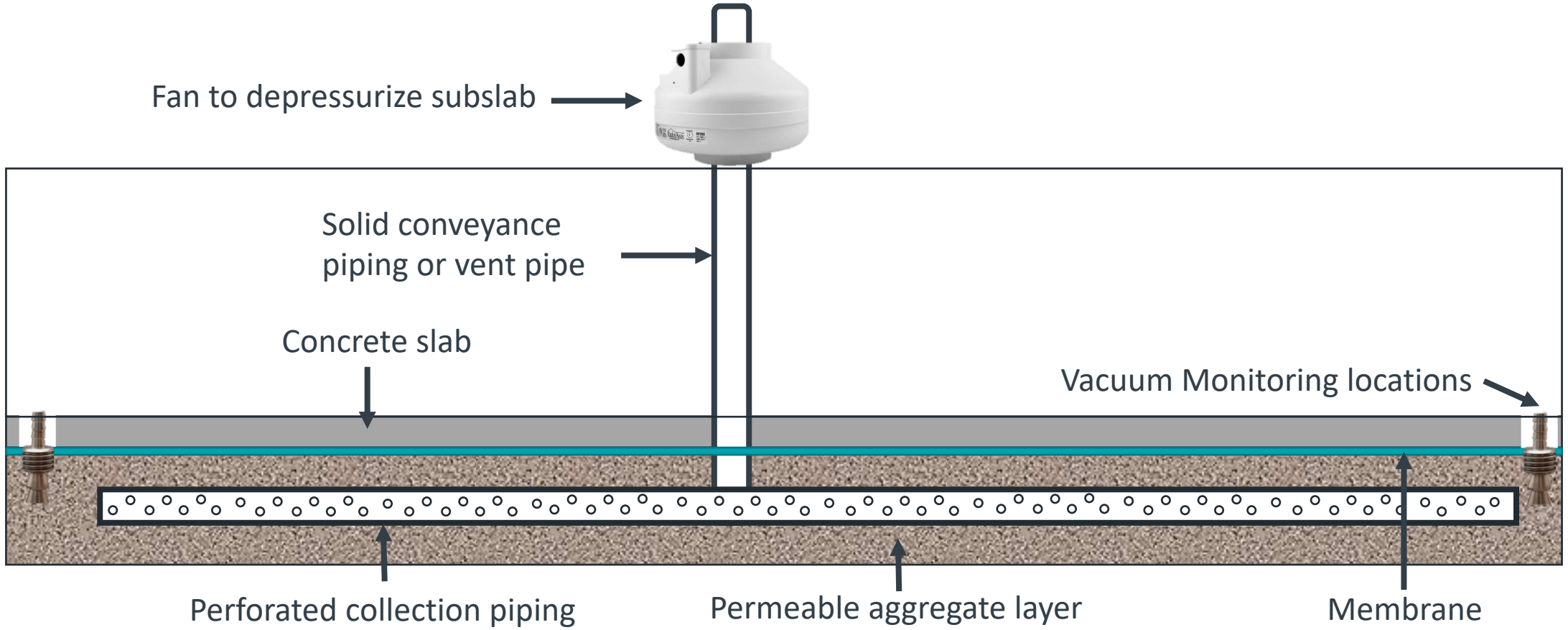
DARIUS MALI – P.ENG (BC) (ON), C-NRPP

- Senior Engineer in the Vapour Intrusion Group
- B.Eng and M.A.Sc from University of Guelph
- Investigate contaminated sites and design and install vapour mitigation systems
- You will find me outdoors hiking, paddling and camping or indoors working on my never-ending house renovation

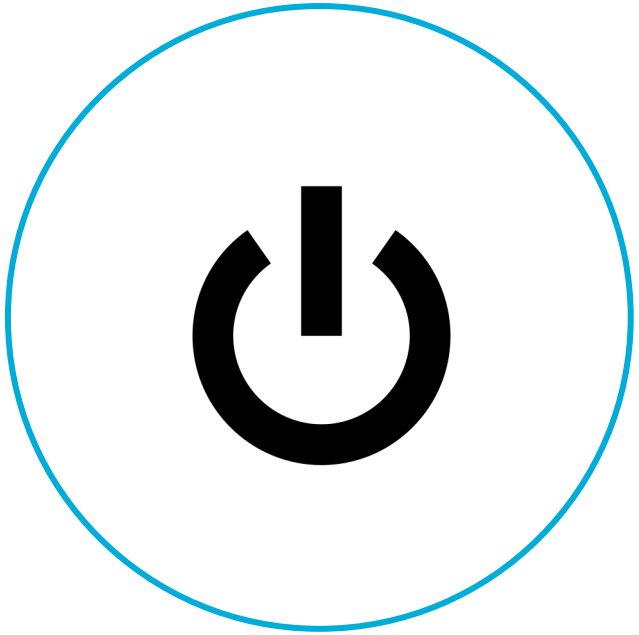
AGENDA

- Review of Vapour Intrusion Mitigation Systems (VIMS)
- Passive VIMS Diagnostics
- Case Study: Former Dry Cleaner

