

Technology Is Powerful, When We Use It Properly.

Judit Nelson

Workplace Safety North

juditnelson@workplacesafetynorth.ca



Content

- ❑ Current way to measure particulate exposure for legislative compliance
- ❑ Occupational exposure limit
- ❑ Direct reading instruments
- ❑ PM 2.5 common language
- ❑ Gravimetric sample results VS direct reading results
- ❑ Diesel exposure
- ❑ Changes to mining regulation

Real-time data is powerful, but only when we understand the instrument, its limitations, and how it responds to our workplace dust.

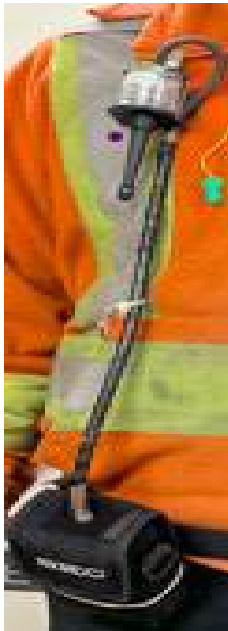


Current Method for Measuring Particulate Exposure

Worker



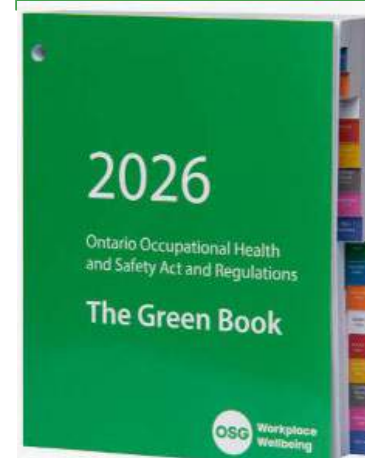
Sampling Train



Lab Analysis



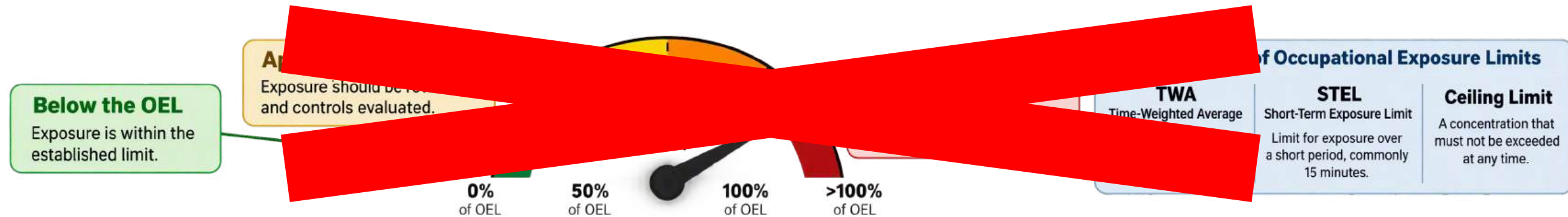
Results Compared to OEL



Traditional sampling tells us how much particulate exposure occurred over the sampling period but provides limited information about exactly when the exposure occurred.

Exposure Limit

- ✓ An OEL is an exposure-management benchmark, not a boundary between safe and unsafe exposure.
- ✓ Being below the OEL does not mean “zero risk,” and exceeding the OEL does not mean that an adverse health effect will immediately occur.



The Dirty Truth

Silica (quartz)

Provinces 0.025mg/m³

Ontario 0.1mg/m³

The worker did not change. The toxicity of silica did not change.
The jurisdiction changed.

Diesel

0.1 mg/m³ 10× reduction New Australian WEL: 0.01 mg/m³

Ontario 0.12mg/m³

Same diesel exhaust. Same human lungs. Different exposure limits.

