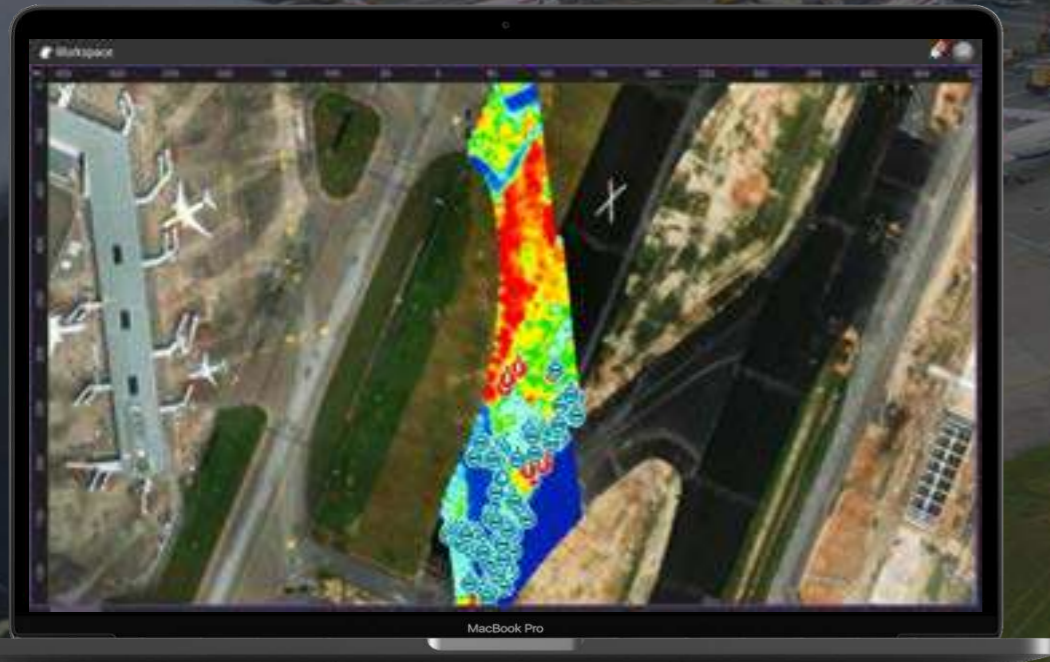


How real-time NDT data can transform Airport Asset Management



Graham Kneller
Senior Area Sales Manager UK/IRE



Pioneering Inspection Tech Company

Screening Eagle Technologies

Market leader

Swiss quality since 1954, world leading Inspection Tech ecosystem of Software & Sensors, best in class

Relentless innovation

Disruptive product development, speed to market and performance track record

Protecting the Built World

Sustainability at the core with software powered asset & infrastructure lifecycle management, data driven predictive maintenance



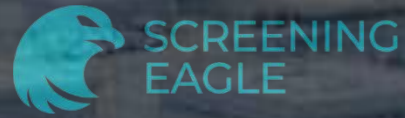
300
Employees

3 global hubs | Austin
| Singapore | Zurich
100+ countries

CHF 60m
Growth capital raised

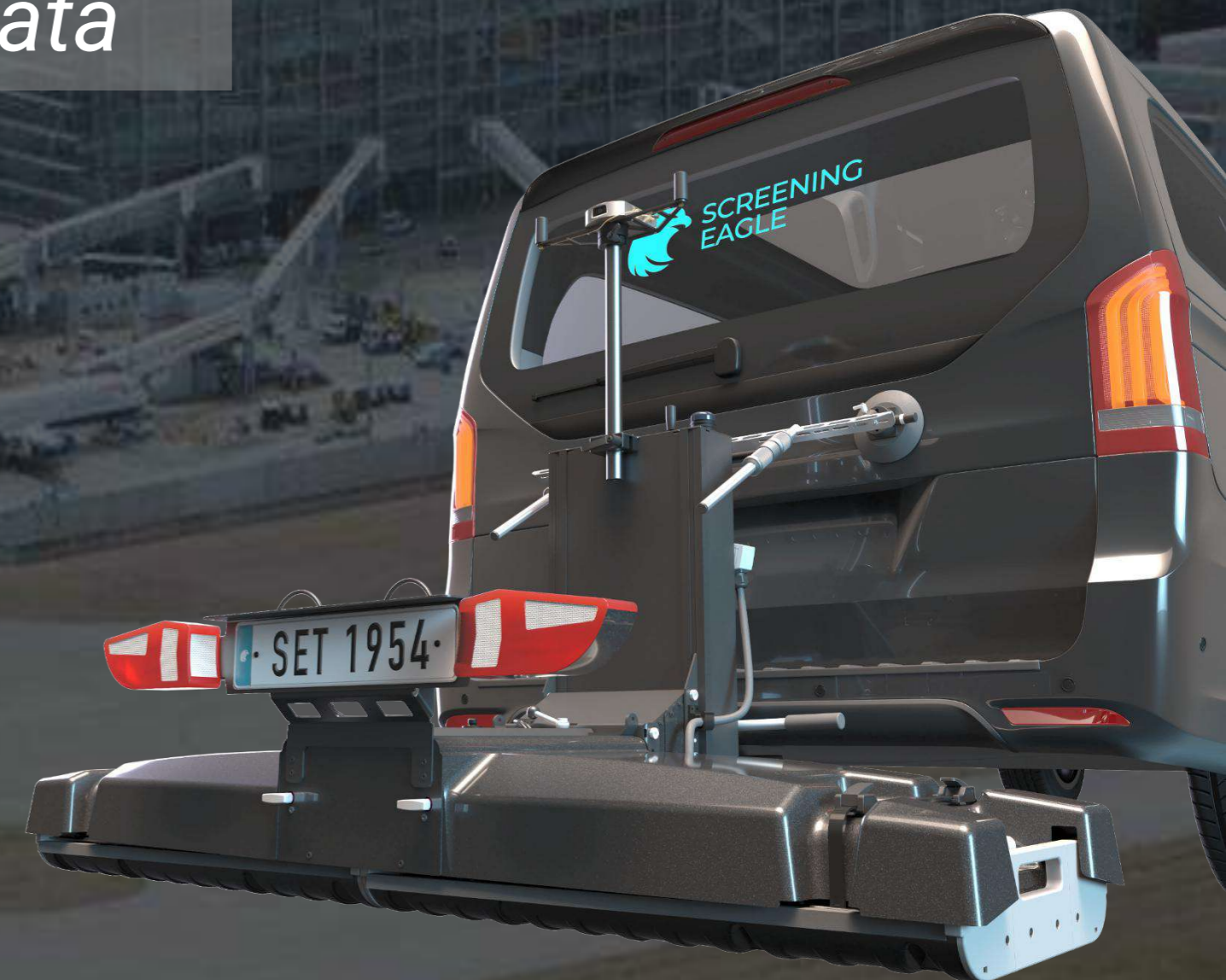
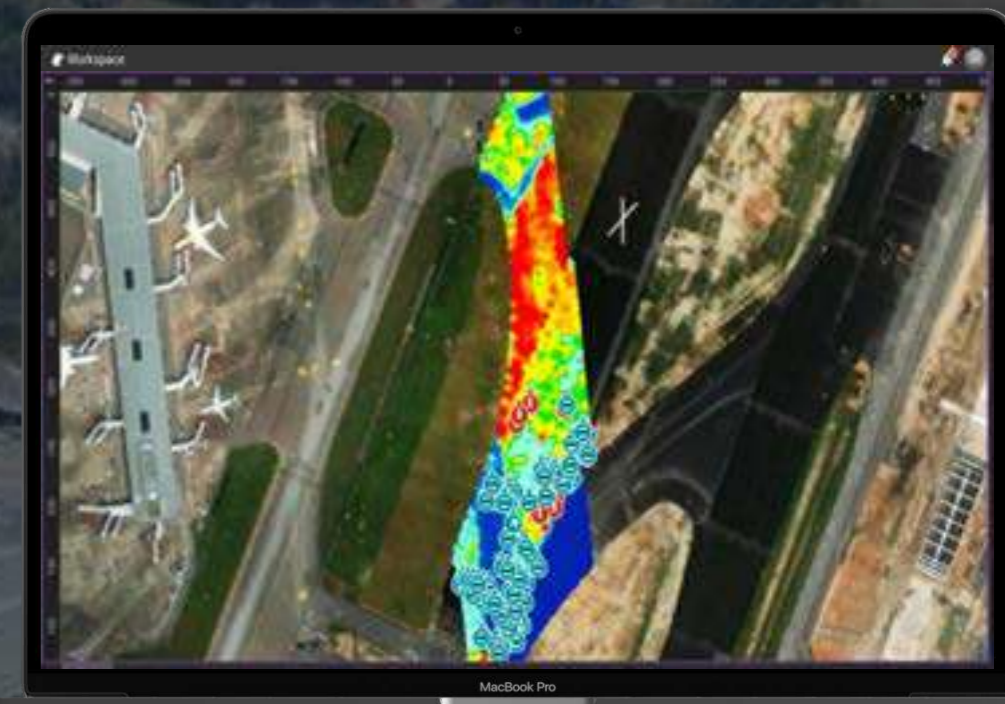
100+
Active Countries

3
Global R&D Sites

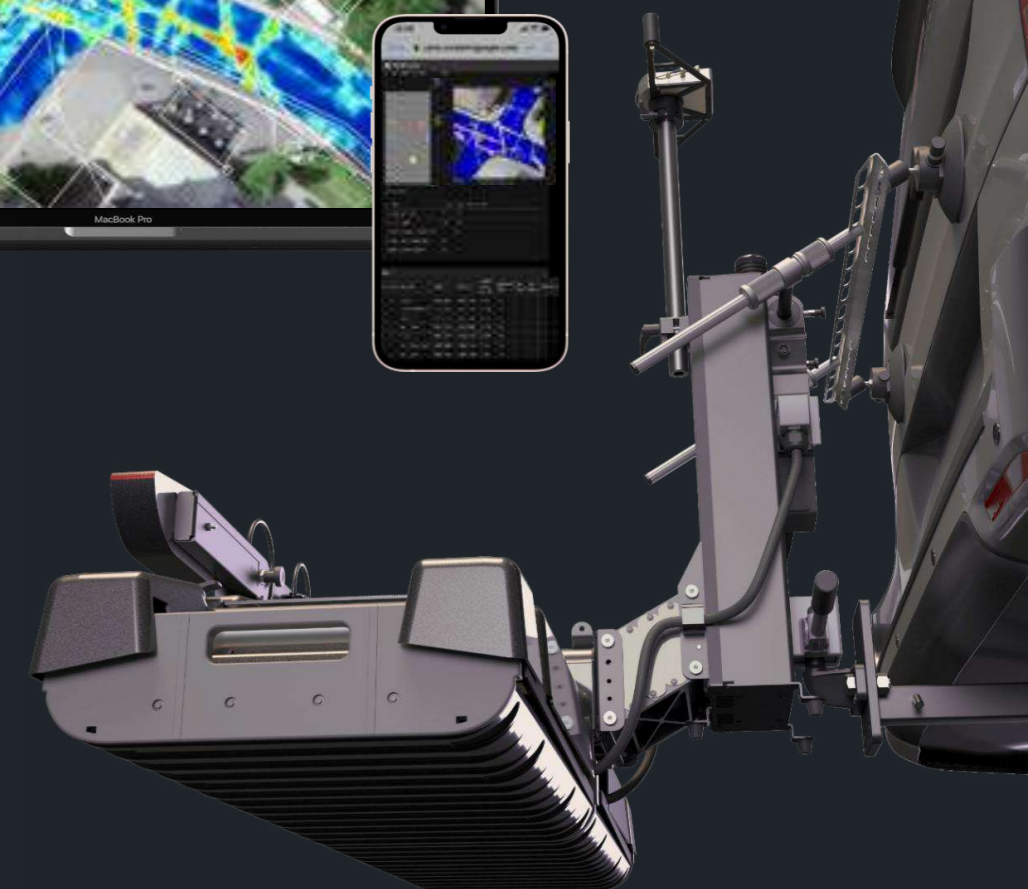
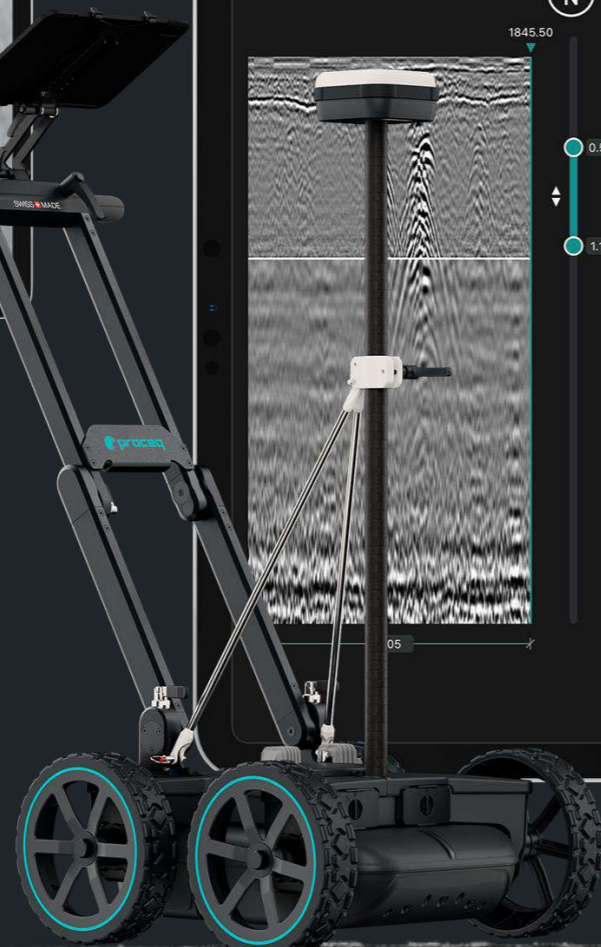
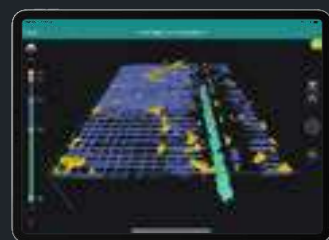
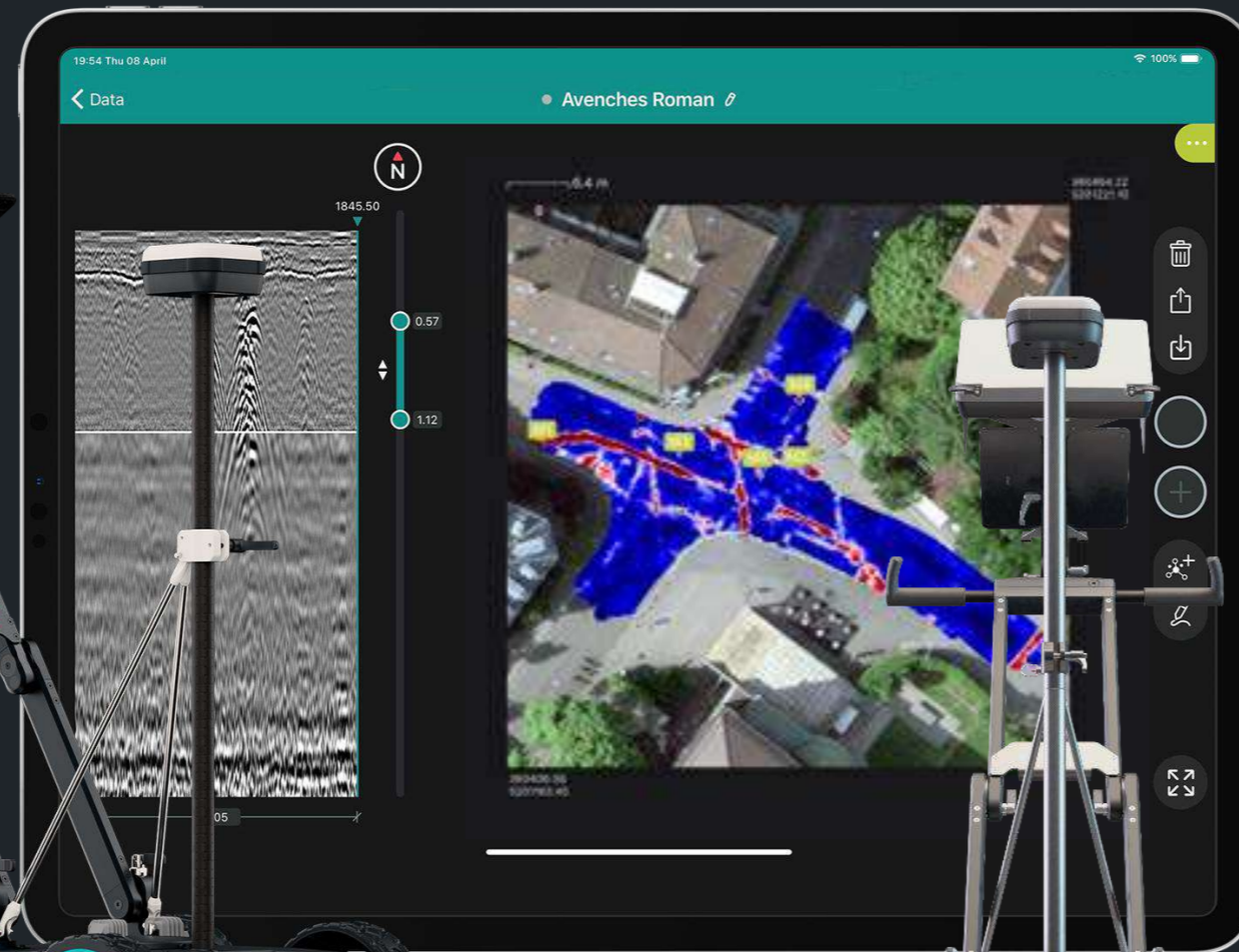


