Perspective on advanced site characterisation techniques

Frederic Cosme, Tamie Weaver, Camillo Coladonato and Joe Duran

Geosyntec consultants
ERM
Dow Seek Together
GOLDER

LOW INVASIVE

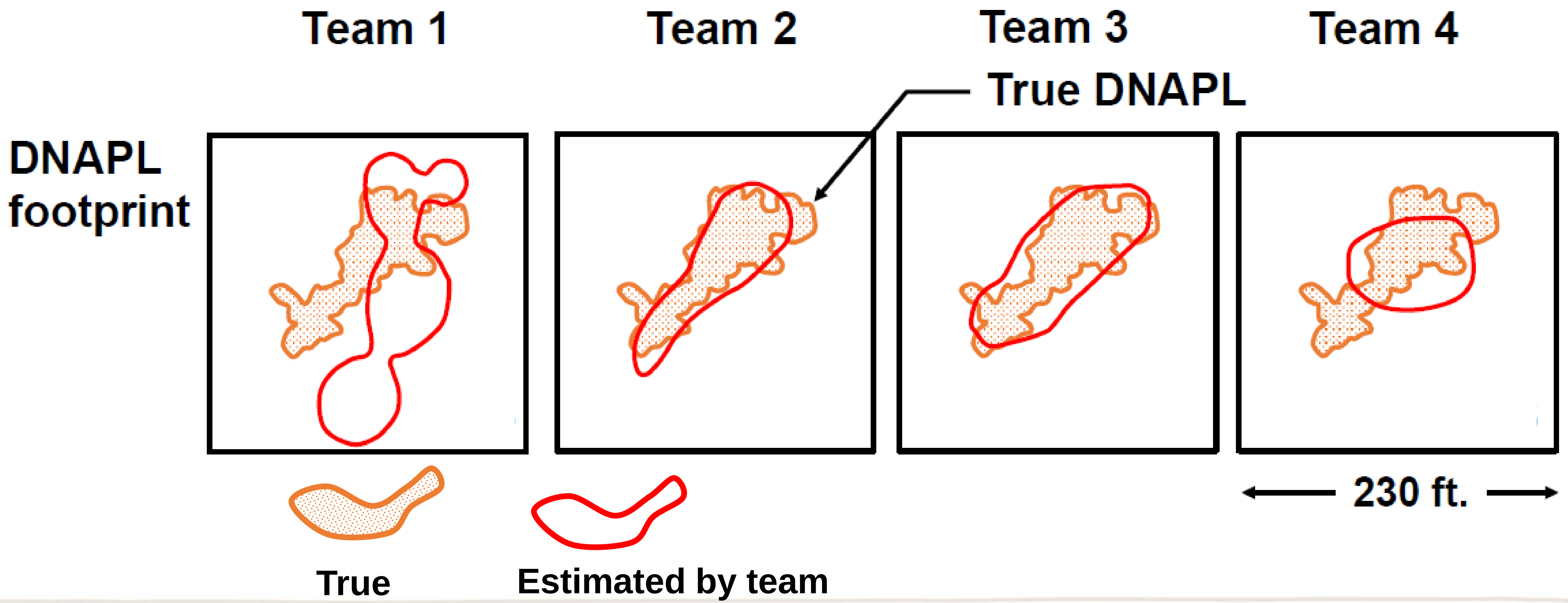
HIGH RESOLUTION

FLUX MEASUREMENTS

FORENSICS

Why this talk?

Real or imaginary problems? Lessons learned from investigating virtual sites



Source: Reynolds et al, 2016
DIVER (Data Information Value to Evaluate Remediation)

Objectives of this presentation

Start the discussion on a different classification of advanced site characterisation techniques in a manner that is focused more on outcomes and which:

- Assists decision-makers in better selecting and designing data collection programs
- Guides further technique development

Proposed classification

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Low invasive techniques

Cover larger areas with improved certainty relative to more invasive techniques; often support contaminant source identification

Passive soil vapour survey

- Waterloo membrane samplers
- AGI samplers (Gore sorbers)

Surface geophysics

- Electrical resistivity
- GPR
- Electromagnetic survey

Hand-held metal detectors

- XRF

Remote sensing

- LiDAR
- Drones

Field mapping and field analysis

- Gastec technology

ALGA Australasian Land & Groundwater Association 10 YEARS & BEYOND

Definition → Examples → Further development

thank you for growing with us.