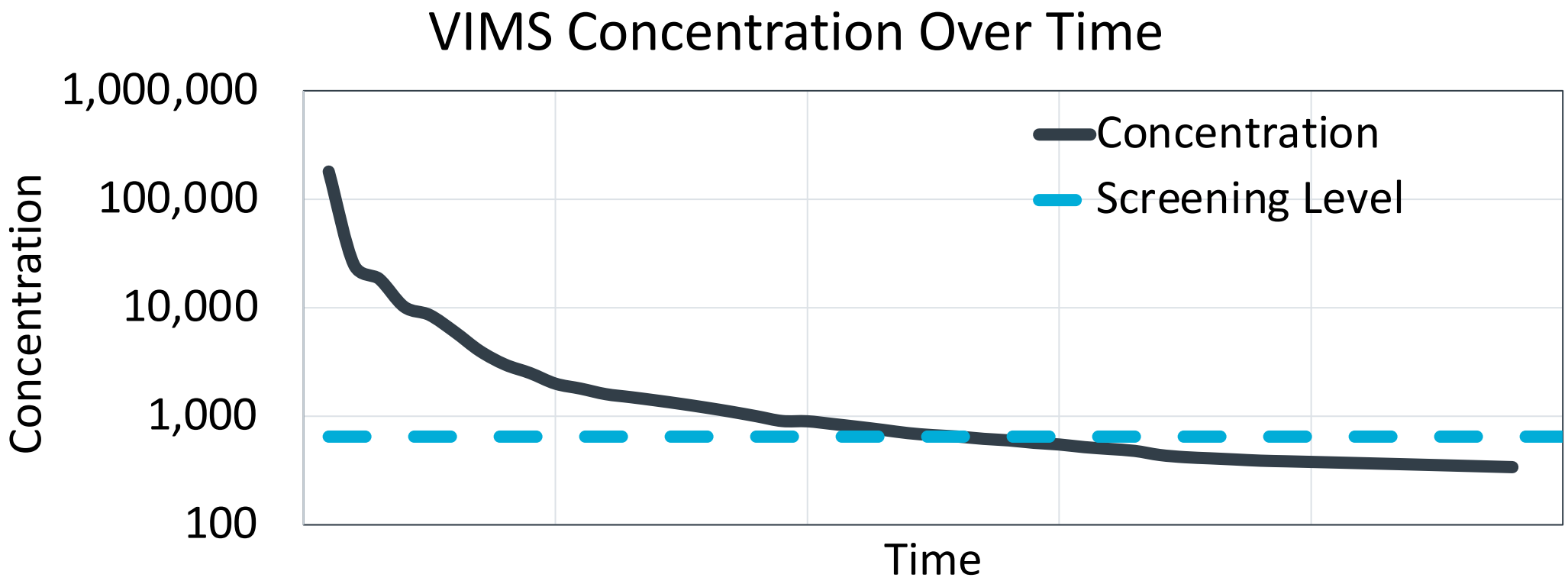
VIMS FOR NEW CONSTRUCTION



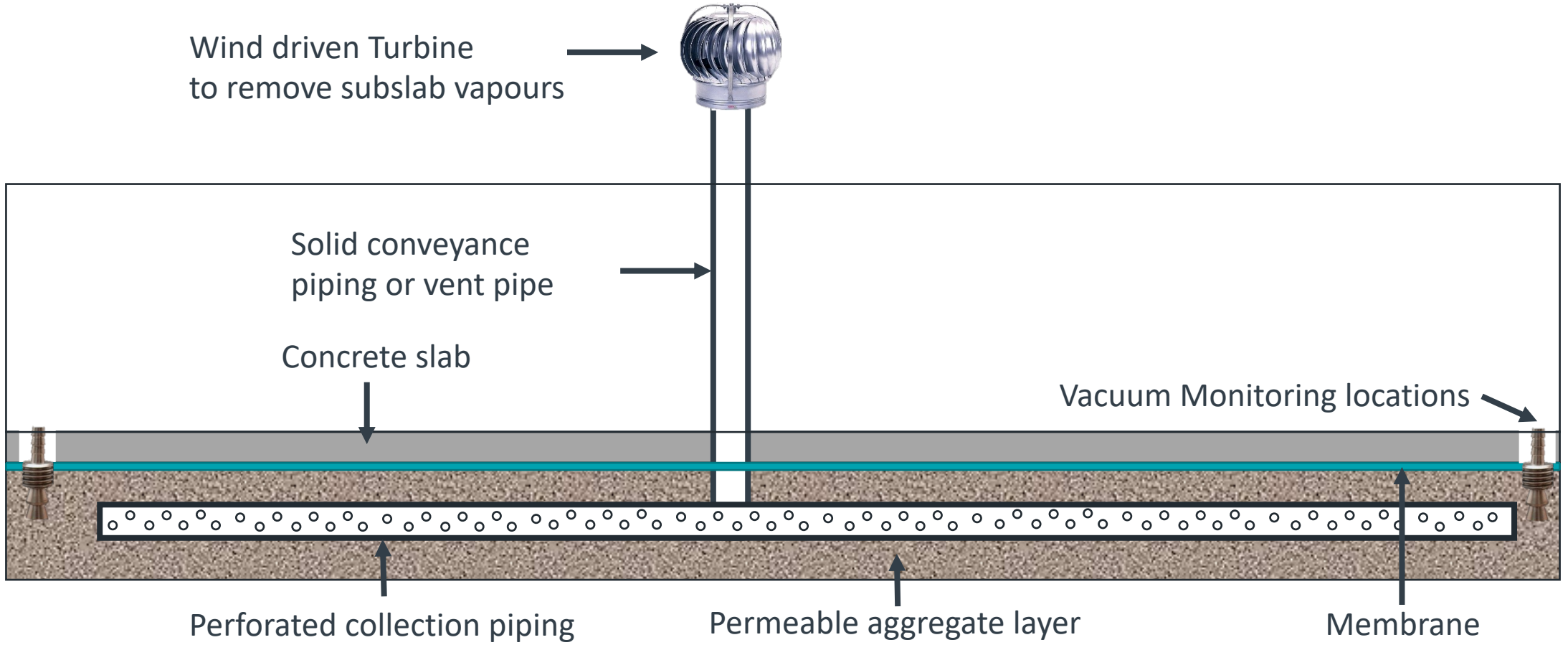
PERFORMANCE MONITORING



TYPICAL VIMS CONCENTRATION TRENDS



VIMS FOR NEW CONSTRUCTION



HOW HAS OUR SYSTEM CHANGED?