Advanced Pavement Mapping for Airfield Investigations

Comprehensive assessment of the airfield's condition with high precision and real-time 3D data



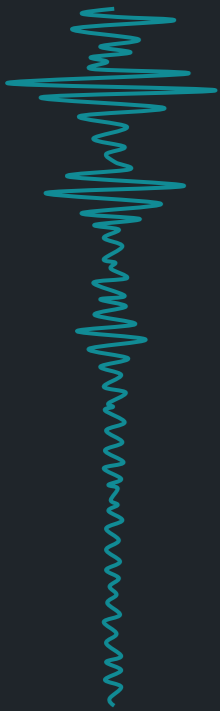
Ground Penetrating Radar (GPR) subsurface mapping



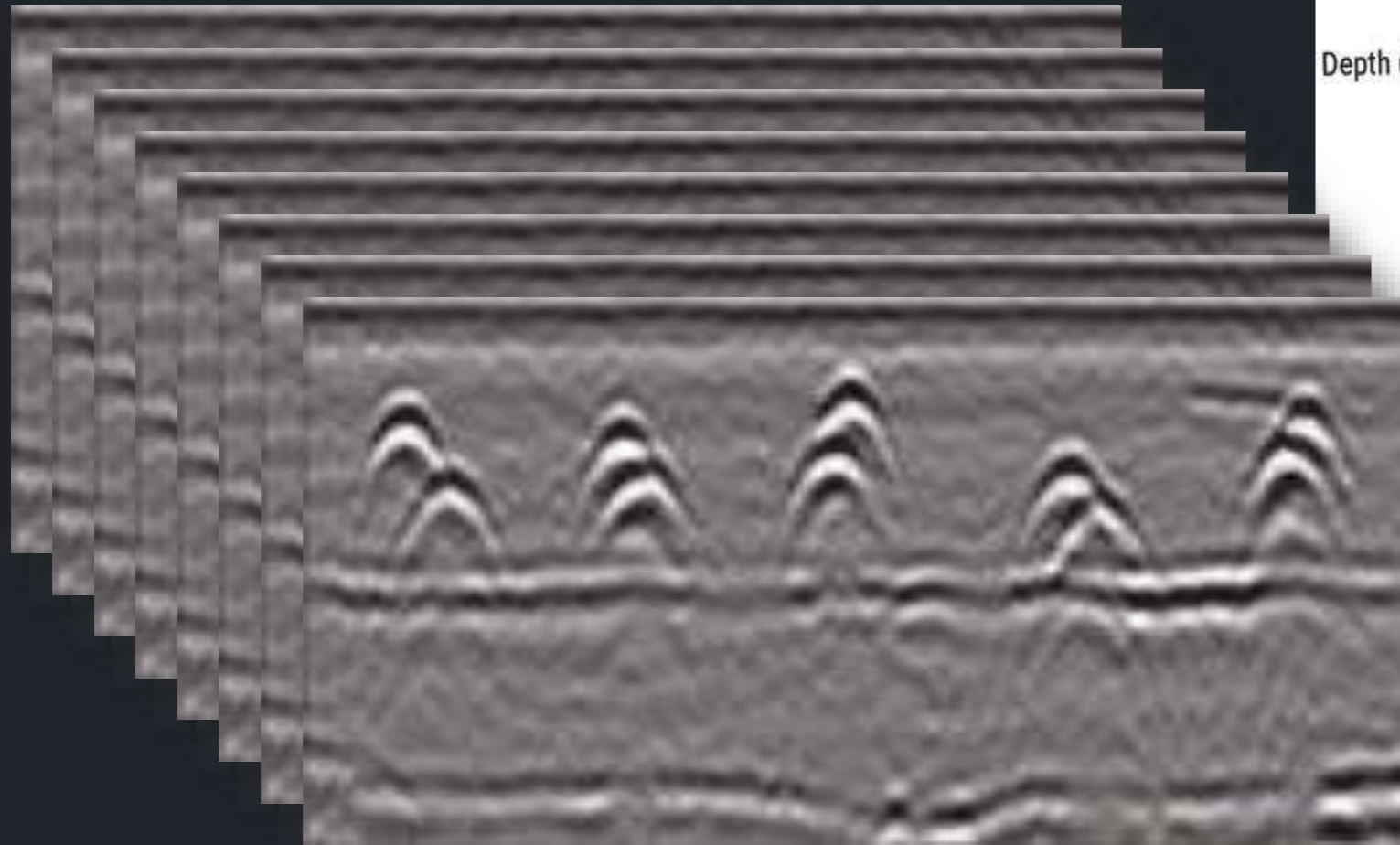


Introduction GPR Data visualization

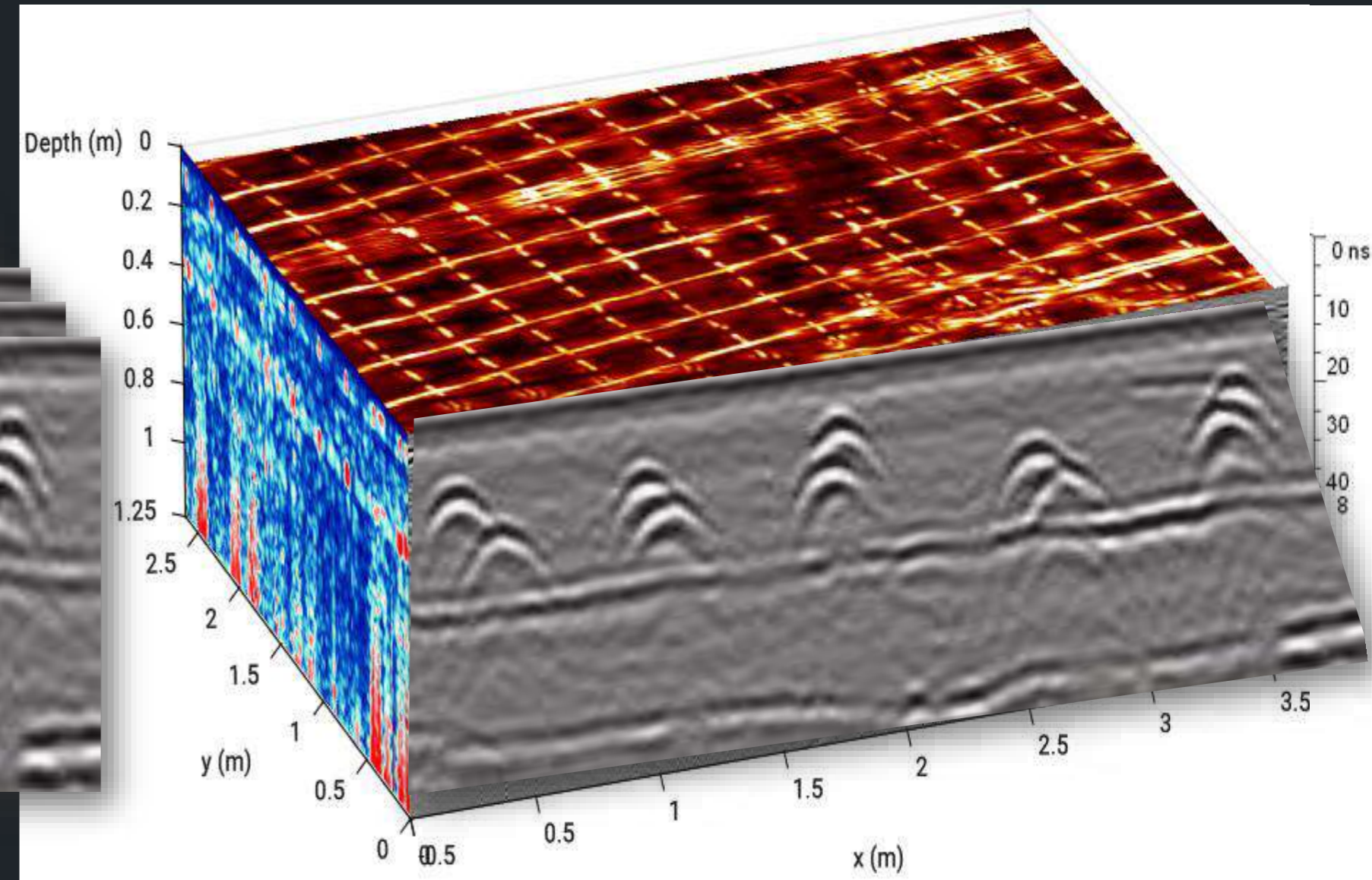
A-
scan

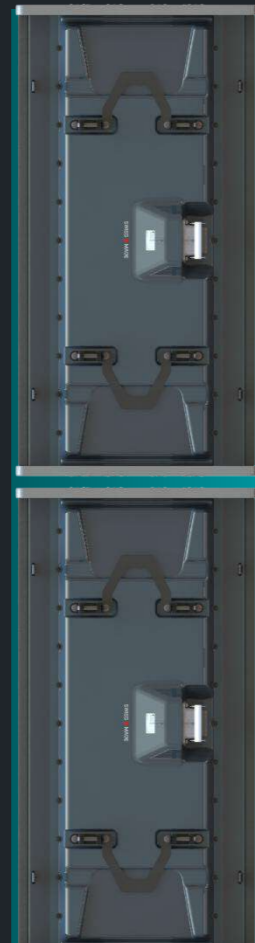
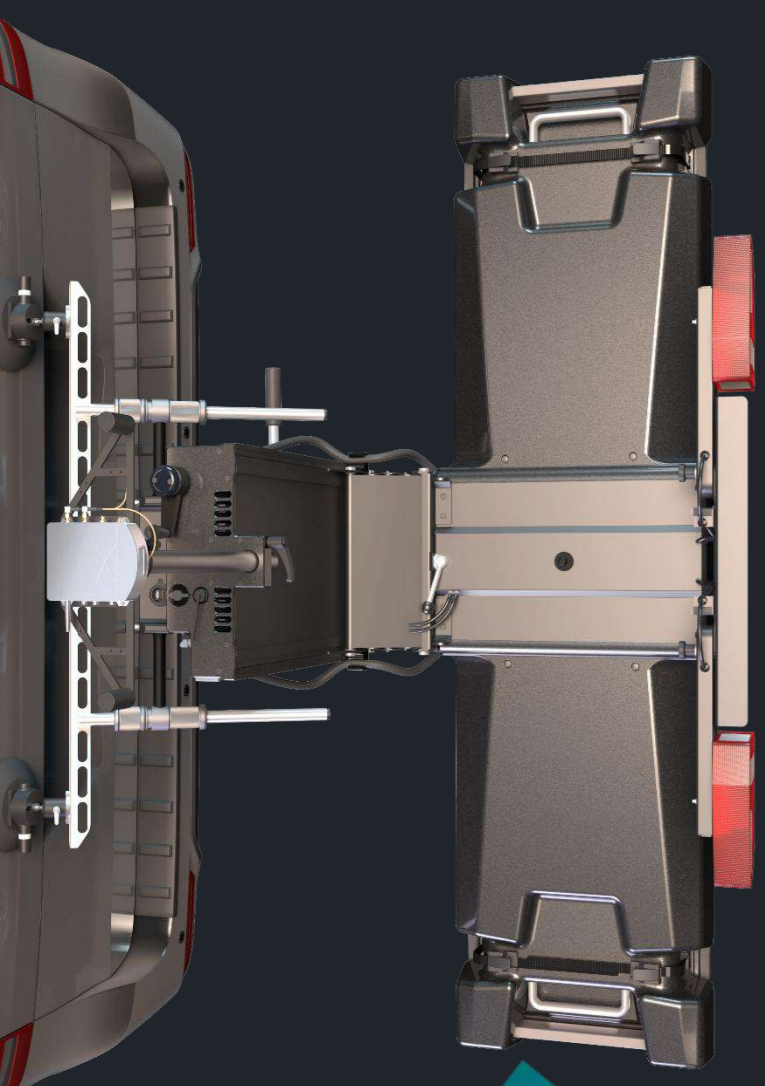


B-
scan



C-

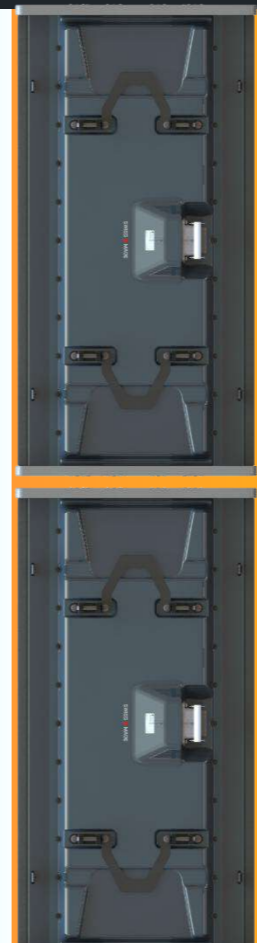




GX1 array

Near-surface applications

- Pavement analysis
- Roadway mapping
- Bridge analysis
- Civil structural inspection
- Railway mapping



GX2 array

Mid-depth applications

- Excavation safety
- Utility mapping & SUE
- Geophysical surveys
- Archaeological prospections
- UXO detection

Versatility meets accuracy

Two interchangeable array modules, one vast array of applications



NDT Evaluation Standard in US

Conduct field testing to assess pavement conditions:

- **PCI Inspection:**
Perform PCI surveys to determine or validate pavement condition.
- **Coring/Test Pits:**
Determine pavement thickness and collect material samples; coring more often due to operational limits.
- **DCP/ADCP:**
Assess soil strength and layer thickness using Dynamic Cone Penetrometer.
- **FWD:**
Use Falling Weight Deflectometer for deflection data and modulus calculations.
- **GPR:**
Determine pavement layer thickness and detect