Low invasive techniques

Typical use:

- Early stages of characterisation
- Generation of more data at lower cost
- Increased use in validation of large remediation works

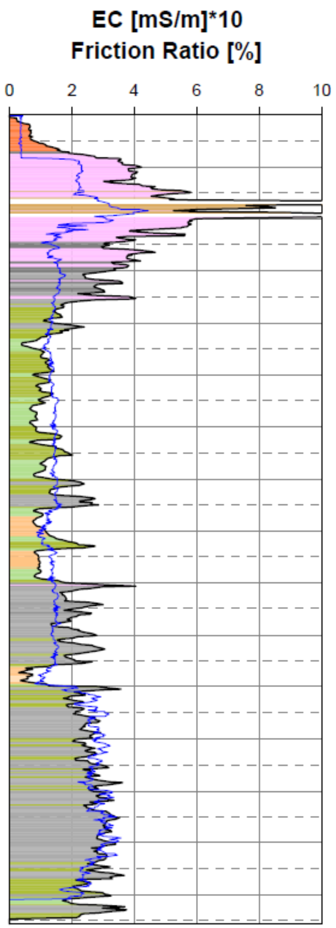
Trends:

- Real-time data generation to optimise collection
- Accessing areas that would be otherwise logistically impracticable
- Combination of techniques (e.g. drone with samplers)

Evolving towards:

- Providing data of similar reliability than permanent monitoring locations
- Overcoming interferences

High resolution techniques



Evaluate contaminant distribution on a smaller scale and the hydrostrati-graphic context in which contamination resides

Membrane Interface probe

Optical Image Profiler

Laser induced fluorescence

- TarGOST, DyeLIF

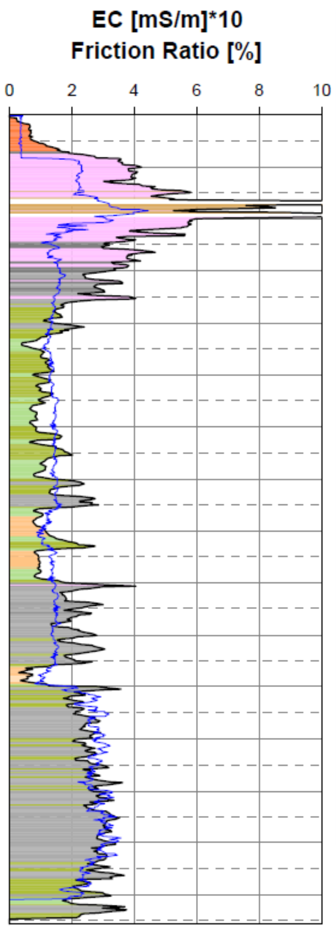
Cone penetrometer testing and electrical conductivity profiling

Hydraulic profiling tool

Borehole geophysics

FLUTe liners

High resolution techniques



Typical use:

- Supporting further assessment or remedial design
- Occasionally used in remediation validation

Trends:

- Combining multiple lines of evidence
- Improving understanding of contaminant accessibility
- Overlooking the potential for cross-contamination

Evolving towards:

- Less marketing
- Increased involvement from academia to aid applied research
- Improved operator training

Flux measurement techniques

Measure groundwater and contaminant mass flux in-situ

- Passive Flux Meters
- iFLUX
- Point Dilution Method
- Finite Volume Point Dilution Method
- Point-Velocity Probe

Typical use:

- Mass discharge as remediation metrics
- Assess exposure to aquatic ecology, human health

Trends:

- Emerging contaminants
- Transient flux

Evolving towards:

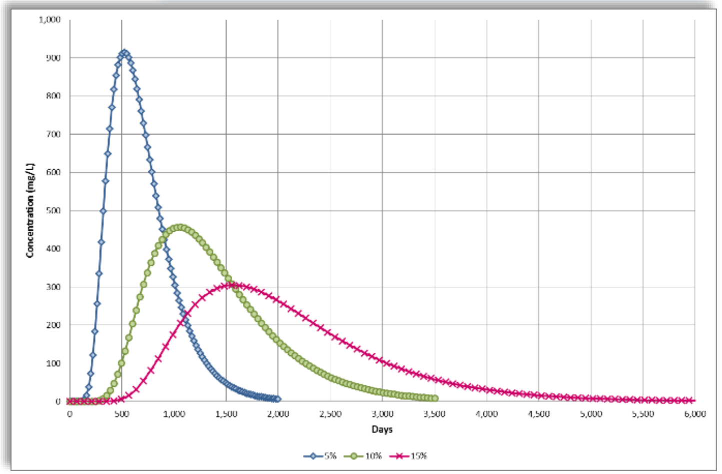
- Improving regulatory acceptance
- Generating real-time data

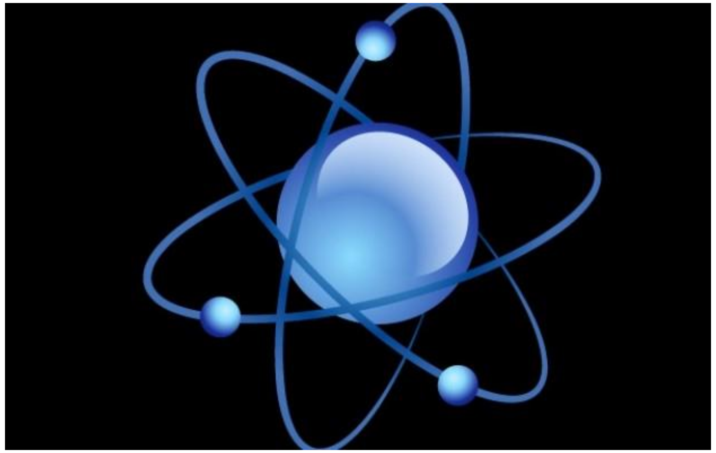
Tracing and forensics

Bring further insight to the assessment of contaminant distribution and transport

- Compound Specific Isotope Analysis
- Applied tracer testing (including fluorescent dyes)
- Environmental tracers:
    - Temperature, EC, major ions
    - Isotopes
    - Age dating and radioactive tracers

- Biological activity (qPCR,etc)
- Contaminant Fingerprinting (PIANO, etc)

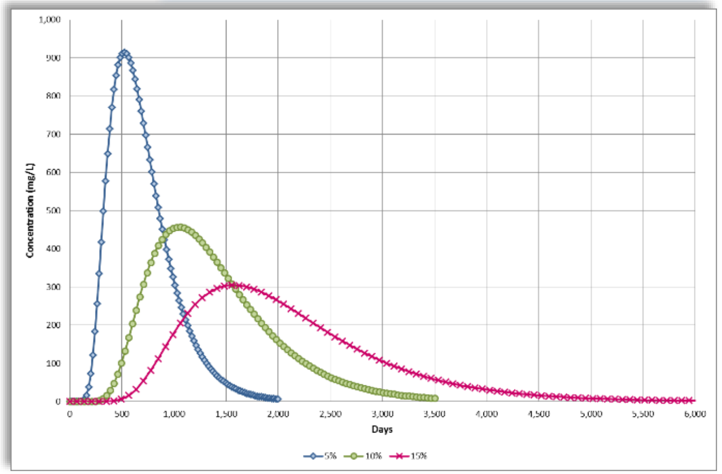




Tracing and forensics

Typical use:

- Litigation
- Natural attenuation studies

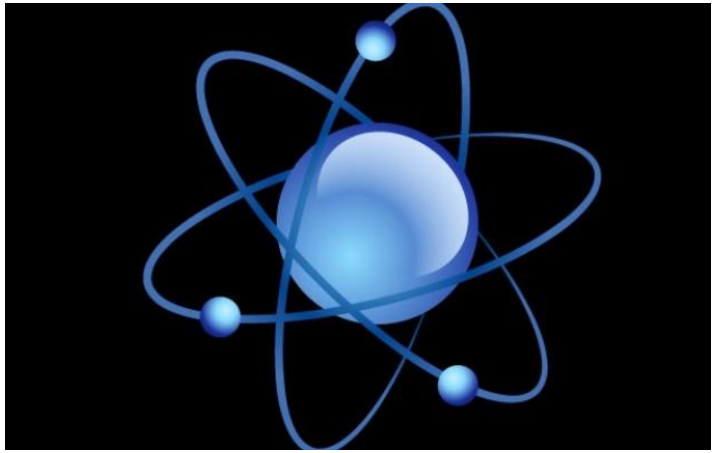


Trends:

- Increase in in-situ and/or automated measurements
- Overall increase in affordability and commercial offering
- Academic institutions providing advices to ensure quality outcomes

Evolving towards:

- Making distinction between natural and anthropogenic
- More versatile tracers



Conclusions

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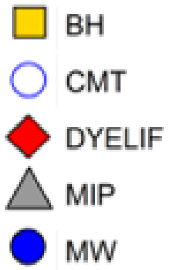
- Advanced site characterisation techniques should remain focused on objectives, rather than as activities in their own right
- There is a need to align outcomes with the right tools at the right time in the assessment

➢ Academic institutions can play a key role in further developing these techniques to achieve better outcomes

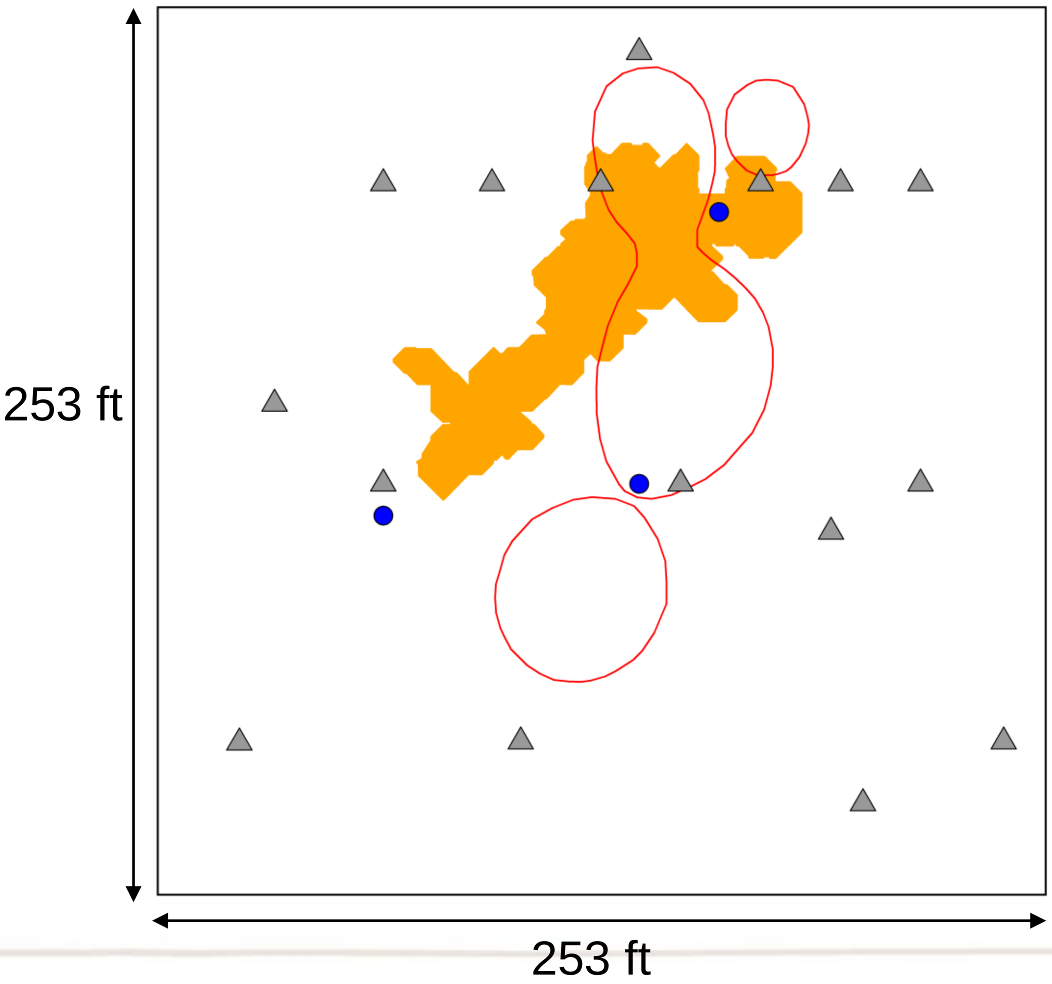
➢ Need to form a diverse interest group to further develop international guidance