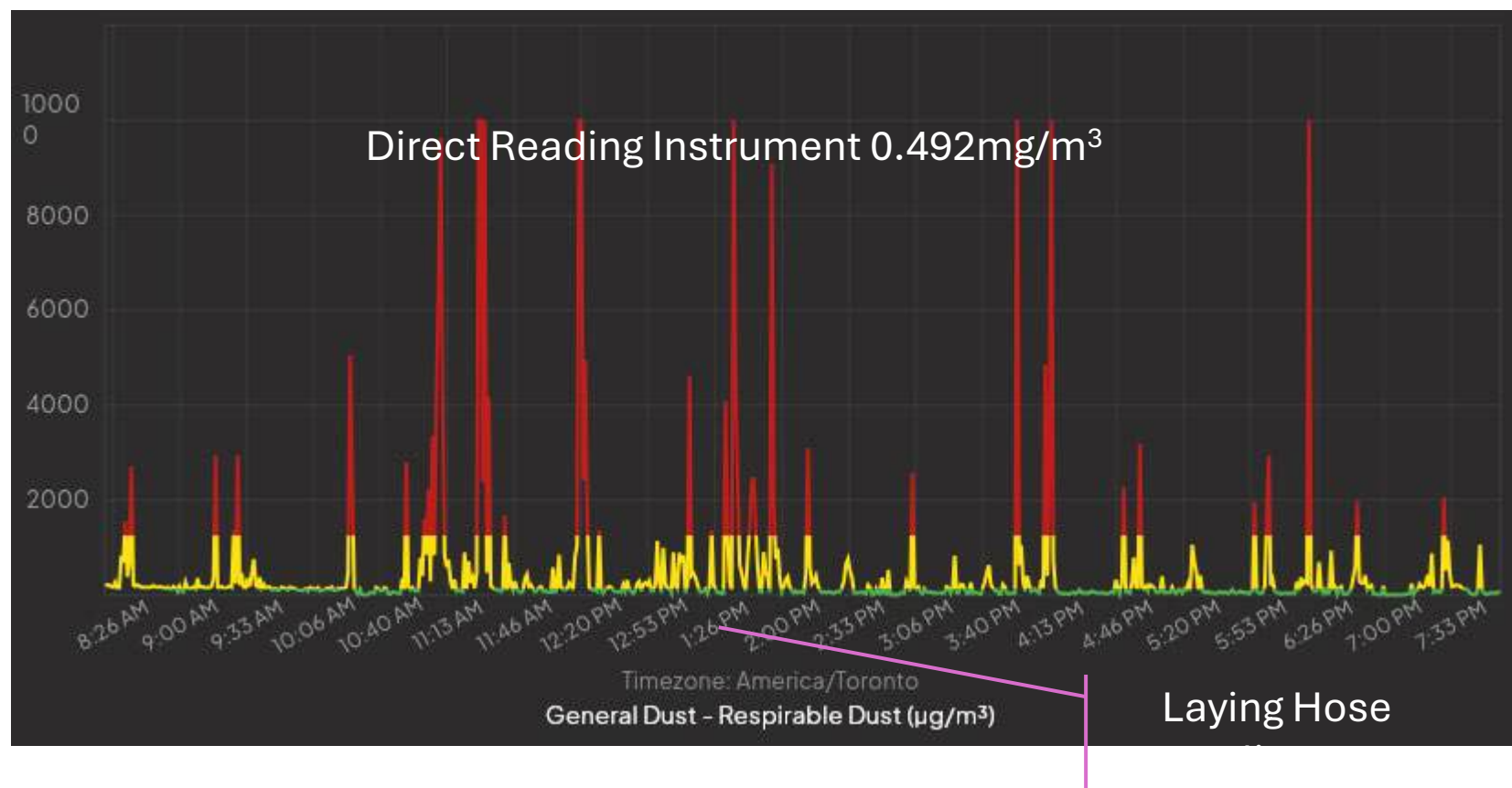
If an OEL Were a Line Between “Safe” and “Unsafe”...Why can the line be different depending on where you work?

So should our goal simply be to stay below the OEL, or should our goal be to understand and reduce exposure?



What If We Could See Exposure as It Happens?