UFC 3-260-03
21 August 2023

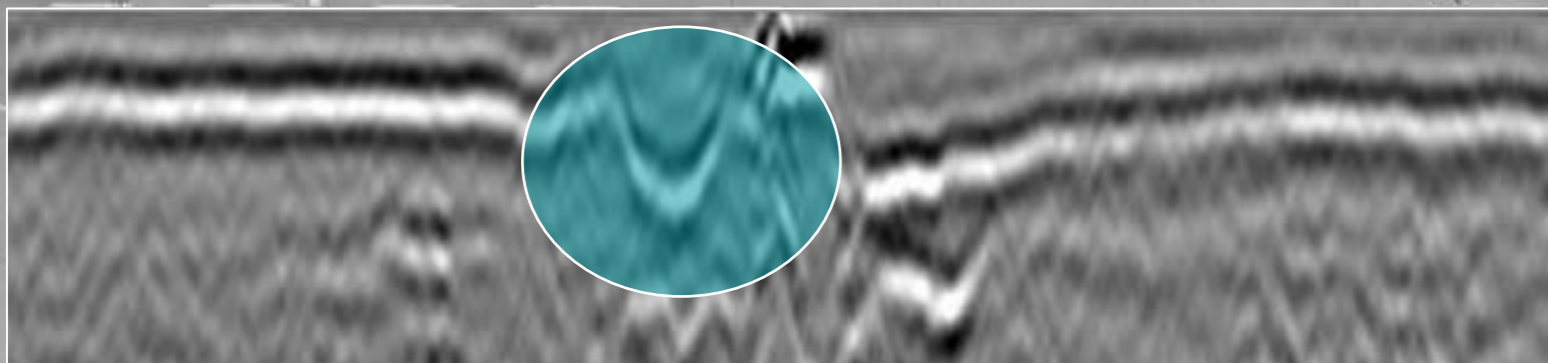
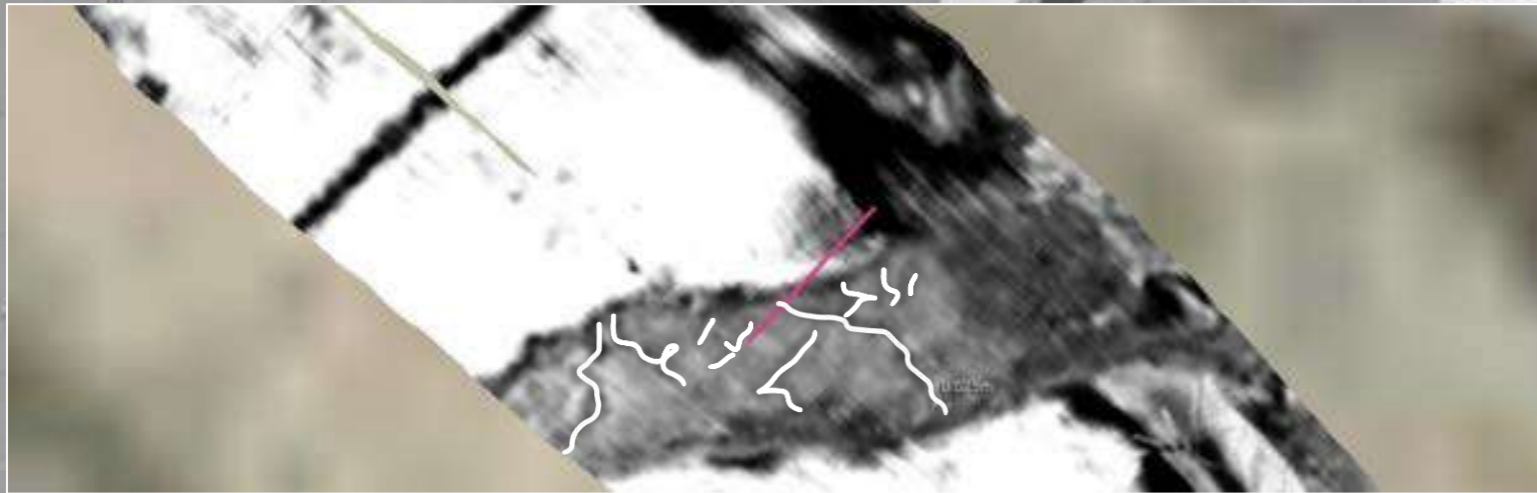
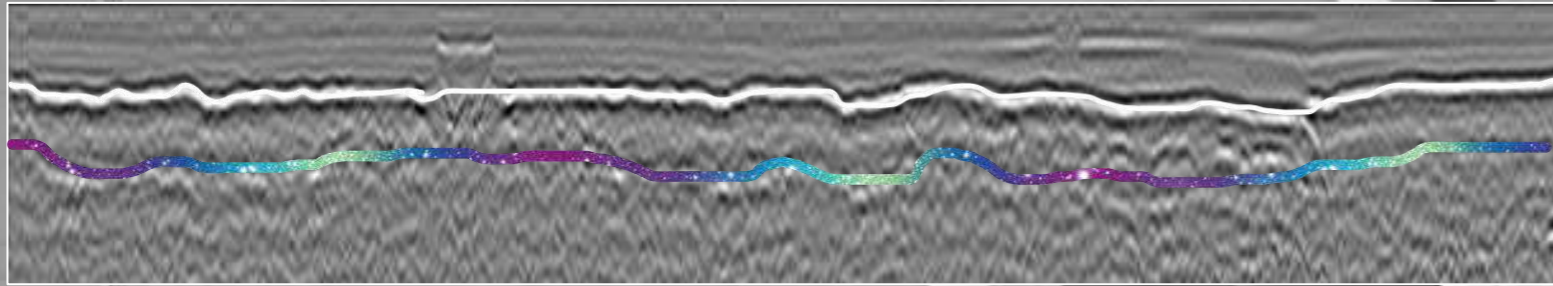
UNIFIED FACILITIES CRITERIA (UFC)

O&M MANUAL: STANDARD PRACTICE FOR AIRFIELD PAVEMENT EVALUATION



APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

Subsurface Mapping System in Airfield Pavements Layering and defects

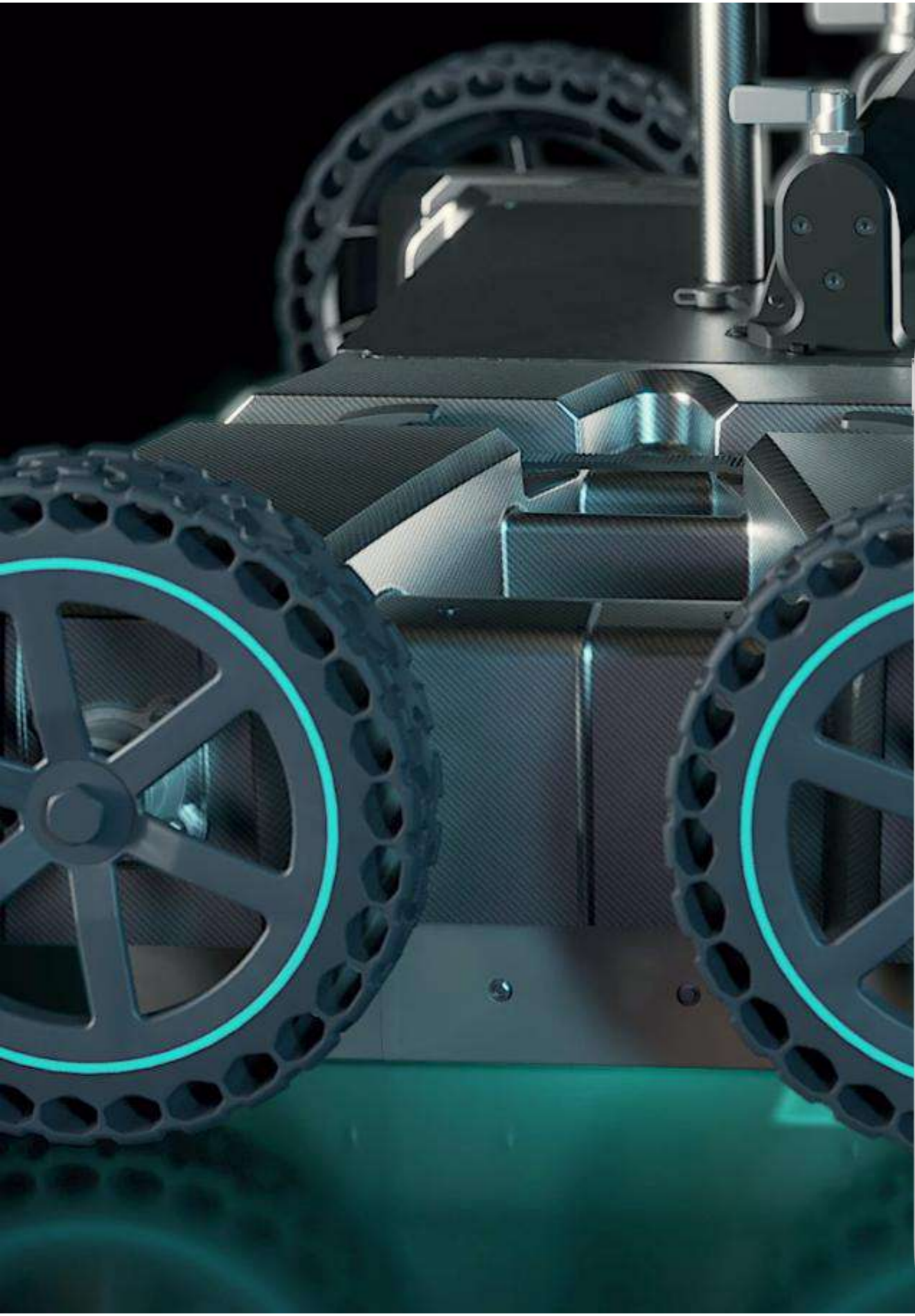


Purpose:

- Pavement condition monitoring
- Mapping of internal damages (cracks, voids, cavities)

Deliverables:

- Layer thickness profiles (2D) and surfaces (3D)
- 3D images and drawings (.dxf) of shallow objects (joints, rebars) and damages (cracks, voids)





Precise Structure Subsurface Data Reinforcement Condition Map

Workspace loading GPR Insights... End session Tools



100% 淨水
bon
aqua
礦泉水
BOTTLED IN THE U.S.A.

Assess concrete with confidence



1. Object Detection

Proceq Ground Penetrating Radar (GPR)

Deep and clear scans with stepped frequency continuous wave technology.

2. Defect Detection

Pundit PD8050 Ultrasonic Imaging

Efficient defect detection and mapping with ultrasonic pulse echo linear array.

3. Uniformity Testing

Pundit PL200 Ultrasonic Imaging

Reliable analysis of concrete properties with ultrasonic pulse velocity.

4. Rebar Detection, Cover & Diameter Measurement

Profometer PM8000 Cover Meter

Accurate rebar cover depth, diameter, and rebar spacing measurement.

5. Corrosion Potential Mapping

Profometer PM8500 Corrosion Sensor

Corrosion detection with half-cell potential and productive wheel probes.

6. Concrete Strength Testing

Schmidt Hammer

Compressive strength estimation and uniformity assessment with rebound technology.

7. Pile Integrity Testing & Impact Echo

Pundit PI8000

Concrete pile integrity, length, and defect location with impact echo technology.

8. Concrete Resistivity Testing

Proceq Resipod

Electrical resistivity measurement to assess the concrete's ability to protect rebar from corrosion.

9. Permeability Testing

Proceq Torrent

Rapid air permeability testing for on-site assessment of concrete quality.

10. Pull-off Adhesion Testing

Proceq DY-2

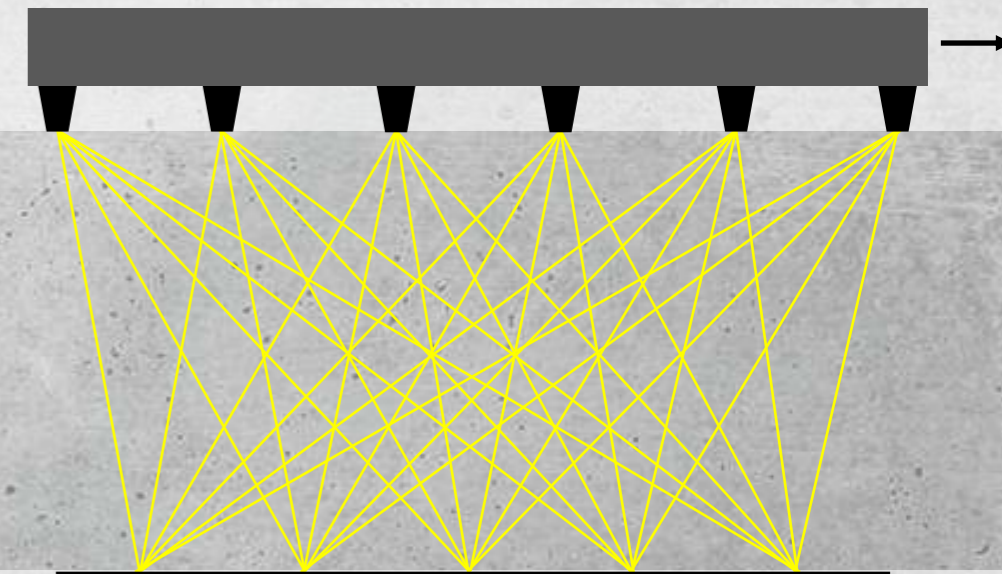
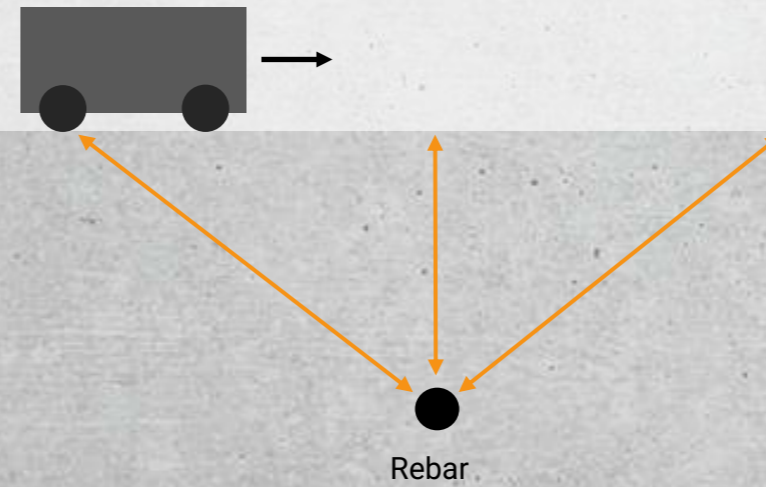
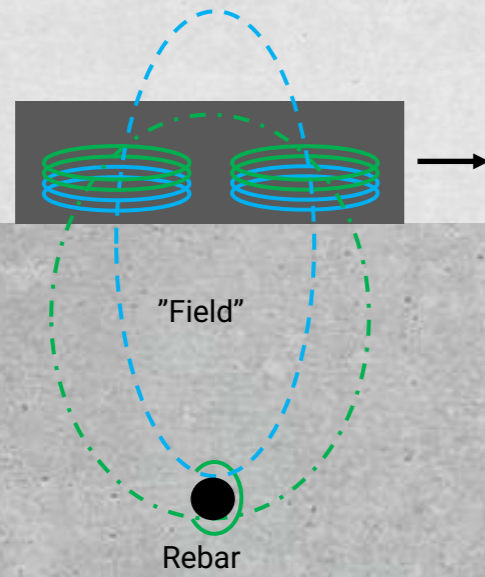
Automated pull-off adhesion testers for varied strength applications.