Questions?

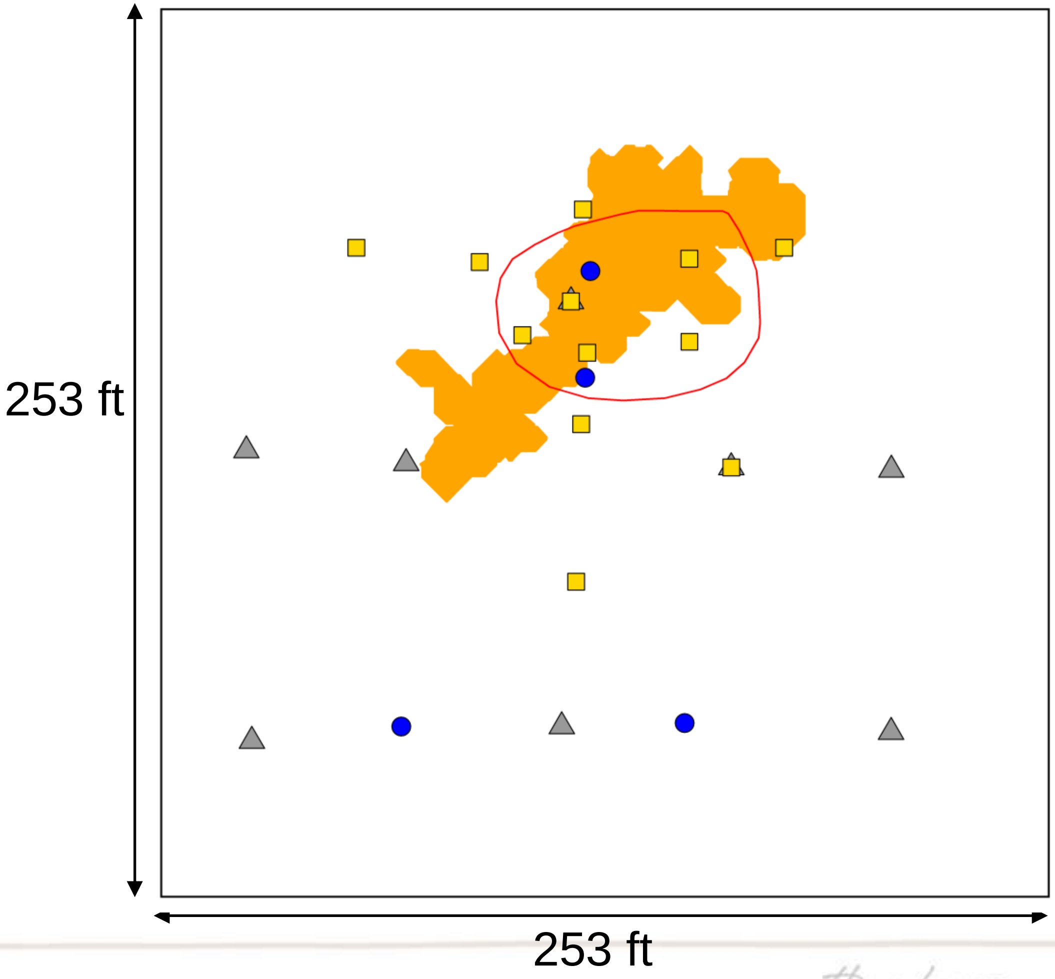
https://www.pexels.com/ https://www.freepik.com/



Team 1



Team 4



fcosme@Geosyntec.com

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