Gravimetric Same Result $5.7\text{mg}/\text{m}^3$ (average exposure)



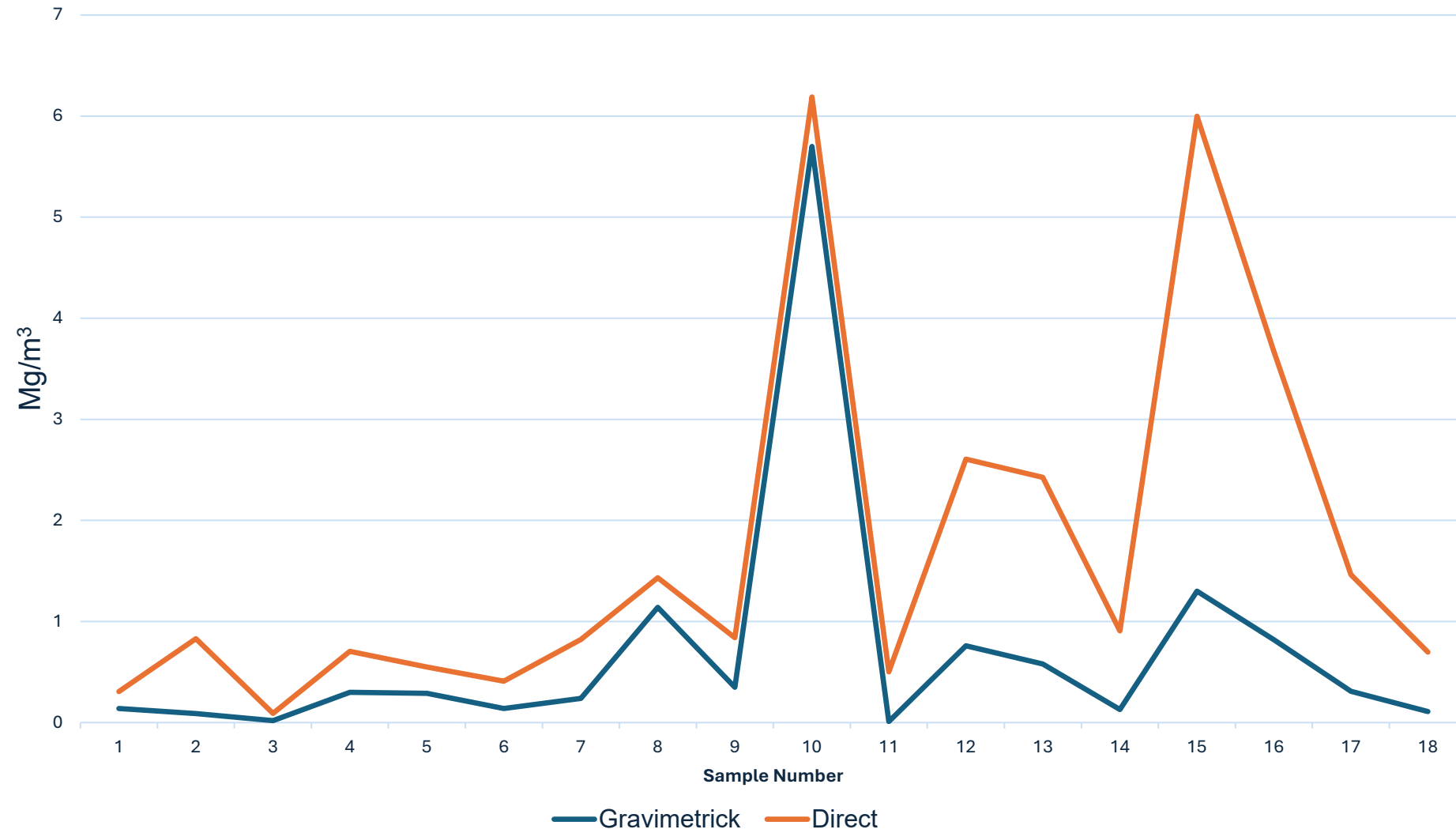
Direct-reading instruments provide particulate concentrations continuously and in real time

Not replacing compliance sampling!