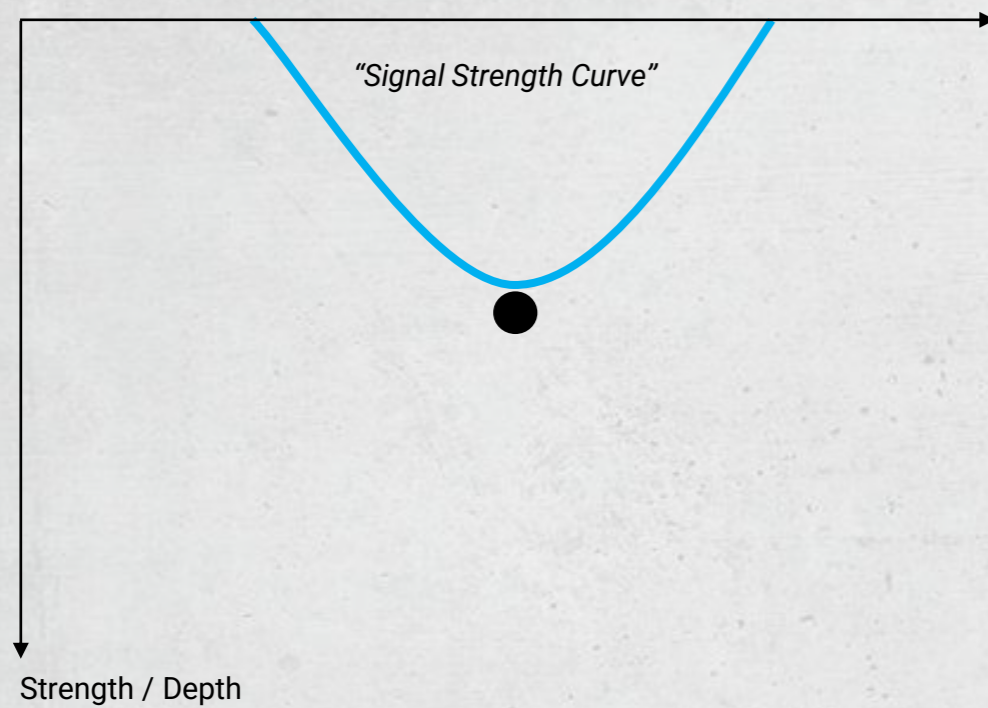


Most commonly used

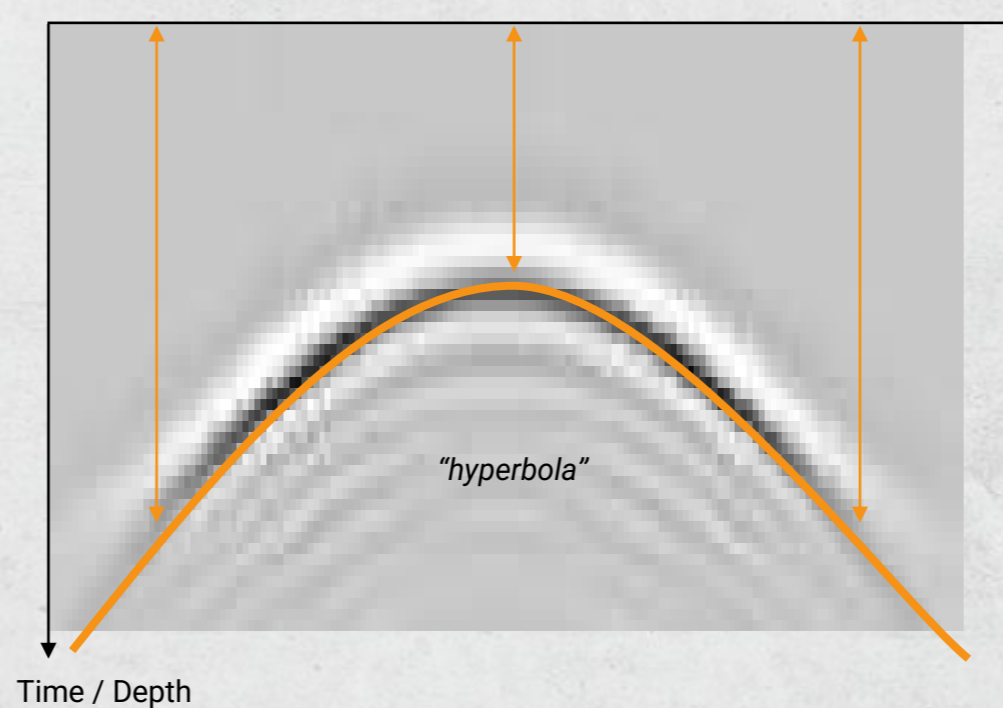
Eddy Current – Ground Penetrating Radar – Ultrasound Pulse Echo



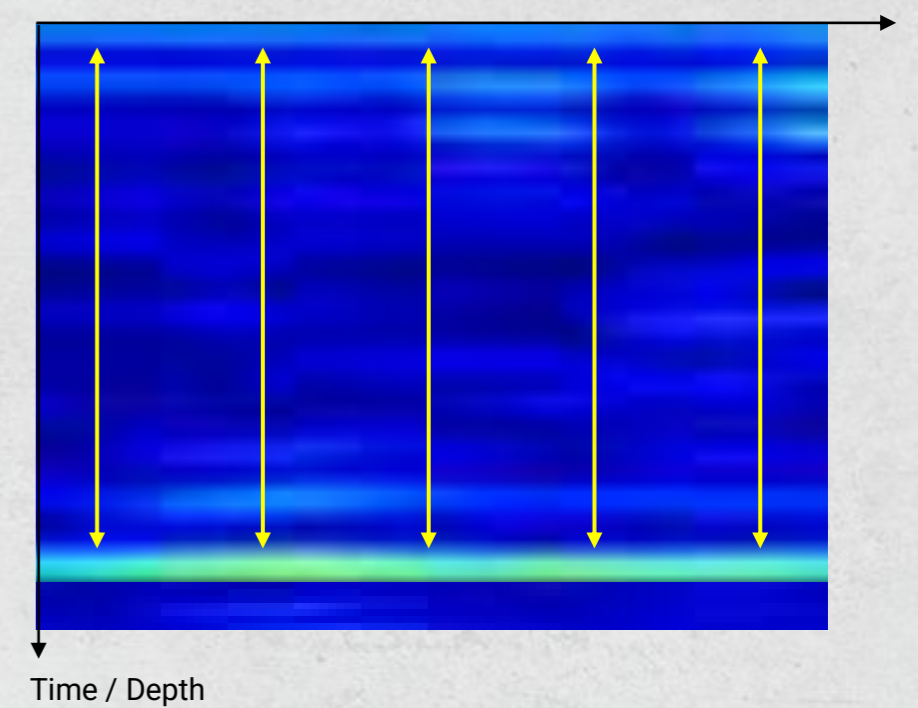
Eddy Current



GPR



Ultrasound Pulse Echo





Depth & Application

Multi Technology Solution

pm

Profometer
< 18 cm

gpr

Proceq GPR
< 150 cm

pa

Pundit Array
+200 cm

Small Object Shadowed
behind metal

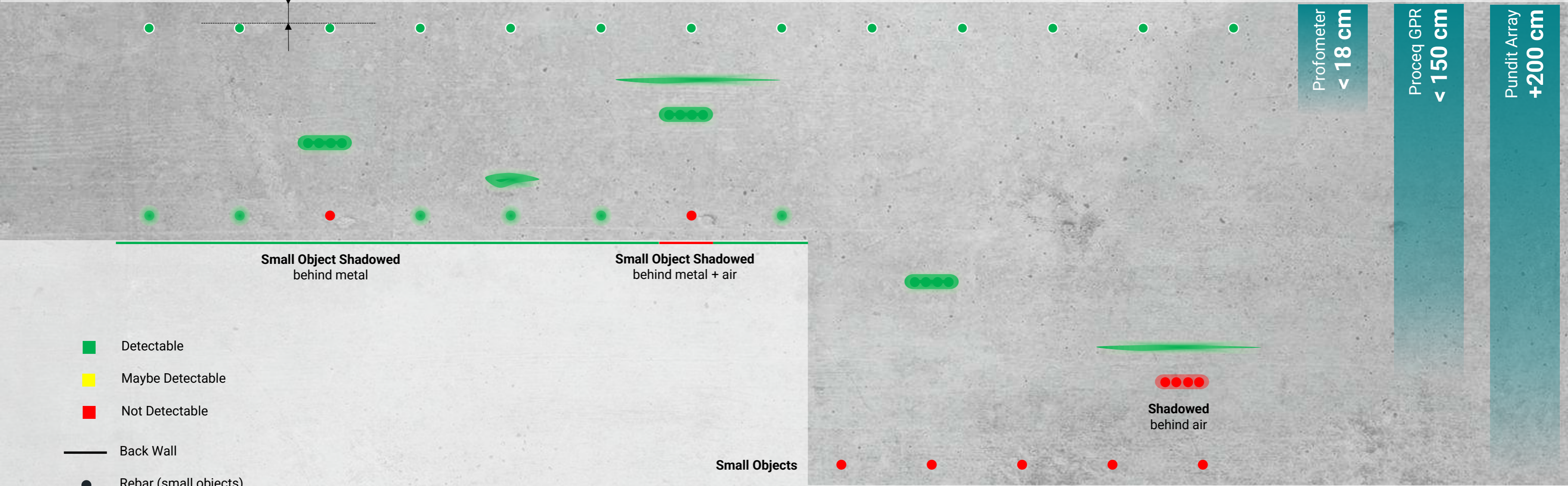
Small Object Shadowed
behind metal + air

Shadowed
behind air

Shadowed
behind air

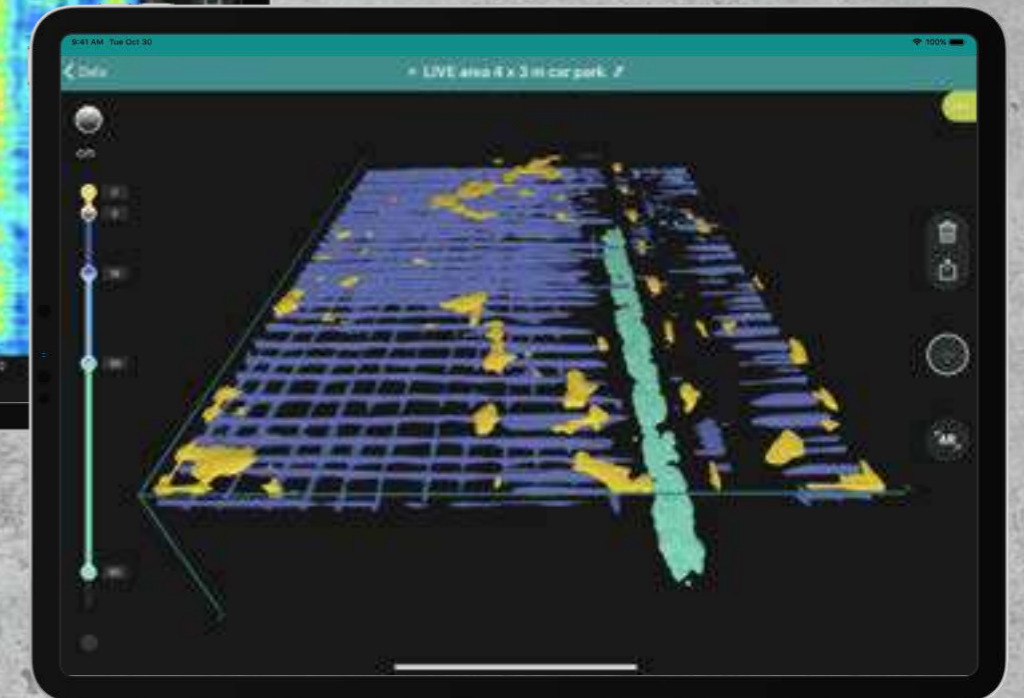
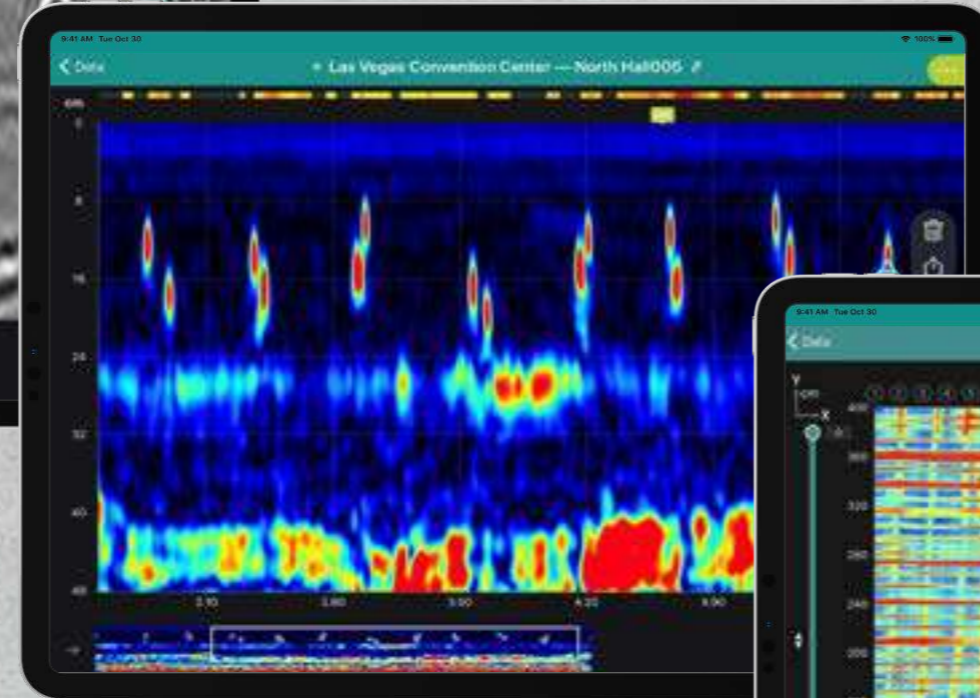
Small Objects

- Detectable
- Maybe Detectable
- Not Detectable
- Back Wall
- Rebar (small objects)
- Post-tensioning, Cables, Pipes (larger objects)
- ☞ Cracks, Delamination, Voids, Honeycombing (air)