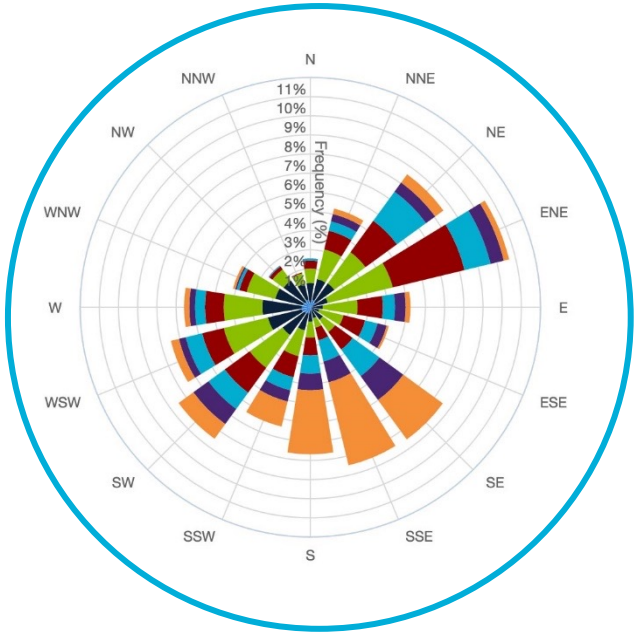
Powered fan

- Consistent applied vacuum and flow rate
- Flow dominated by advection
- Assess system effectiveness through cross-slab vacuum, system applied vacuum and system flow rate

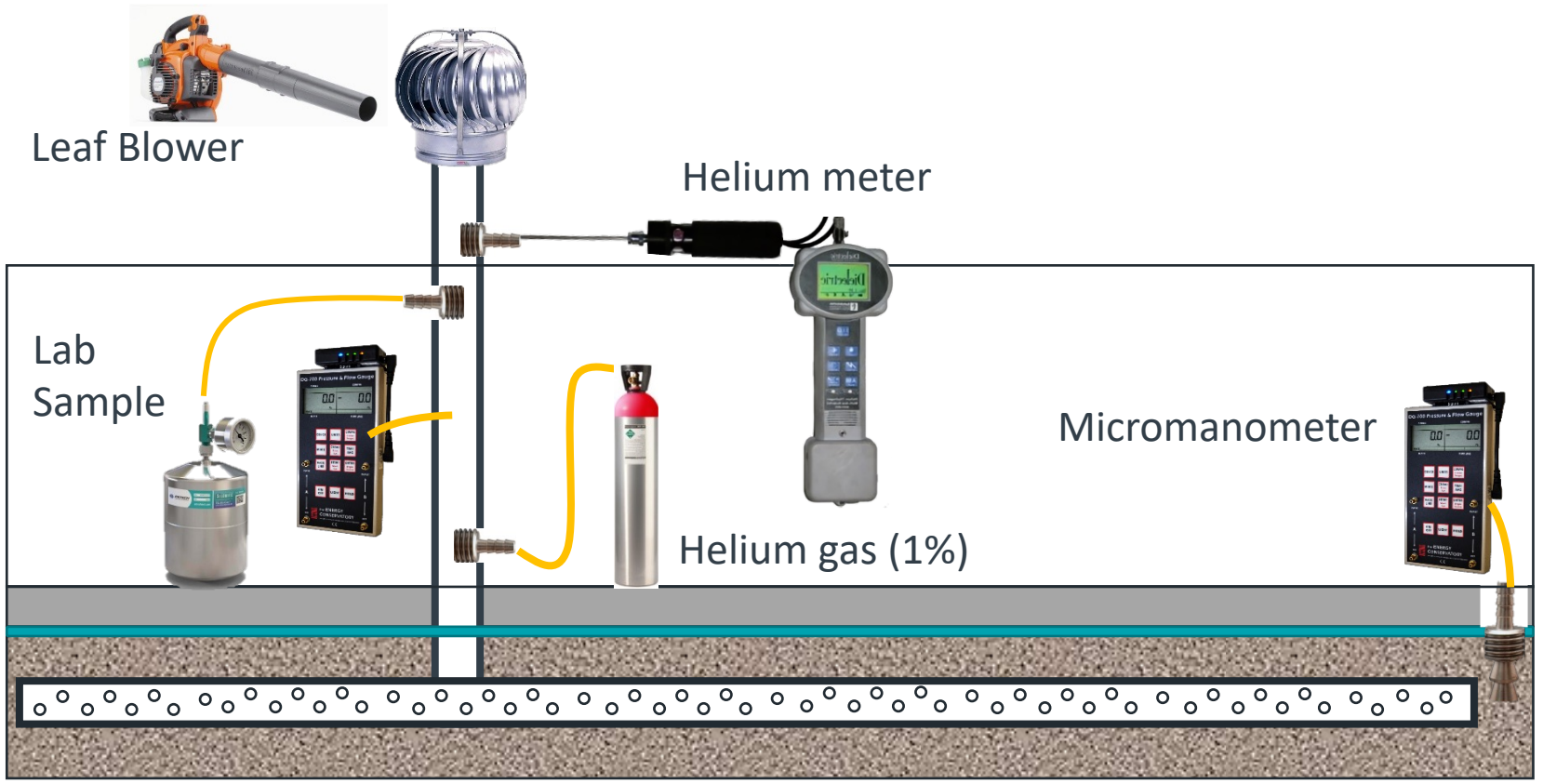
Wind-driven turbine

- Variable applied vacuum and flow rate
- Balance of chemical and thermal diffusion and wind induced advection
- Assess system by….sampling indoor air?