Instead of asking only “What was the worker’s average exposure?” we can start asking “When did the exposure occur, what caused it, and how can we prevent it?”

Evidence

Gravimetric VS Direct Reading



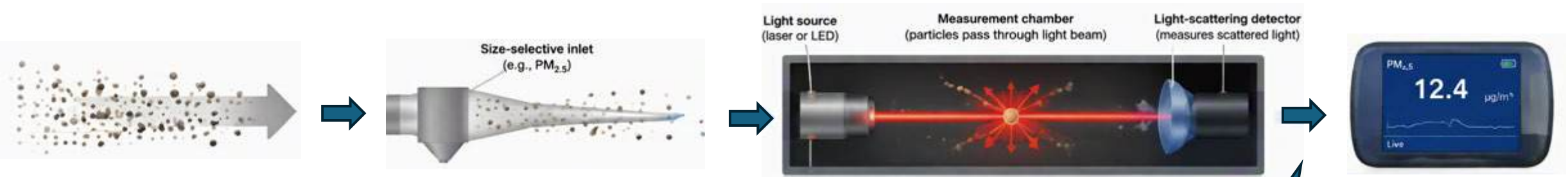
Not All Direct-Reading Dust Monitors Are the Same

Most direct-reading dust monitors use light-scattering/optical technology, but vary in accuracy, calibration, particle-size response, and application.



Light Scattering Technology

The instrument measures an optical response, not the chemical identity of the dust.



Factory calibration is the starting point. Field comparison helps determine how the instrument responds to the actual aerosol being measured.

Converts scattered light into electrical signal, using calibration factors to estimate mass

Know your dust. Test your instrument. Adjust before you trust the data.

PM 2.5 Common Language for Fine Particulate Exposure (for environmental scientist)

What Do We Compare PM 2.5 Results To?

Currently, there is no Ontario occupational exposure limit specifically for PM 2.5.