Imaging Intuitive GPR Software



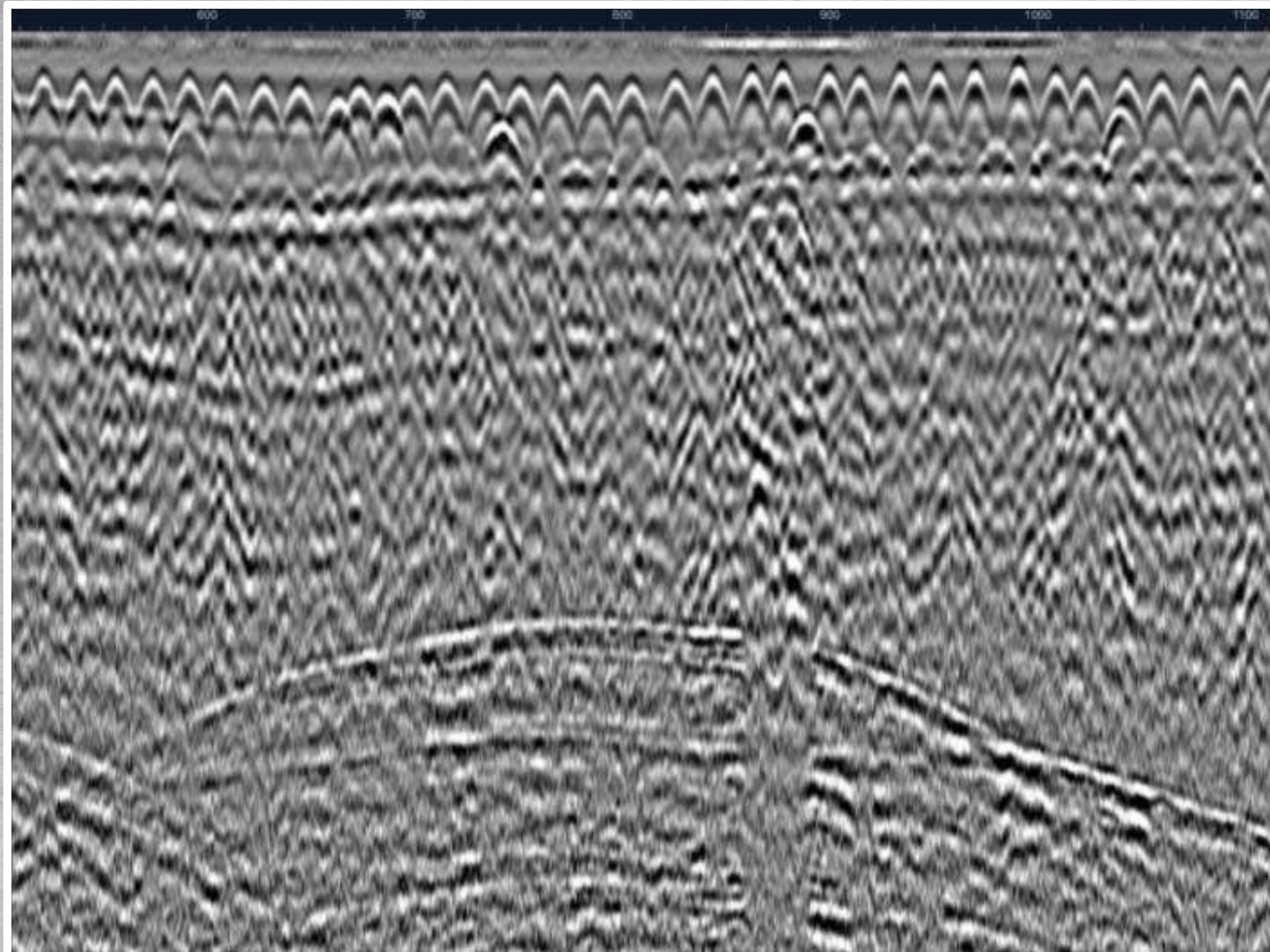
Download on the
App Store





Solution

Post-tensioning Survey – Unexpected Data

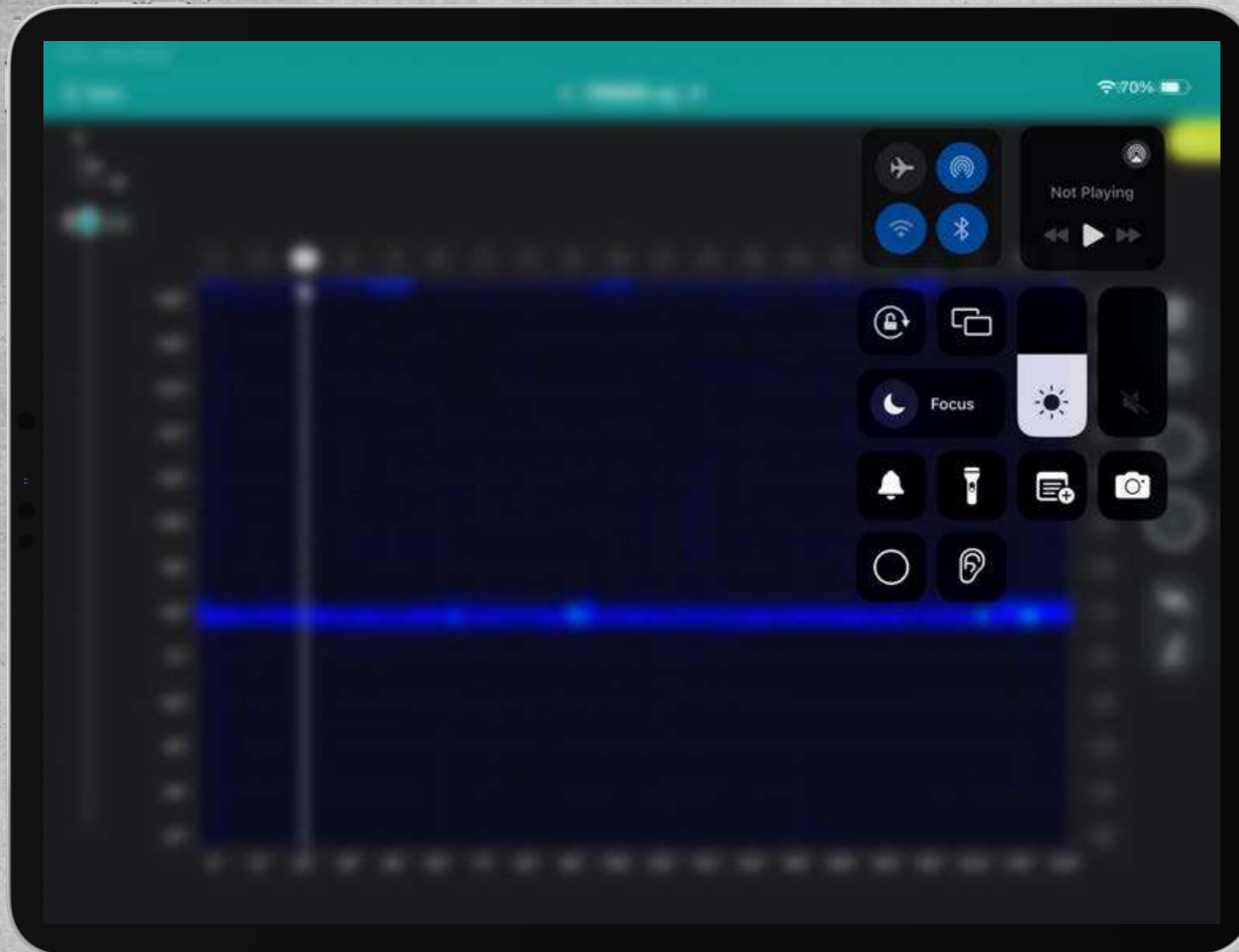


***Courtesy of Trace
Structural Investigations**



Solution

Locating Heating System in Slab

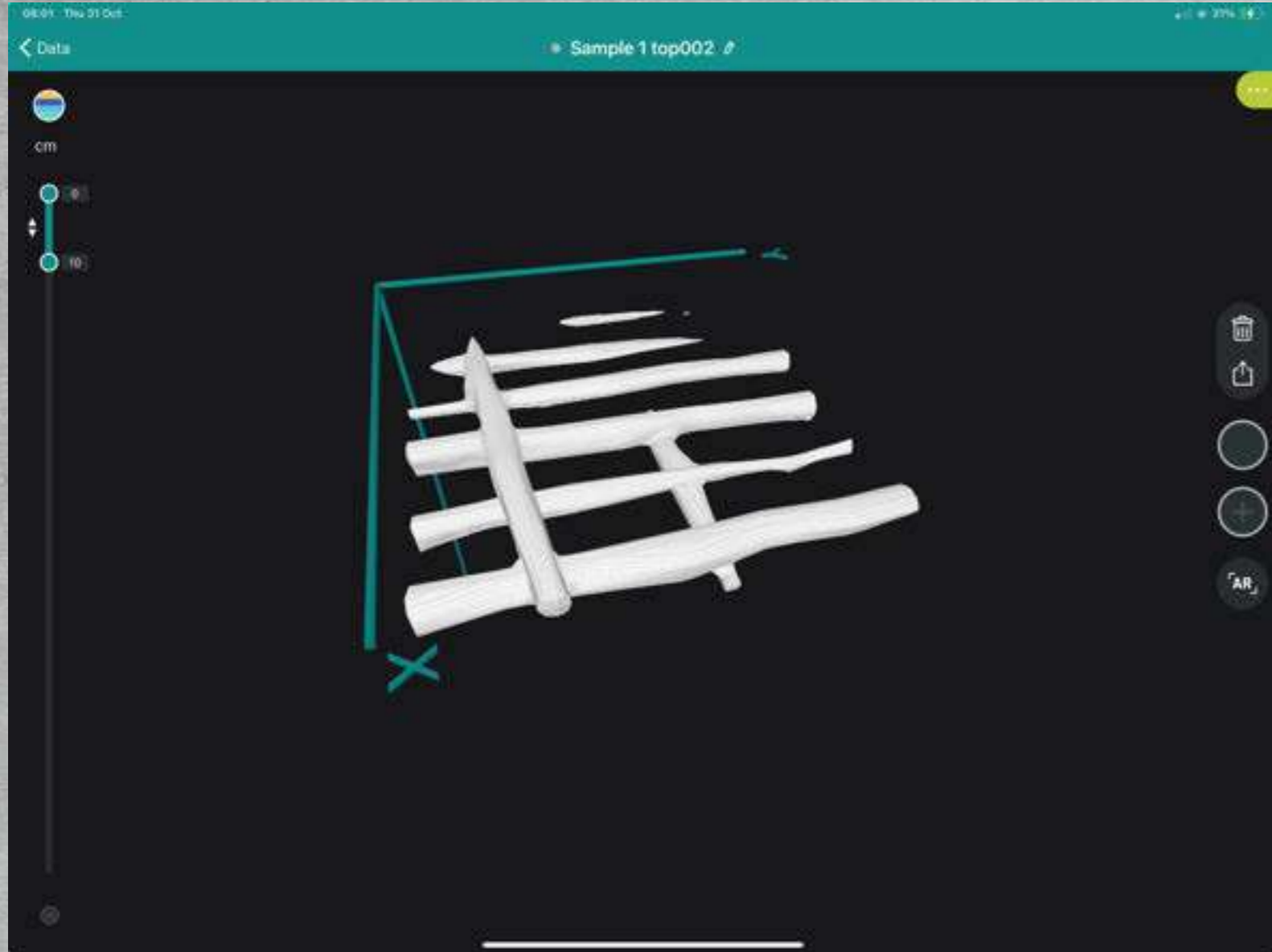


* Courtesy of Cobra
Concrete Cutting Services

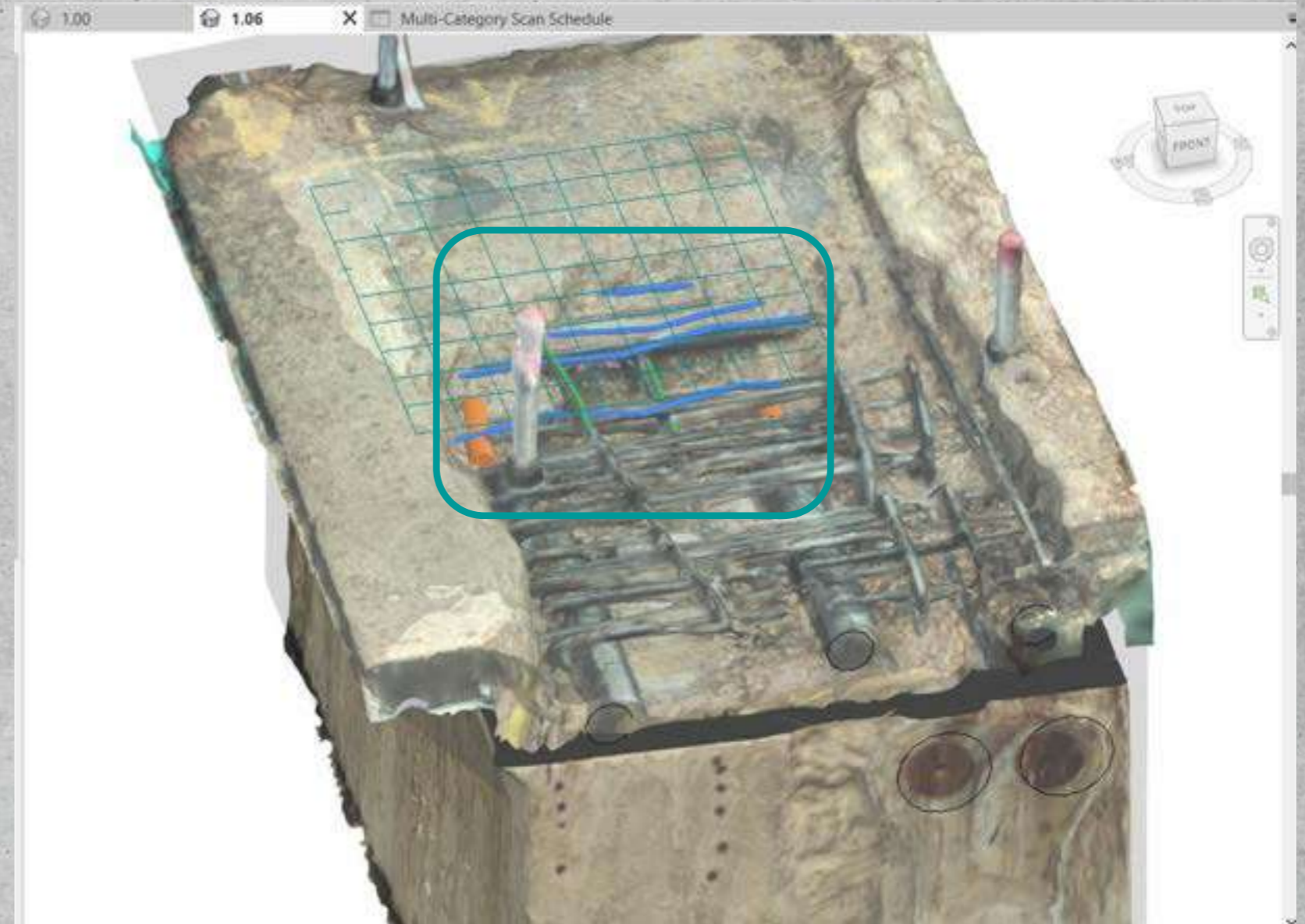


Atkins Realis

Structures Moonshot



GPR Area
Scan

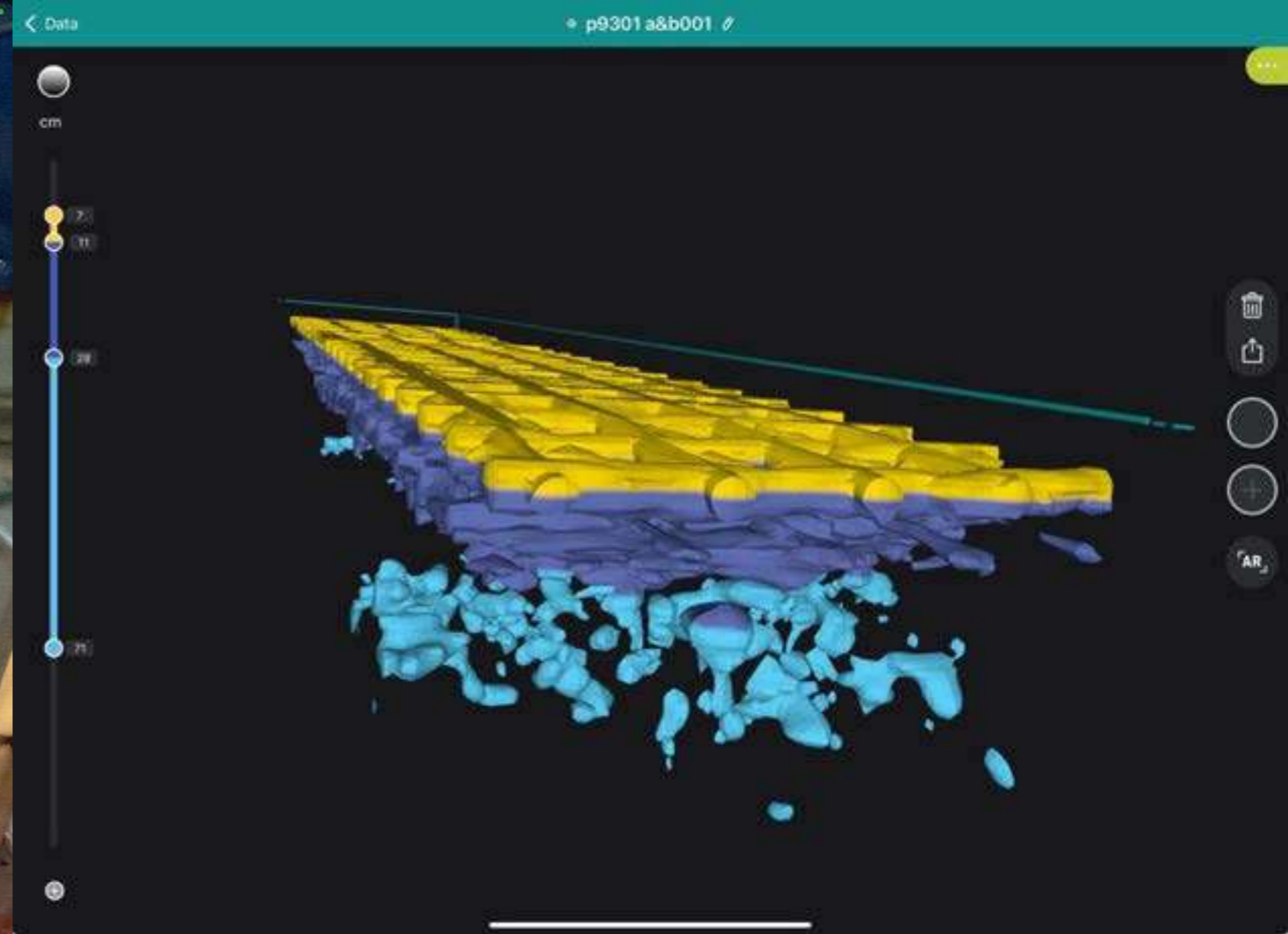