SIMULATING VIMS FLOW AND VACUUM

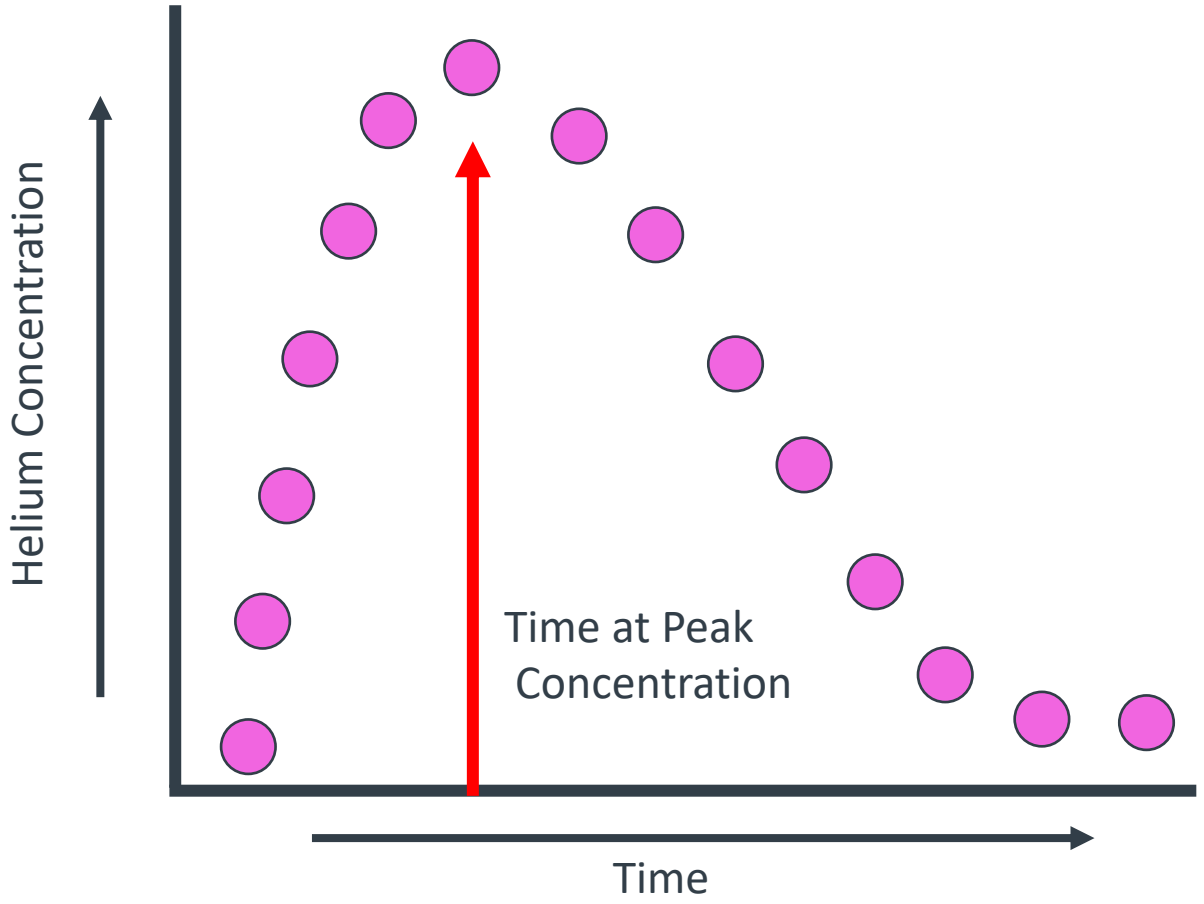


DIAGNOSTIC TESTING



1. Collect vacuum data
2. Conduct helium tracer test
3. Collect soil vapour sample

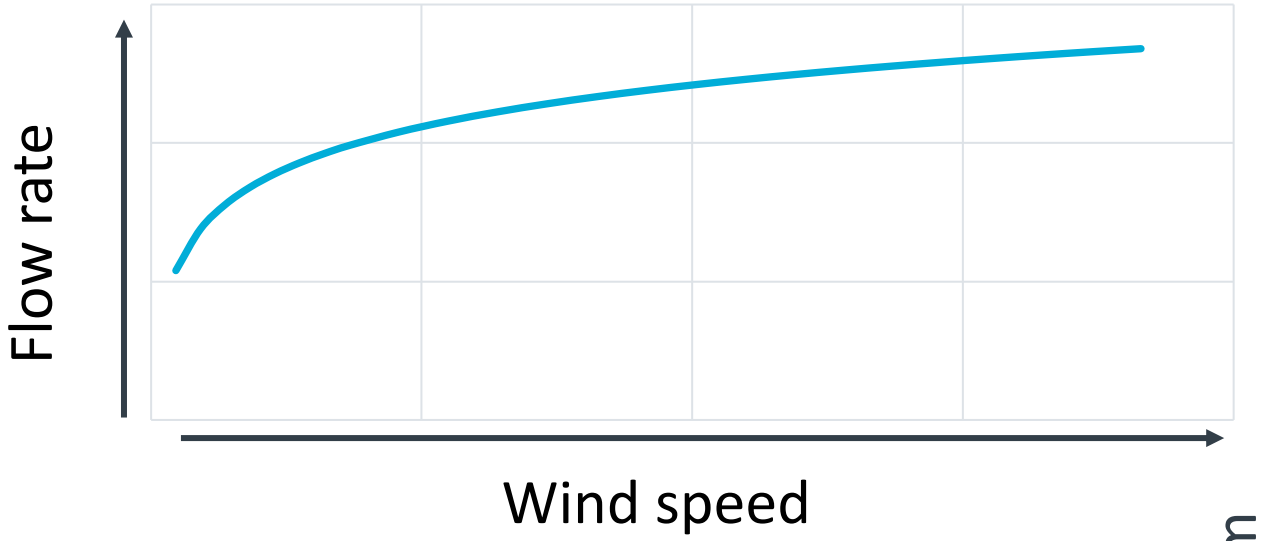
CALCULATING FLOW RATE