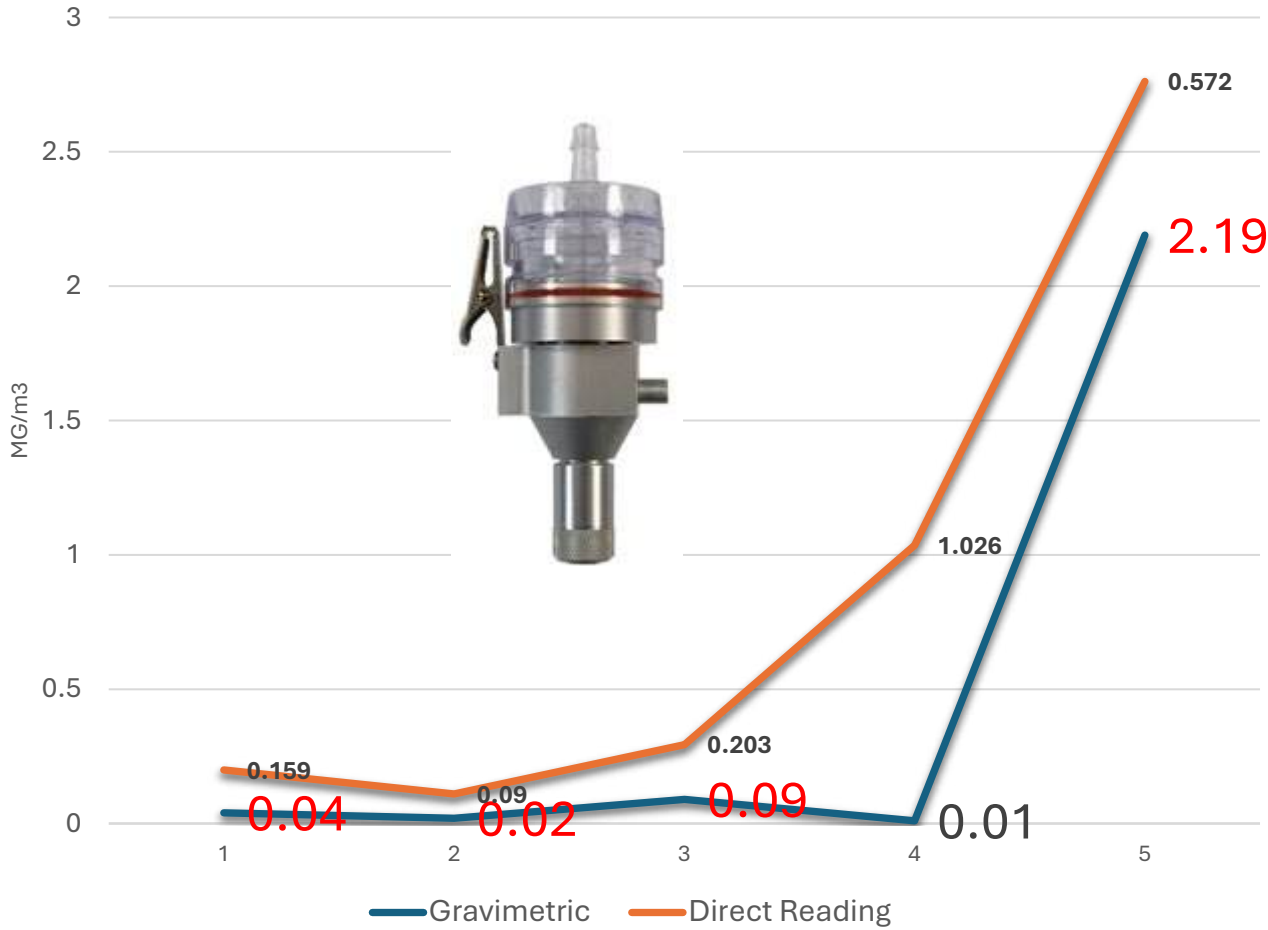
One option is to use the Canadian Ambient Air Quality Standard (CAAQS) for PM_{2.5} as a reference benchmark, not as an occupational exposure limit. (health- and environment-based)

PM 2.5	2020	2030	
24-Hour	27 µg/m ³ (0.027mg/m ³)	23 µg/m ³ (0.023mg/m ³)	98th percentile annually, averaged over 3 consecutive years
Annually	8.8 µg/m ³ (0.0088mg/m ³)	8.0 µg/m ³ (0.008mg/m ³)	Annual mean averaged over 3 consecutive years.