WIP Hydro-dem
Analysis



Challenge

Plantroom – Pump Stabilisation



Confirmed construction joint location in reinforcement

Suspected voiding and incomplete injection repair



Case Study

Edinburgh Airport – MSCP Inspection

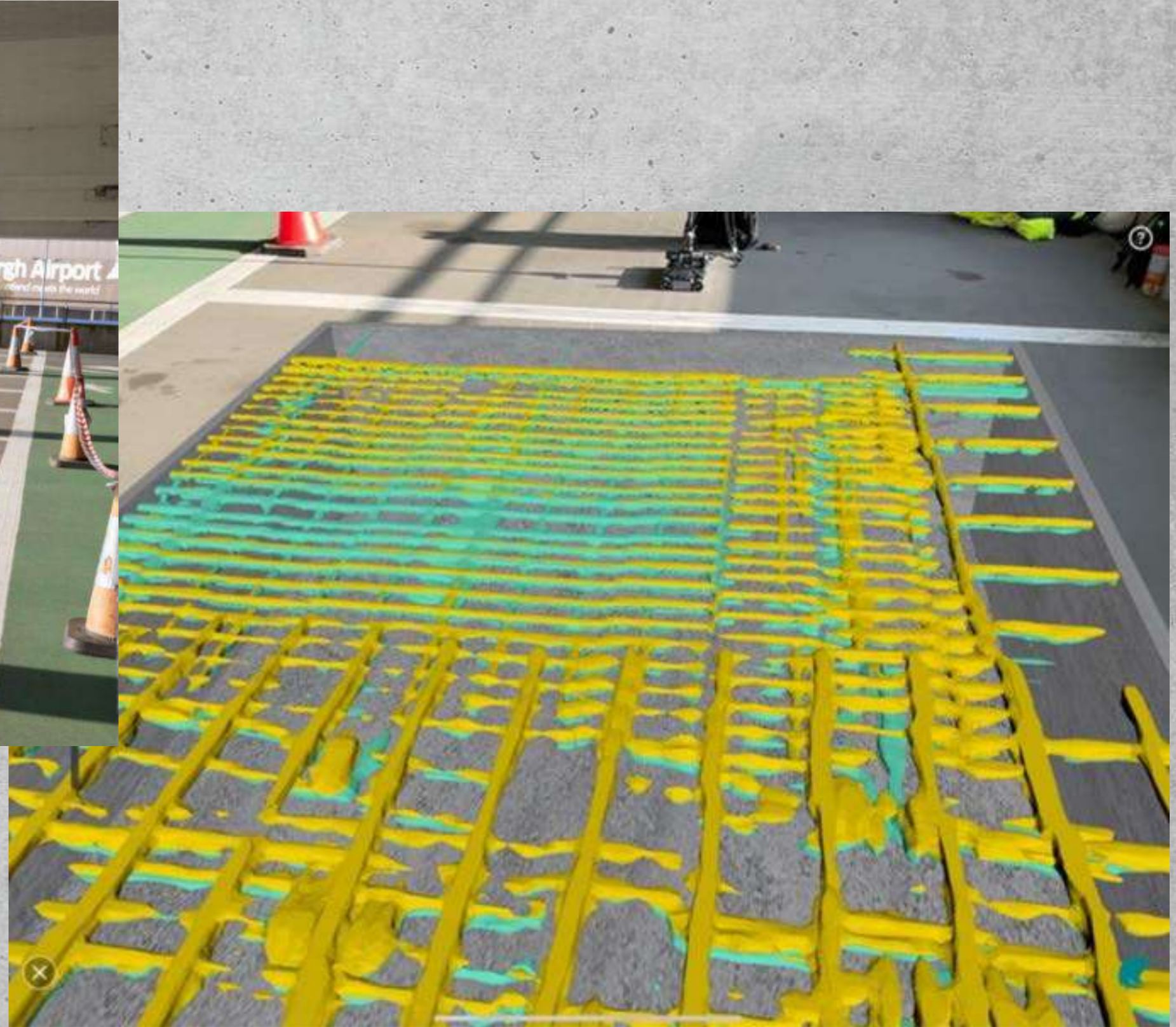


Built in 2004, has six floors (from the ground floor to the roof deck) and can hold several thousand cars.



Case Study

Edinburgh Airport – GPR Data



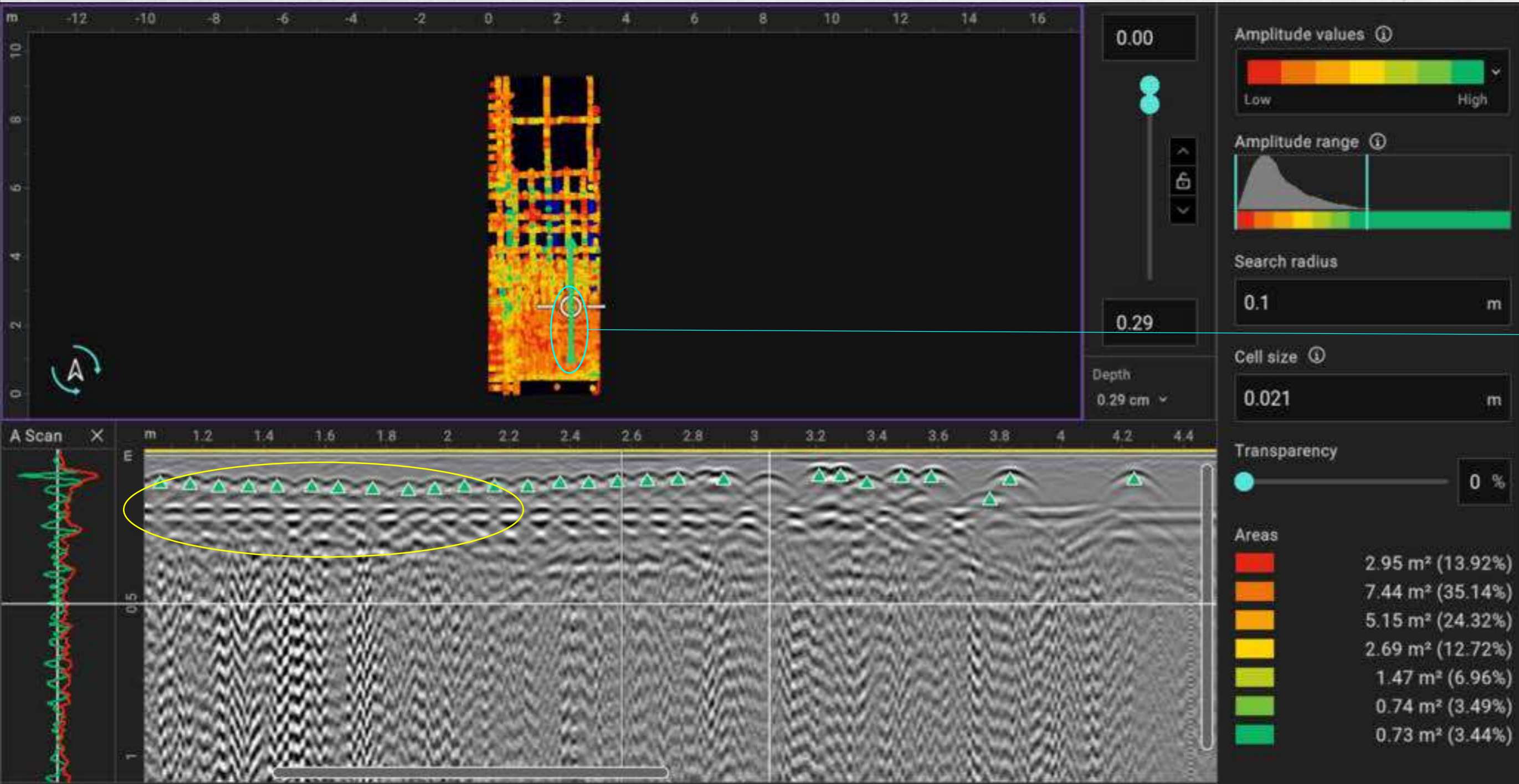
GPR scan undertaken 1st floor parking area

