ATU – Creating a Decision Support System for Streetworks: The GPR Challenge

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ATU: The Objectives

Work Stream 3 – “assess the condition of the infrastructure using GPR deployed in different manners.”
What exactly are we looking for?

- Target size (cf reduction from service to deterioration)?
- Target Depth?
- Type of Target e.g. water, fibre optic cables?
- Type of Cover – build materials?
- Instrumentation - A Camera?
- Limitations of the GPR or.........?
Target Resolution

Measurement in fractions/unit of $\lambda$.

Moving on to problems in the Infrastructure.

400MHz
Target Resolution

- Overcrowding in the Subsurface
- Cast Iron pipes – detection of pipe & differentiation of condition.
- What’s leaking & how big is the fracture?
- Tree roots?
- Λ varies with water content.
- Corrosion – inside or outside?
- Faint targets (e.g. fibre optic cables)

We need to know what we are measuring.
Target Resolution

• No one size radar fits all situations.
  • Frequency/Wavelength critical for detection.
  • So is Survey Medium.
  • So is Depth (20 λ)

• 800MHz (compromise between 400/500MHz and 1 to 1.5GHz.)
  • Magnetic Losses?

• Dual e.g. 400MHz & 1.5GHz.
  • Cost implication in terms of antennas/ multi-channel controller.
Target Resolution

1GHz

4GHz – tendon duct

400MHz & 1GHz
Target Resolution

- **Duos**
  - extracted, not added, frequency range
  - Implication for smaller targets.

- **Swept Frequency**
  - near surface problematical
    (overloading of Rx from continual transmission)
  - speed implications.

- **Pre-Filtering**
  - Processes must be appropriate
The Blue Planet

An Efficient Excavator
Water

Slower Transmission speed

Leakage ≠ Water

1.5GHz (In Bore)

50MHz
Water

Ionised material a major problem when combined with water (mobility).

But that doesn’t necessarily mean That all wet clay is unsuitable.
Voids

400 MHz

4GHz

6GHz
Build Materials

Beware of recycled materials
Blast Furnace Slag
Blue Engineering Bricks
Some membranes
Combined Technology
Training

- Current role of GPR in utility detection training
  - GPR/EML split?
  - 1 radar system?
  - Implications for Condition Assessment.
Training

- Pejuta – Malaysian Land Surveyors - MTU Initiative
- EuroGPR – on-line competency assessment.
Over to you.........................