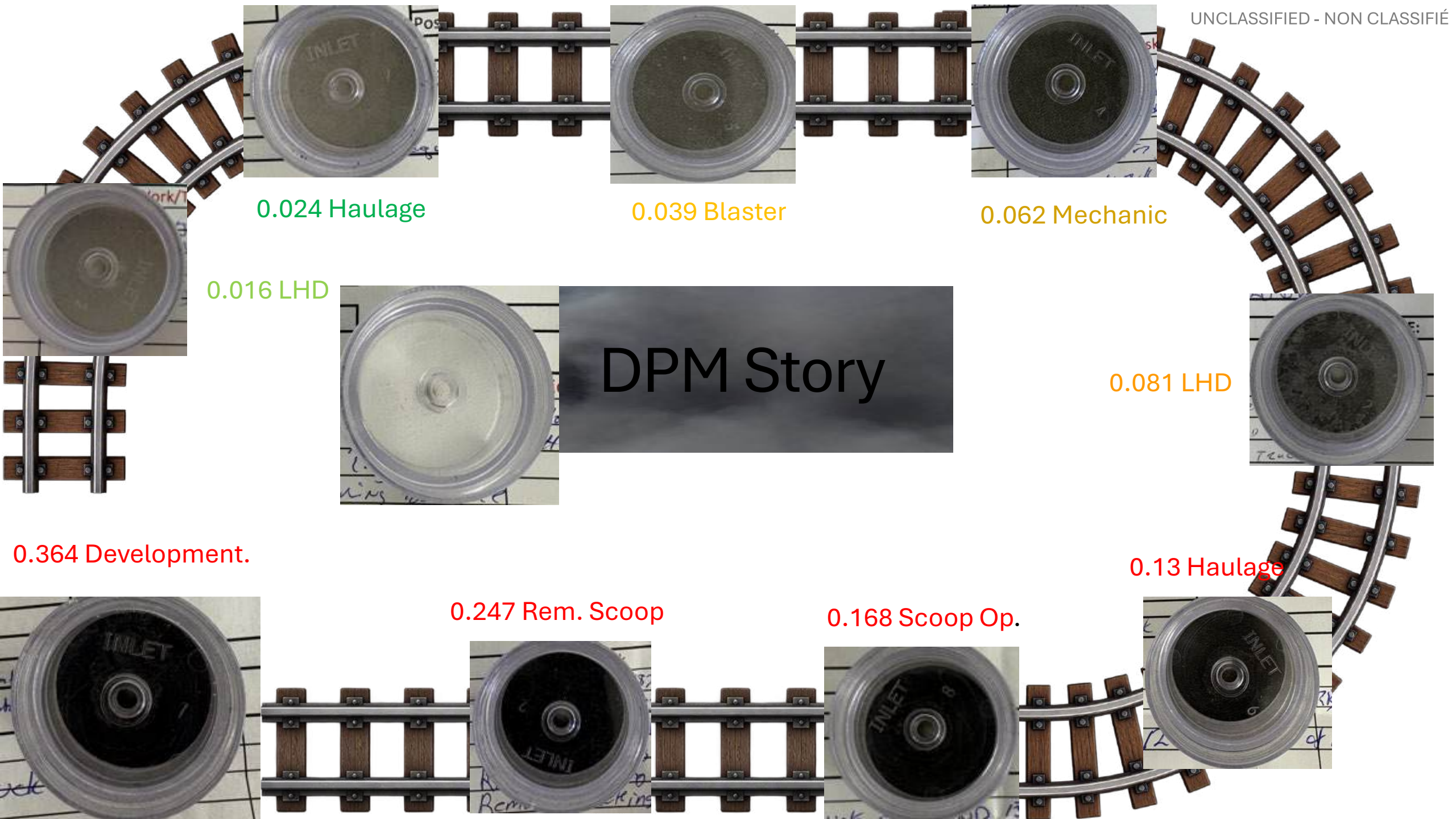
We need a consistent reference point!



Gravimetric VS Direct Reading PM 2.5

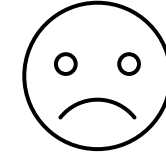


(0.027mg/m3) Canadian Ambient Air Quality Standard



Sad Day And Joyful Day for Occupational Hygiene

Reduced ventilation volume requirements allow airborne contaminant concentrations to increase