AR image from area scan

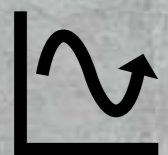


Case Study

Edinburgh Airport – GPR Data



Insights
post processing
highlights lower
amplitude

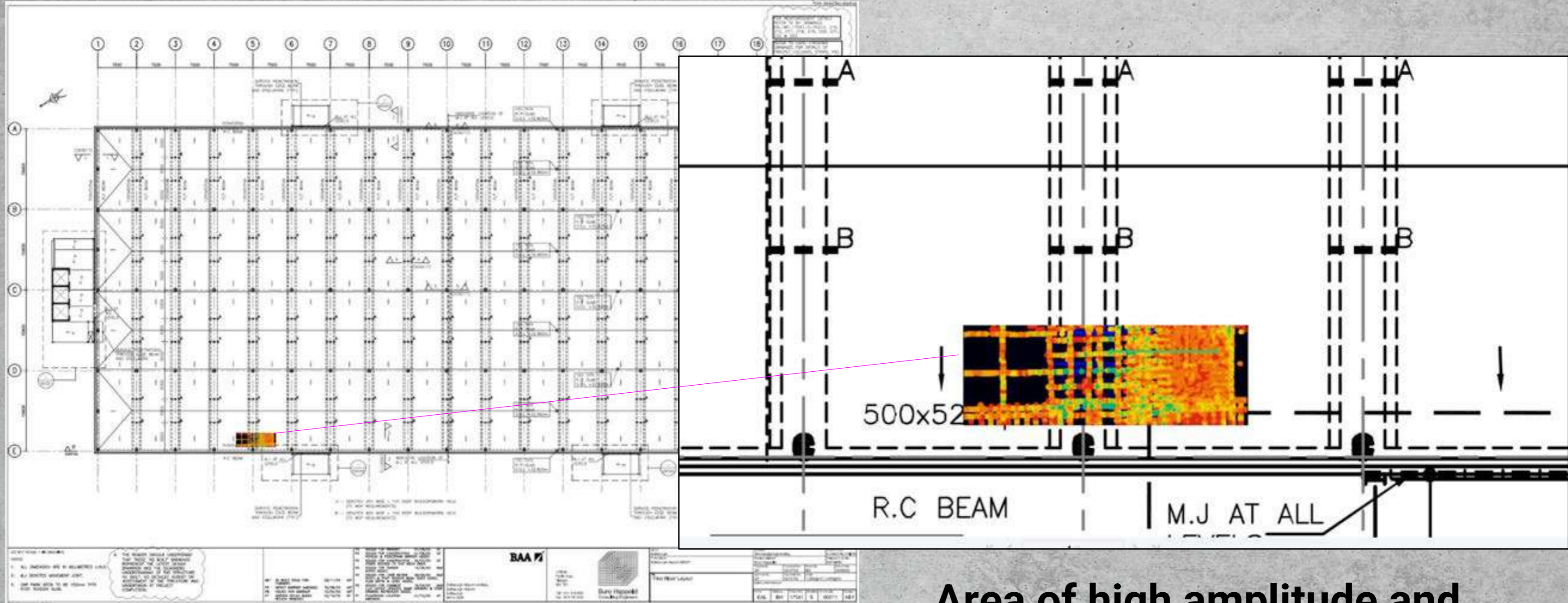


B Scan data shows lower amplitude up to 0.8m length



Case Study

Edinburgh Airport – GPR Data

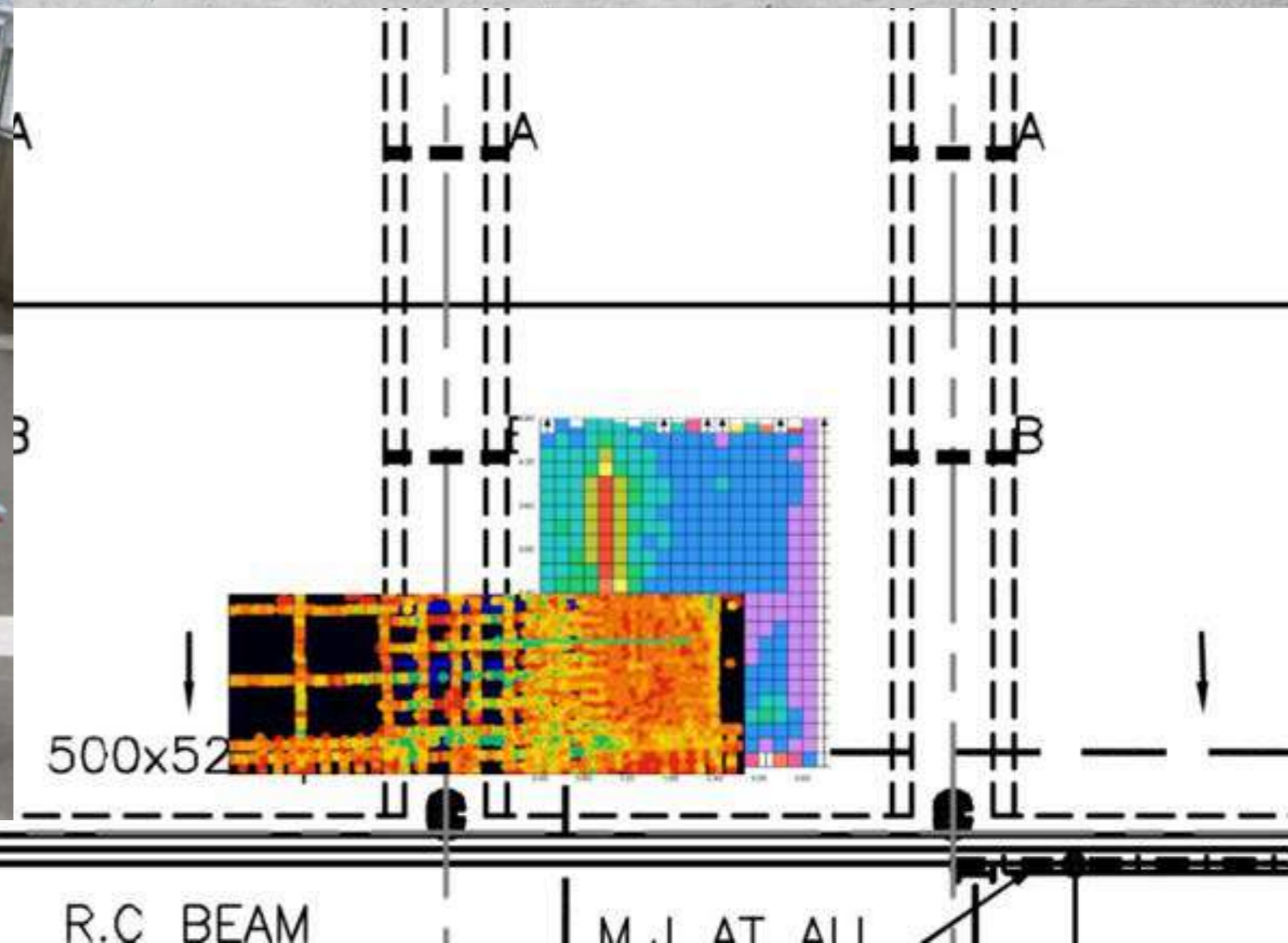


Area of high amplitude and likely corrosion clearly shown and overlaid



Case Study

Edinburgh Airport – Half Cell Corrosion Data



Area of high potential identified by half cell corrosion sensor & software

When overlaid by GPR, areas of high corrosion potential



Challenge

Grouting Defects in Post-tensioning



Properly Grouted
No Corrosion



Grouting Defect
Light Corrosion



Grouting Defect
Heavy Corrosion

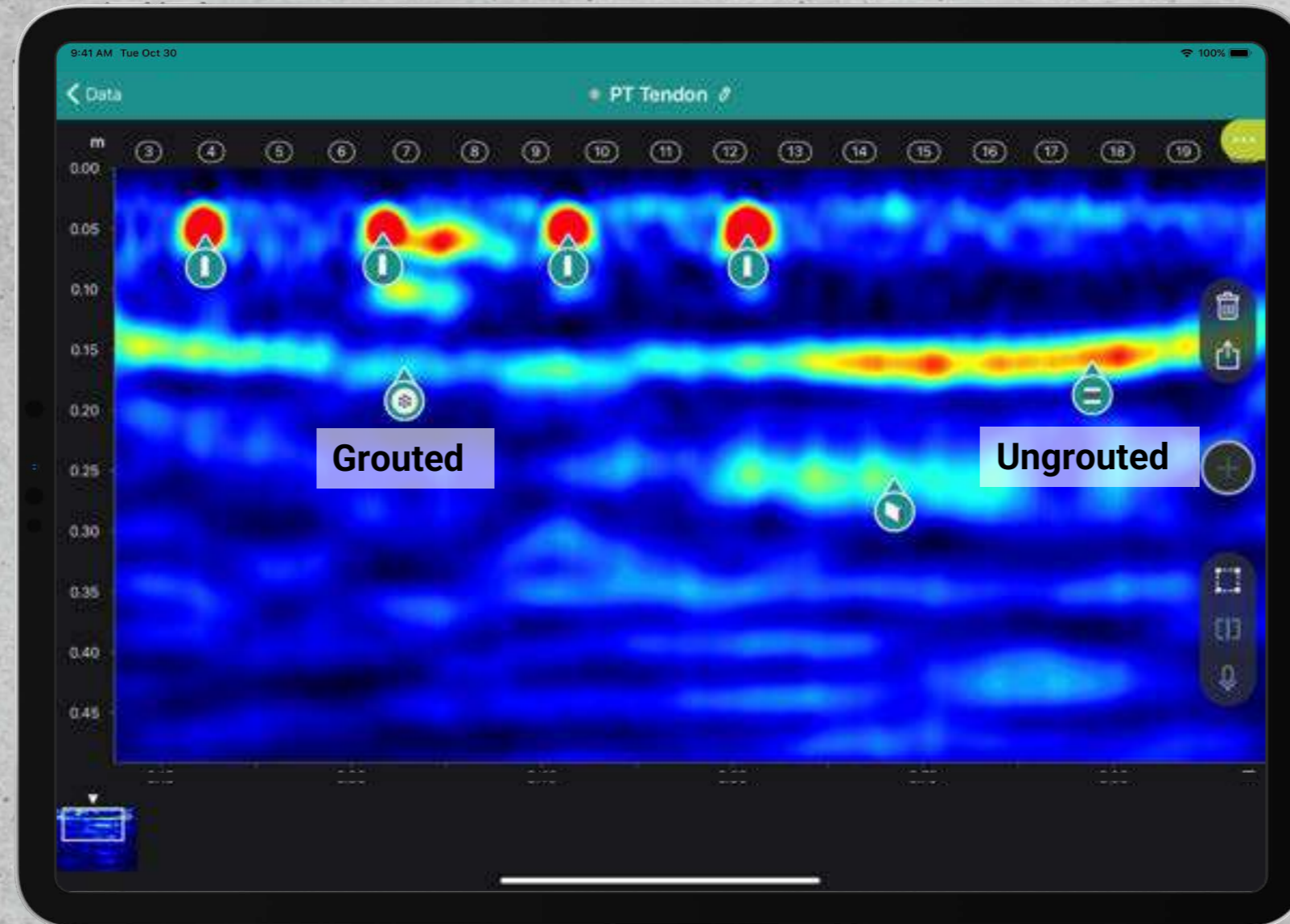
Tendon failures will result in a full or partial **collapse** of the structure!



Solution

Inspection Tech for Grouting Defects in Post-tensioning

 Ultrasound Pulse Echo (Pundit)



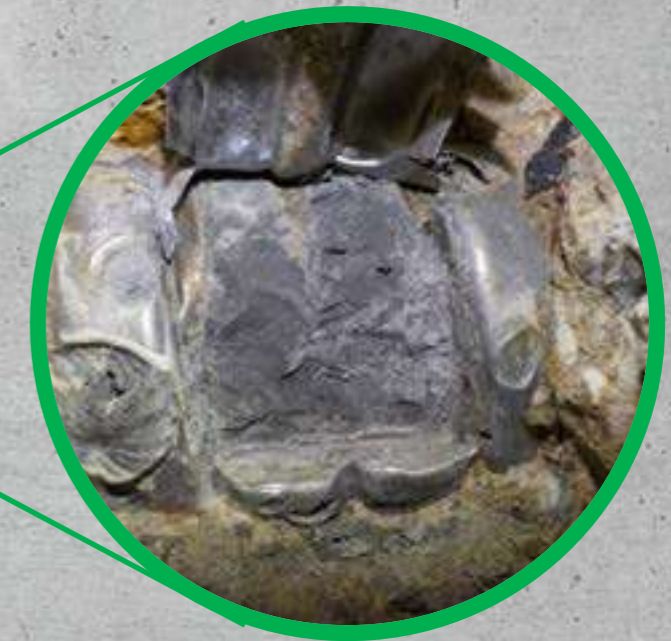


Solution

Inspection Tech for Grouting Defects in Post-tensioning



Borescope verification



Borescope verification

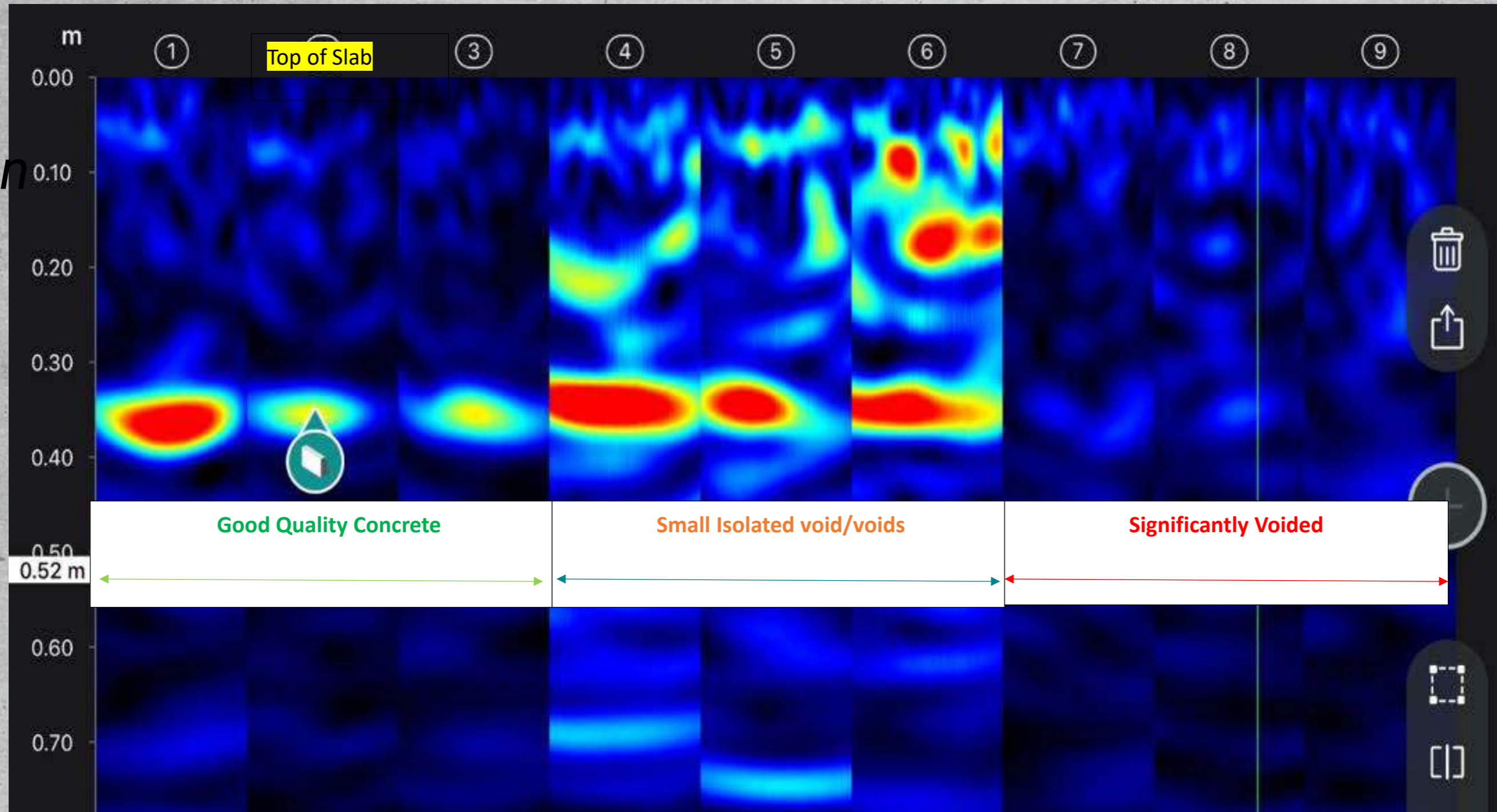
* Courtesy of Henderson
Thomas Associates



Challenge

New Build Quality with Steel Wire Fibre Concrete

Ultrasound Scans



Courtesy





Challenge

New Build Quality with Steel Wire Fibre Concrete



*Formed SWF
Concrete*



*Voided SWF
Concrete*



Challenge

New Build Quality with Steel Wire Fibre Concrete

*Seriously
Concerned - SWF
Concrete*





Challenge

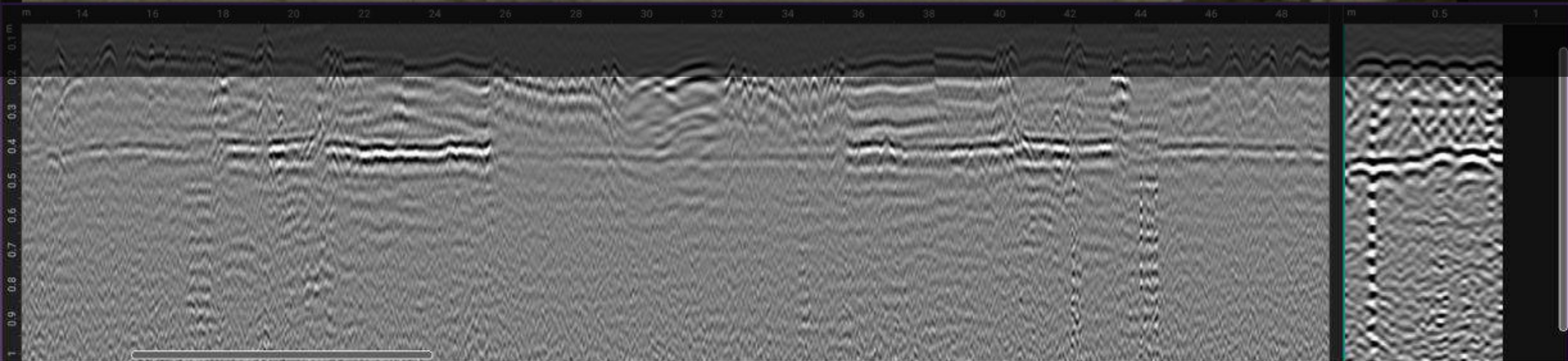
New Build Quality with Steel Wire Fibre Concrete

CCT
V





Protect the Built World



Safe Digging: Let's Make a Difference

LUNCH BREAK

**EXHIBITIONS &
DEMONSTRATIONS**



Safe Digging for All

Rick Crowhurst

CECA South - Heathrow

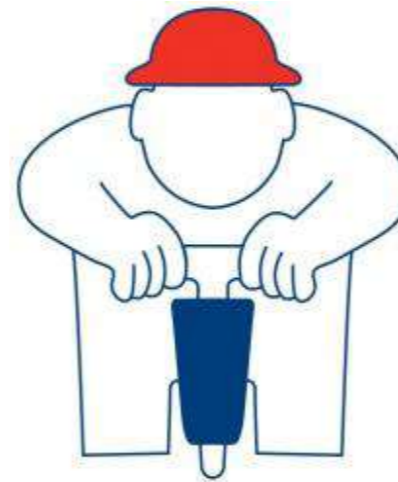
18th February 2025

Safe Digging for All

LSBUD (Linesearch Beforeudig)

LSBUD exists to reduce the risk of deaths, injuries, damage and disruption caused by asset strikes

3.85 million enquiries in 2024



Free to use portal for multiple utility plans across the UK

Over 300,000 Registered Users growing by 3000 every month

160+ Members covering 1,900,000 km of underground assets

Safe Digging for All



LSBUD Members & Users

FOUNDER MEMBERS



MAINLINE PIPELINES LIMITED



exolum

160+ MEMBERS



310,000+ USERS



Safe Digging for All



Our Members include...

2003

2012

Safe Digging for All



Our Members include...

2012

 <p>WESTERN POWER DISTRIBUTION <i>Serving the Midlands, South West and Wales</i></p>	 <p>SEABANK POWER</p>	 <p>manxcable company limited</p>	 <p>Transmission Capital</p>	 <p>bp</p>
 <p>EIRGRID</p>	 <p>ESP UTILITIES GROUP</p>	 <p>Gamma</p>	 <p>Orsted</p>	 <p>ESB</p>
 <p>concept solutions people.</p>	 <p>zayo GROUP</p>	 <p>VATTENFALL</p>	 <p>NORTHUMBRIAN WATER <i>living water</i></p>	 <p>ESSEX & SUFFOLK WATER <i>living water</i></p>
 <p>exolum</p>	 <p>Lightsource</p>	 <p>CEMEX</p>	 <p>petroineos REFINING AND TRADING</p>	 <p>eni</p>
 <p>PENSPEN</p>	 <p>CATS</p>	 <p>Synthol energy company</p>	 <p>City of Westminster</p>	 <p>FULCRUM</p>
 <p>westernlink</p>	 <p>cng services</p>	 <p>SELCHP energy recovery facility</p>	 <p>SGN Your gas. Our network.</p>	 <p>UK Power Networks</p>

2017

Safe Digging for All



Our Members include...

2017

2020

Safe Digging for All



Our Members include...

2021

2024

Safe Digging for All



Our Members include...

2025

				
				
				
	<p>Coming soon:</p>			
<p>Northern Ireland :</p>				
				

Safe Digging for All



LSBUD Data Collection

New enquiry

Enquiry details
Information about the work site, and the type of work involved

Enquiry type*
Information Only

Work category*
Development Projects

Work type*
Demolition (with explosives)

Job start date* 23 May 2023 Job end date* 23 May 2023

Your reference*
LSBUD TEST JOB ONLY

Preferred plan paper size* A4 Preferred plan size* 1250

Working on behalf of*
Other

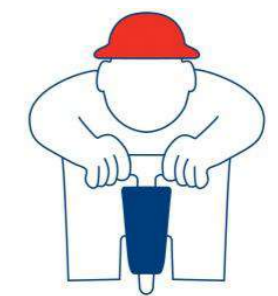
Name of utility/authority
— Select one —

The contact name
LSBUD TEST JOB ONLY

The contact telephone no.