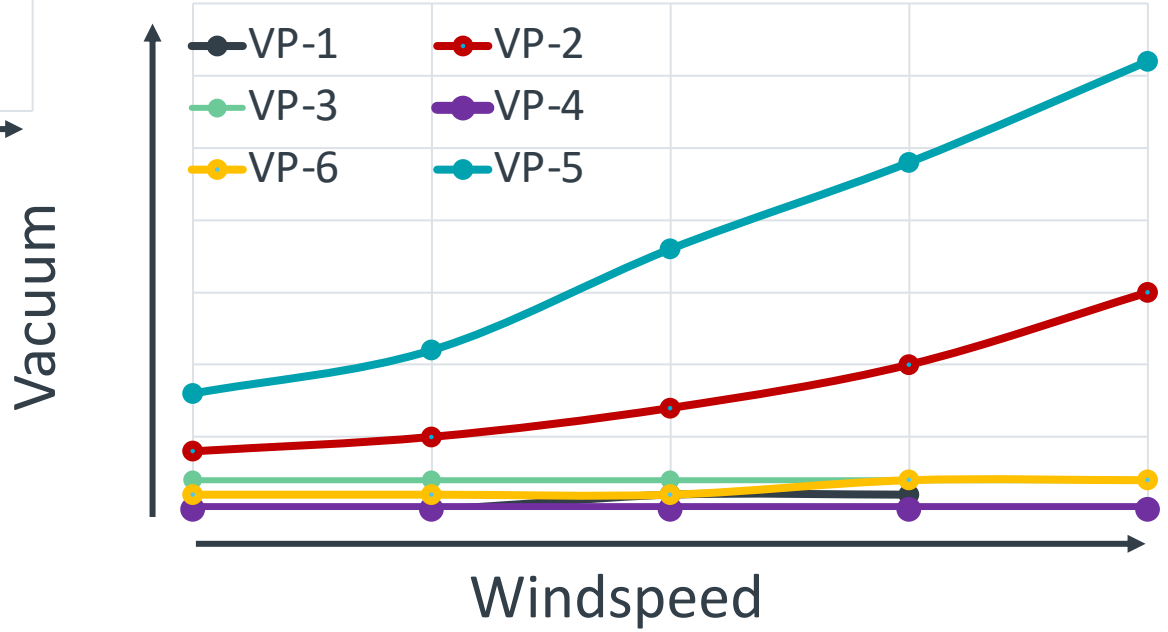


$$Q = l * t * A_x$$

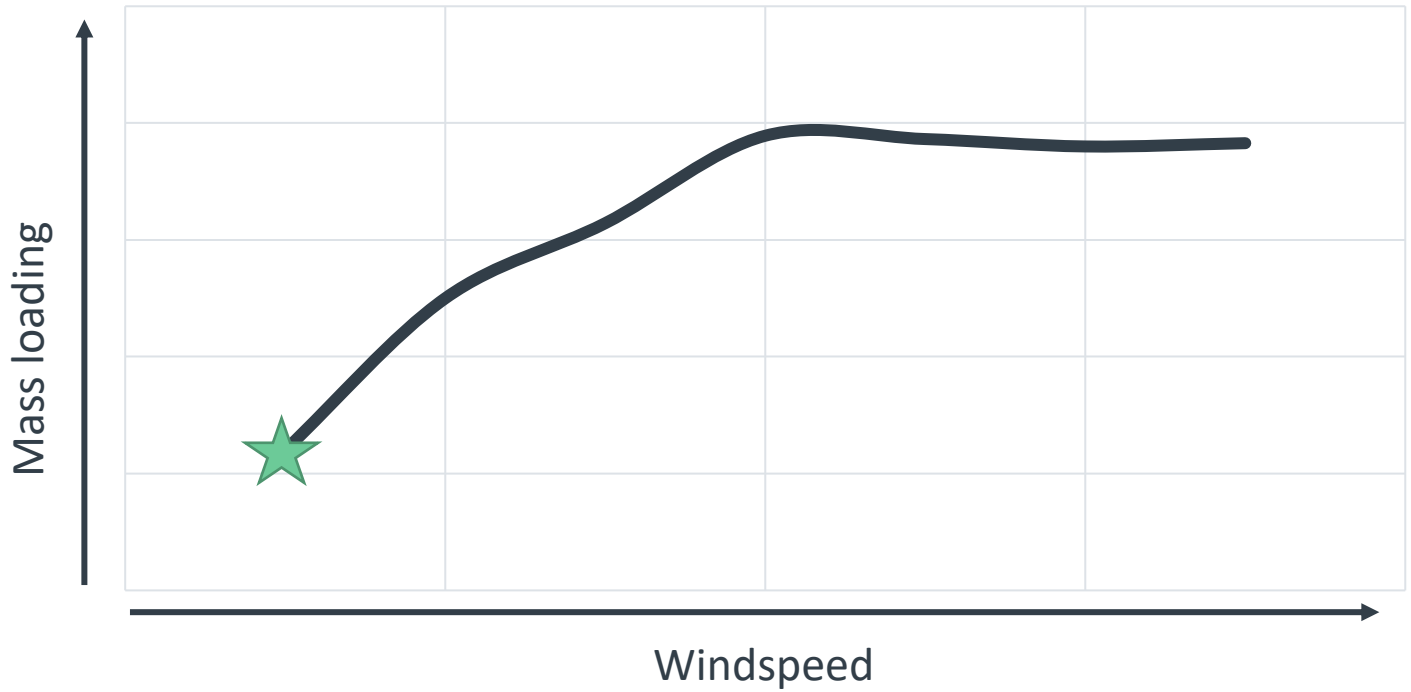
Q – flow rate of the VIMS
l – distance between the injection point and the measurement point
t – time to peak concentration
A_x – cross-sectional area of the vent pipe