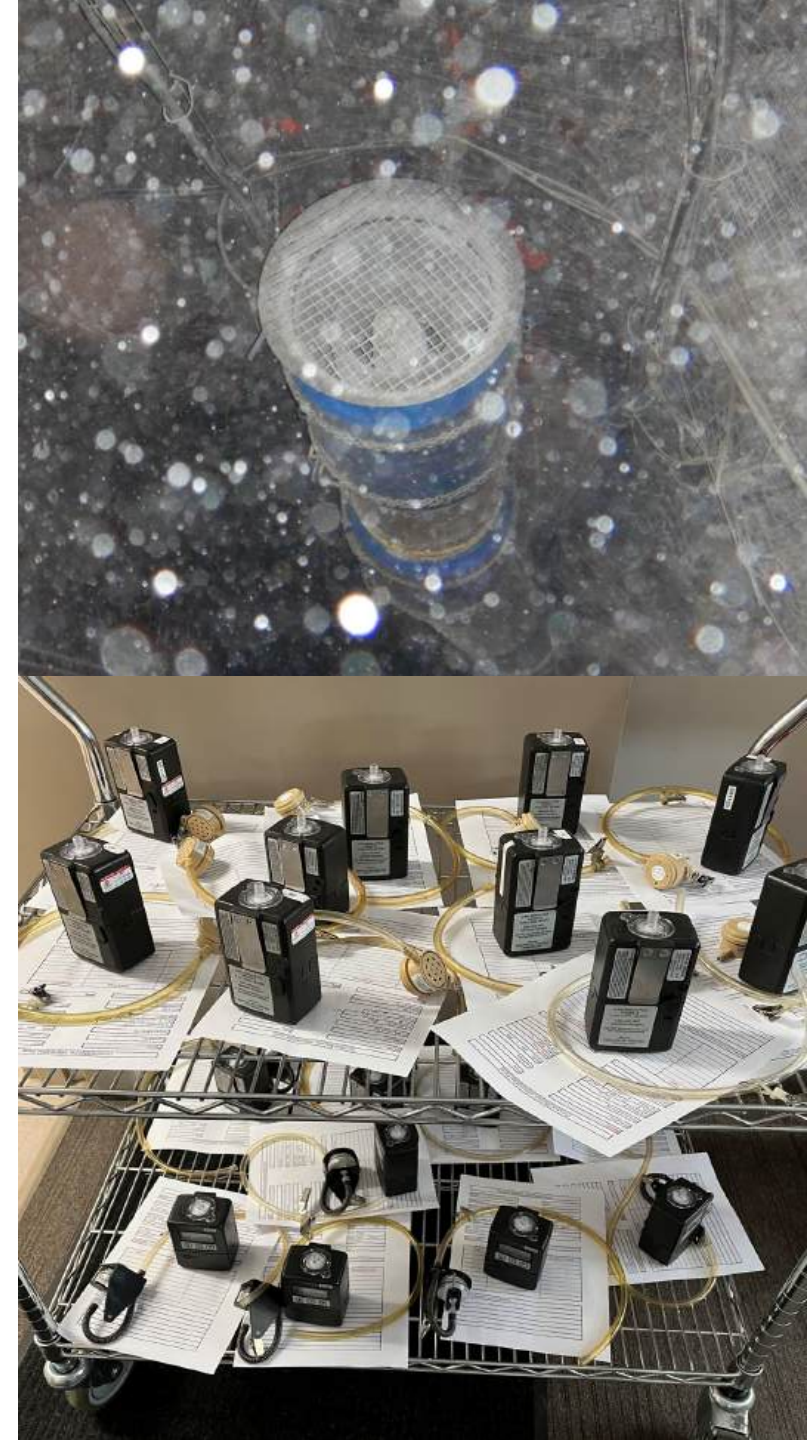
Less ventilation makes understanding actual worker exposure more important than ever.

The Airborne Hazard Management Program gives us a stronger framework to identify, assess, monitor, and control airborne hazards.



When ventilation changes, we need smarter exposure management.

Direct-reading technology helps us see exposure as it happens and act before it becomes a problem.



From Measuring Exposure to Managing Exposure

- ✓ OELs are benchmarks, not a line between “safe” and “unsafe.”
- ✓ Traditional sampling remains essential but provides limited information about when and why exposure occurs.
- ✓ Direct-reading instruments allow us to see exposure patterns and identify peaks associated with specific tasks.
- ✓ PM 2.5 monitoring provides a consistent indicator for tracking fine particulate, even where a specific occupational PM 2.5 limit is not established.
- ✓ Changes in mine ventilation make effective airborne hazard management and exposure monitoring increasingly important.
- ✓ Combining traditional sampling with real-time monitoring can help us identify sources, evaluate controls, and make better exposure-management decisions.

**If we can see exposure as it happens, we can control it
before it becomes tomorrow's disease.**



Don't just measure exposure. Understand it. Control it.