RELATIONSHIP TO WINDSPEED





SUBSLAB VACUUM VS WINDSPEED



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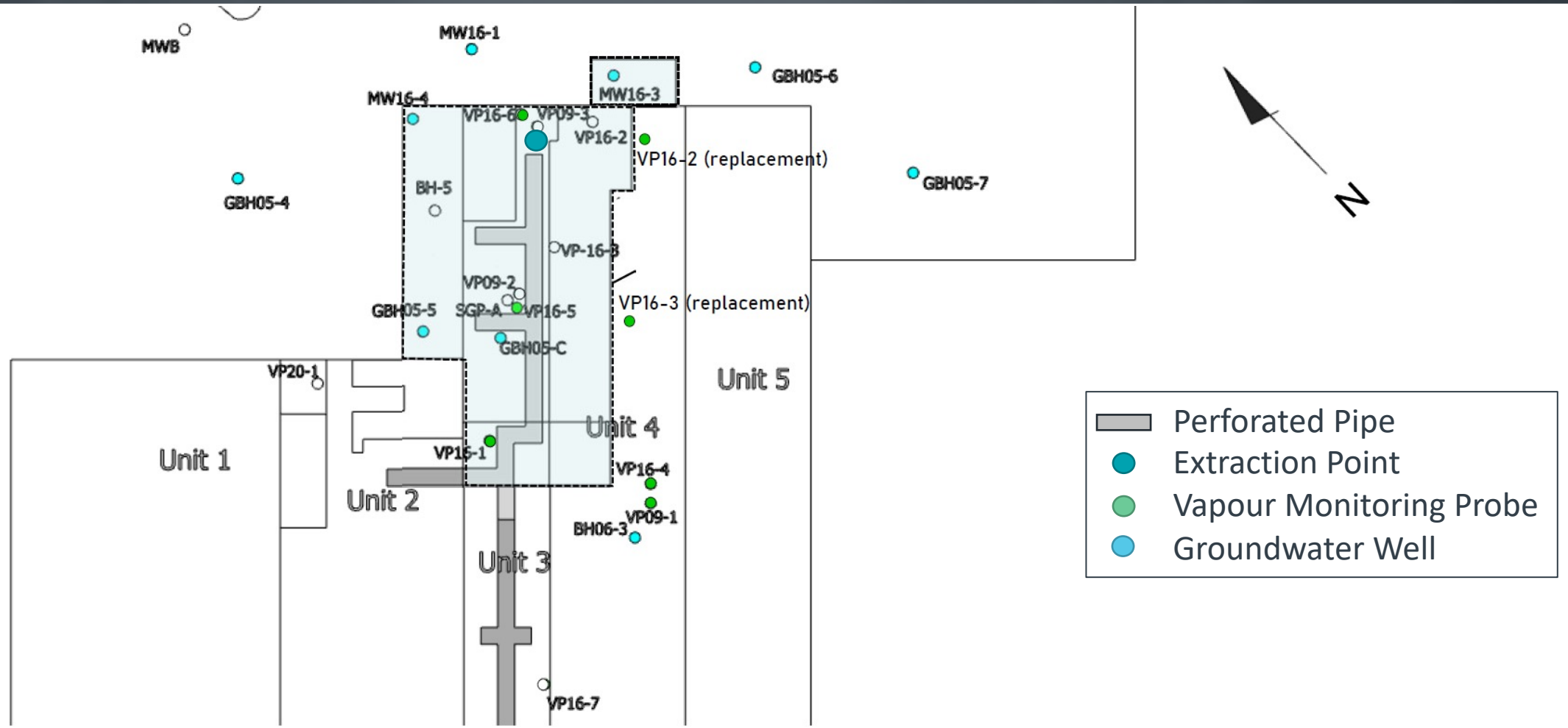
CASE STUDY

Former Ontario Drycleaner

SITE LAYOUT

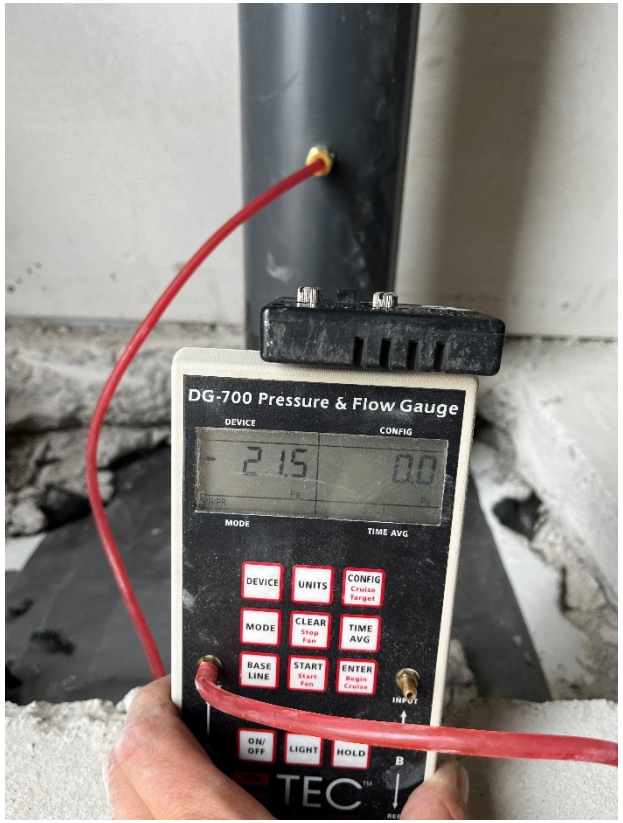

MWB
MW16-1
MW16-3
GBH05-6
MW16-4
VP16-6
VP09-3
VP16-2
VP16-2 (replacement)
GBH05-4
BH-5
GBH05-7
VP-16-3
VP09-2
GBH05-5
SGP-A
VP16-5
VP16-3 (replacement)
GBH05-C
VP20-1
Unit 5
Unit 4
Unit 1
VP16-1
VP16-4
Unit 2
VP09-1
BH06-3
Unit 3
VP16-7
N
Perforated Pipe
Extraction Point
Vapour Monitoring Probe
Groundwater Well

PERFORMANCE MONITORING

LET'S TRY THIS AGAIN

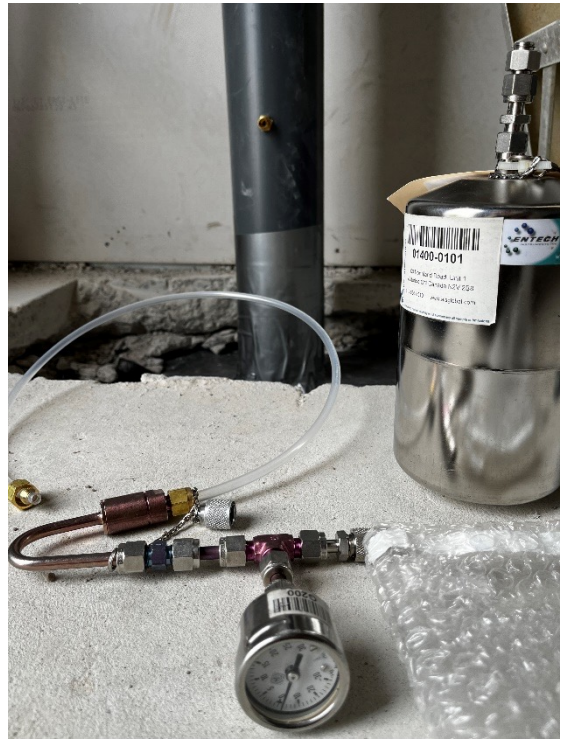
Simulate Windspeed

Measure Vacuum

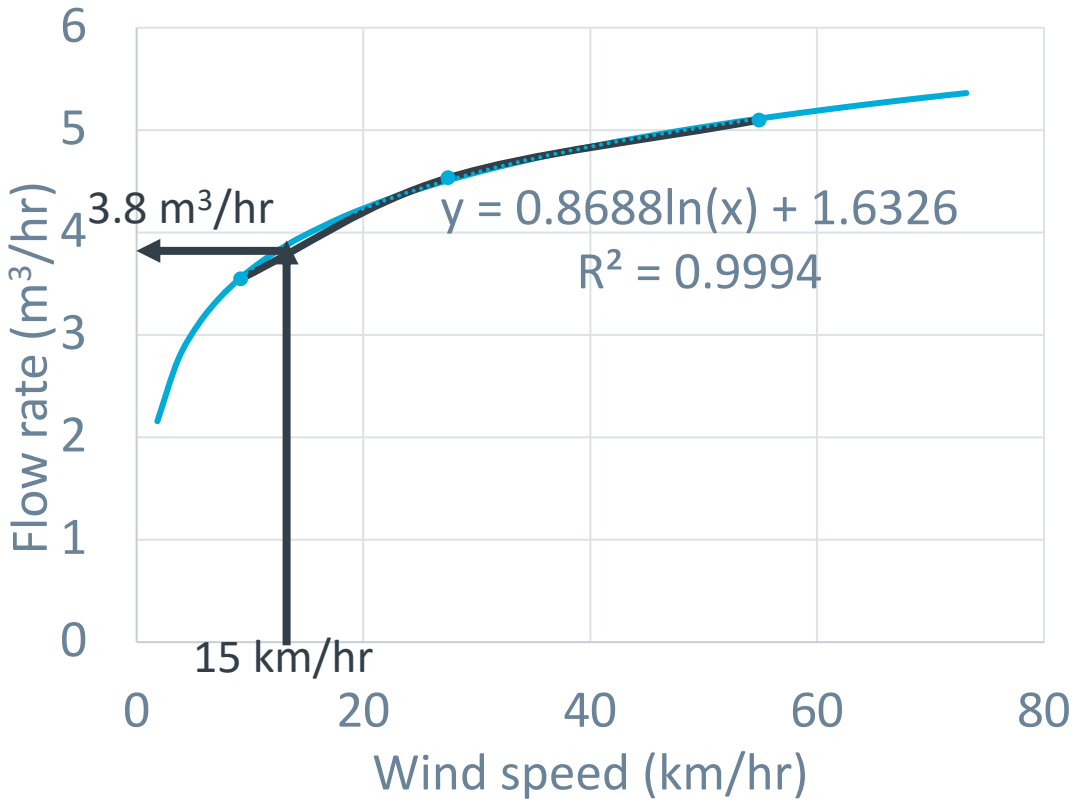


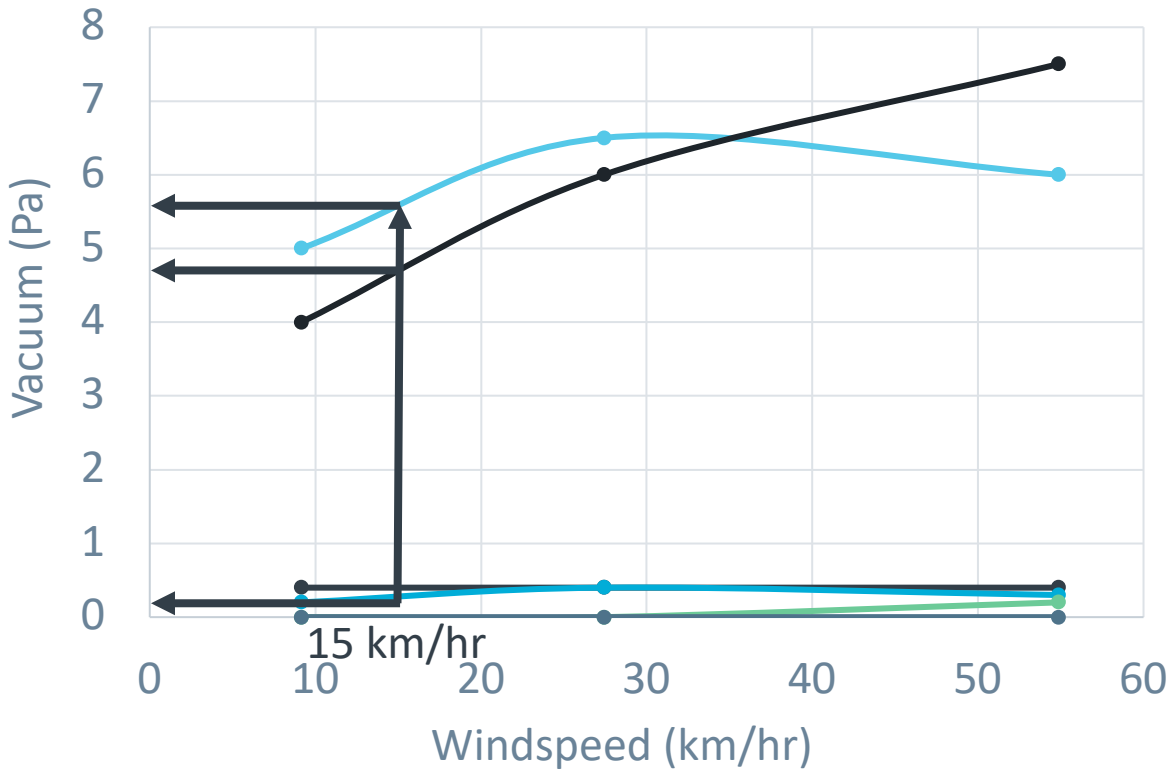
Helium Tracer Test

Laboratory sample



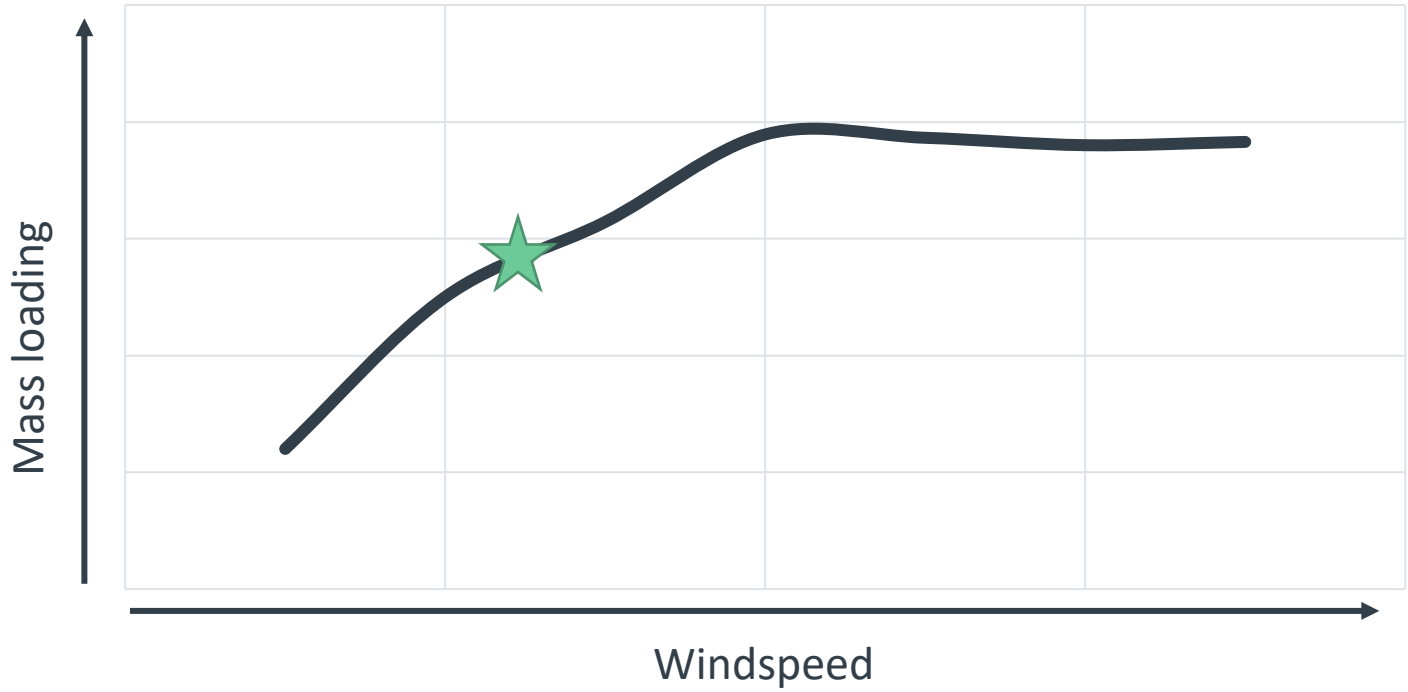
FLOW RATES AND VACUUM





MASS LOADING

Previous mass loading (mg/hr)	3.4		
Mass loading (mg/hr)	1.3	1.5	1.8



SUMMARY

- When properly designed, passive systems can provide protection from the risk of vapour intrusion
- There are methods and metrics available to assess performance other than indoor air sampling
- Remote monitoring without a telemetry system by looking up the windspeed

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THANK YOU FOR YOUR TIME

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