Next Back Help

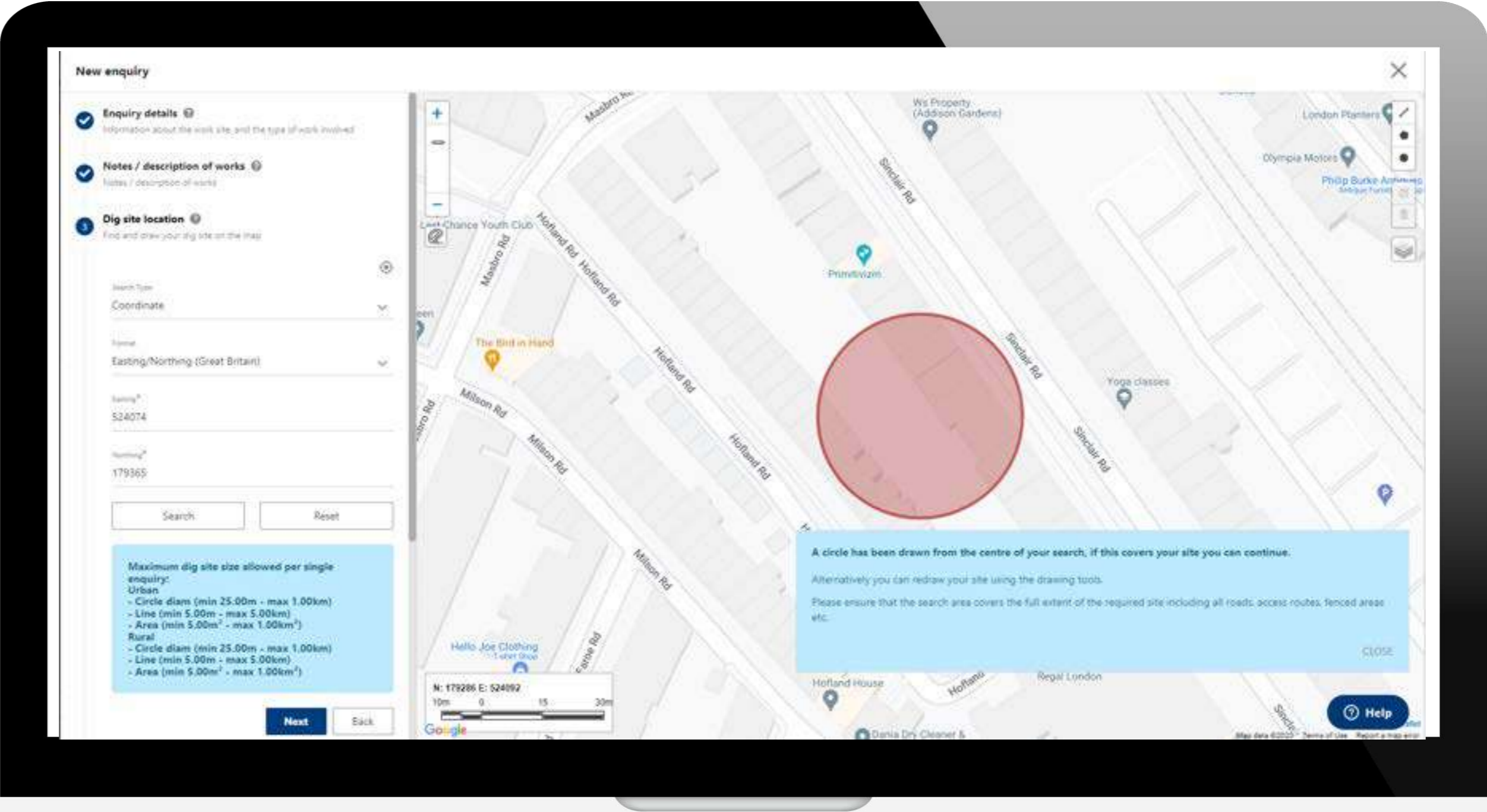
Provide details about your enquiry



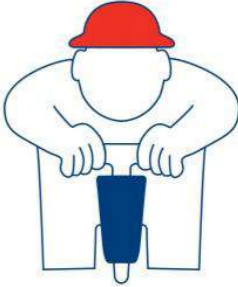
Safe Digging for All



LSBUD Work Site



Define your work area



Safe Digging for All



LSBUD Work Site

New enquiry

Enquiry details
information about the work site, and the type of work involved

Dig site location
Find and draw your dig site on the map

Search Type:
Postcode/Town:
Postcode/Town:
NE46 ZIP

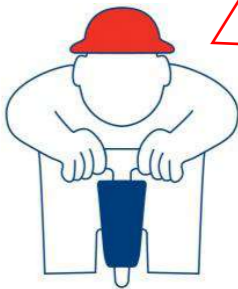
Search Reset

Maximum dig site size allowed per single enquiry:
Urban
- Circle diam (min 25m - max 1km)
- Line (min 5m - max 5km)
- Area (min 5m² - max 1km²)
Rural
- Circle diam (min 25m - max 1km)
- Line (min 5m - max 5km)
- Area (min 5m² - max 1km²)

By submitting you agree that this enquiry, including the address, the location of the drawn dig site and all other enquiry details are accurate and correct.

Submit Back

This site is protected by reCAPTCHA and the Google Privacy Policy and Terms of Service apply.



Define your work area

Safe Digging for All



LSBUD Enquiry results

Planned Works 34565594

Top-Up Service EMAPSITE Actions New Enquiry



1 Enquiry details
Information about the worksite and type of work involved

Enquiry type
Planned Works

Work category
Utility Works

Work type
Multiple excavations site (1.5m or shallower)

Enquiry lodged on
30/08/2024 - 01:52:36 pm

Enquiry start date
09/09/2024

Enquiry end date
12/09/2024

Your reference
LSBUD TEST JOB

Preferred plan paper size
A4

Preferred plan scale
1:250

Working on behalf of
Private

Affected Members 2

Affected LSBUD members

Thank you for your enquiry

Shortly you will receive an email confirming your enquiry and listing the Asset Owners who will contact you regarding the location of their assets.

It is **your responsibility** to identify the presence of any underground/aboveground assets in and around your proposed site. Please be aware that not all Asset Owners are registered with this service so it is your responsibility to identify and contact any Asset Owners not listed here as either Inside or Outside the Zone of interest.

If you are required to email additional info please note that we need the following:
Site contact name and number, Location plan, Detailed plan (minimum scale 1:2500), Cross sectional drawings (if available), Work Specification.

CLOSE

LSBUD Members who have assets registered on the LSBUD service within the vicinity of your search area. Do not proceed until **all** Members listed below have confirmed that your works can continue.

Northern Gas Networks Limited 🔥 Gas - Await Response	Phone/Email 08000407706 (opt 3)	Emergency Only 0800111999
Northumbrian Water Limited 💧 Water - Await Response	Phone/Email 03702417408	Emergency Only 03457171100
Zayo Group UK Ltd c/o JSM Group Ltd 📡 Fibre / Comms - Await Response	Phone/Email 01992 655 919	Emergency Only 0800 109 1646

List of not affected LSBUD members

Non-LSBUD members (Asset owners not registered on LSBUD)

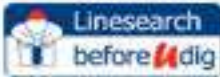
The following non-LSBUD members may have assets in your search area. It is YOUR RESPONSIBILITY to contact them before proceeding. Please be aware this list is not exhaustive and it is your responsibility to identify and contact all asset owners within your search area.



Safe Digging for All



LSBUD Confirmation Documents




Enquiry Confirmation

LSBUD Ref: 34565594

Date of enquiry: 30/08/2024
Time of enquiry: 13:52


Enquirer			
Name	Mr Fawn Wardrop	Phone	07970686255
Company	LineasearchbeforeUdig	Mobile	Not Supplied
Address	Blot Park Innovation Centre 4 Barling Way, Nuneaton Warwickshire CV10 7RN		
Email	fawn.wardrop@lsbud.co.uk		

Enquiry Details	Site Map																										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Enquiry type</td><td>Planned Works</td></tr> <tr><td>Work category</td><td>Utility Works</td></tr> <tr><td>Work type</td><td>Multiple excavations site (1.5m or shallower)</td></tr> <tr><td>Work type buffer*</td><td>25 metres</td></tr> <tr><td>Start date</td><td>06/09/2024</td></tr> <tr><td>End date</td><td>12/09/2024</td></tr> <tr><td>Scheme/Reference</td><td>LSBUD TEST JOB</td></tr> <tr><td>Search location</td><td>NEM2P</td></tr> <tr><td>Confirmed location</td><td>361716 562337</td></tr> <tr><td>Site size</td><td>90 metre diameter</td></tr> <tr><td>Site Contact Name</td><td>Mr Kenny Loggins</td></tr> <tr><td>Site Phone No.</td><td>01234567890</td></tr> <tr><td colspan="2">LSBUD TEST JOB ONLY</td></tr> </table>	Enquiry type	Planned Works	Work category	Utility Works	Work type	Multiple excavations site (1.5m or shallower)	Work type buffer*	25 metres	Start date	06/09/2024	End date	12/09/2024	Scheme/Reference	LSBUD TEST JOB	Search location	NEM2P	Confirmed location	361716 562337	Site size	90 metre diameter	Site Contact Name	Mr Kenny Loggins	Site Phone No.	01234567890	LSBUD TEST JOB ONLY		 <p>Map data ©2024</p>
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Site Contact Name	Mr Kenny Loggins																										
Site Phone No.	01234567890																										
LSBUD TEST JOB ONLY																											
<p>Description of Works</p> <p>Please note that the above map only displays the location of the proposed work site and will not display any of the Members' pipes and cables. It is imperative that this area accurately reflects the proposed work site.</p>																											

Affected LSBUD members:
(LSBUD Members who have assets registered on LSBUD within the vicinity of your search area.)
Do not proceed until all Members listed below have confirmed that your works can continue.

Asset Owner	Phone/Email	Emergency Only	Status
Northern Gas Networks Limited	0800407766 (opt 3)	0800 11999	Await response
Norfolk Water Limited	03702417409	03437 17100	Await response
Najo Group UK Ltd (a JSM Group Ltd)	01902 855 319	0800 169 1646	Await response

Status explanation
Await Response means that the asset owner will contact you. This is typically by sending the plan response but they may ask for further information before being able to do so, particularly if any payments or authorisations are required.
Email Additional Info means that the asset owner needs further information about your works to assess your enquiry before providing a response. Please provide any details you have available including plans, method statements etc. if available.



Enquiry Confirmation

LSBUD Ref: 34565594

Date of enquiry: 30/08/2024
Time of enquiry: 13:52

Important notices


It is very important that you correctly understand what the service does and the procedures in order for you to work safely. Please refer to the LSBUD Support Page (www.lsbud.co.uk/lineasearchbeforeudig-support) for further guidance. This information includes how to provide additional information to the LSBUD Members who request it to provide a response to your enquiry.

Validity and search criteria. The results of this enquiry are based on the confirmed information you entered and are valid only as at the date and time of the enquiry. It is your responsibility to ensure that the Enquiry Details are correct, and LineasearchbeforeUdig (LSBUD) accepts no responsibility for any errors or omissions in the Enquiry Details or any consequences thereof. LSBUD Members update their asset information on a regular basis so you are advised to consider this when undertaking any works. It is your responsibility to choose the period of time after which you need to resubmit any enquiry but the maximum time (after which your enquiry will no longer be dealt with by the LSBUD Helpdesk and LSBUD Members) is 28 days. If any details of the enquiry change, particularly including, but not limited to, the location of the work, then a further enquiry must be made.

Terms and Conditions. Please note that this enquiry is subject always to our standard terms and conditions available at www.lsbud.co.uk ("Terms of Use") and the disclaimer at the end of this document. Please note that in the event of any conflict or ambiguity between the terms of this Enquiry Confirmation and the Terms of Use, the Terms of Use shall take precedence.

List of not affected LSBUD members:
(LSBUD Members who do not have assets registered on the LSBUD service within the vicinity of your search area.)

Angus Energy	AWE Pipeline	B & D Energy Limited
Barbour Beauty Investments Limited	BBC Limited (A Member of the Linde Group)	Bus Broadband
BP Exploration Operating Company Limited	BPA	Cadent Gas
Cambridge Water	Cambridgeshire County Council Climate Change and Energy Services	CATS Pipeline (a Wood Group PSN)
Cemex	Centria Storage Ltd	CNG Services Ltd
Concept Solutions Peggie Ltd	Concepts (UK) Teleside Operator Ltd	D & Smith
Diamond Transmission Corporation	DTC (MOO Use Pipelines)	Drax Power Limited
E.ON UK CHP Limited	EDF Energy Renewables Ltd	EET Fuels
Electric	Electric Limited	Electricity North West Limited
Energy Assets Networks	Eni & Honor (a Penapen Ltd)	ENOS NND Limited
EP Langage Limited	ESB OCGT Power station (Camrington Gas Pipeline)	EDF Utilities Group
Esso Petroleum Company Limited	evitebooks Fiber UK Ltd	EXA Infrastructure
Evonik Pipeline System	Fulcrum Electricity Assets Limited	Fulcrum Pipelines Limited
G-Network Communication Ltd (a JSM Group Ltd)	Gamma	Gas Networks Ireland (UK)
Gateshead Energy Company	Glaxoair Ltd	Greenlink Interconnector Ltd
Harbour Energy	Heathrow Airport LTD	Humbly Grove Energy
IGas Energy	INEOS PPG Pipelines	INEOS Manufacturing (Scotland and TSEF)
INOVIN ChlorVinyls Limited	INOVIN Enterprises Limited	Intergen (Canyon Energy or Spalding Energy)
Jurisdac Fibre Ltd	Kensa Utilities	Laft Mile
Machine Pipelines Limited	Manchester Jetline Limited	Mark Cable Systems
Marineport Power Ltd (GAS Pipelines)	Marathon Total Limited	MUA Group Limited
National Gas Transmission	National Grid Electricity Distribution	National Grid Electricity Transmission
National Grid Ventures	Ned Networks	NPower CHP Pipelines
NTT Global Data Centers EMEA UK Ltd	NTNet Ltd	Oil
OKS Storage Limited	Orsted	Oxym Paper Ltd
Petropac UK Limited (Purbeck Southampton Pipeline)	Petronex	Phillips 66
Portsmouth Water	Premier Transmission Ltd (CHP)	Redundant Pipelines - LPGA
RWE - Great Yarmouth Pipeline (Barton to Great Yarmouth Power Station)	RWEpower (Little Barton and South Haven)	SABIC UK Petrochemicals
SAS Utility Services Ltd	Scottish and Southern Electricity Networks	Scottish Power Generation
Seabank Power Ltd	SEB Water	SGN
Shell	Shell NOP	South Staffs Water



Enquiry Confirmation

LSBUD Ref: 34565594

Date of enquiry: 30/08/2024
Time of enquiry: 13:52

BP Energy Networks	Comq Pipes Limited	South Essex Networks
GBE Generation Ltd	GBE Transmission	SOE Utility Solutions Limited
Clarengy	Tata Communications (a JSM Construction Ltd)	TL - London Underground HV Cables (Road Side Cables)
Coop Limited	Total Composite Pipelines	Total Pipeline Pipelines
Transmission Capital	Triplan Energy Limited	UK Power Networks
Uniper UK Ltd	University of Cambridge Grants Backbone Network	valentia
Veolia ED DELCHP Limited	Veolia ES Sheffield Ltd	Vonbus Limited
VPI Power Limited	Wales and West Utilities	Wales Power
West of Duddon Sands Transmission Ltd	West Sussex OpenNetwork (Cooperative National Infrastructure)	Westminster City Council

Non-LSBUD members (Asset owners not registered on LSBUD)
(The following Non-LSBUD Members may have assets in your search area. It is YOUR RESPONSIBILITY to contact them before proceeding. Please be aware this list is not exhaustive and it is your responsibility to identify and contact all asset owners within your search area.)

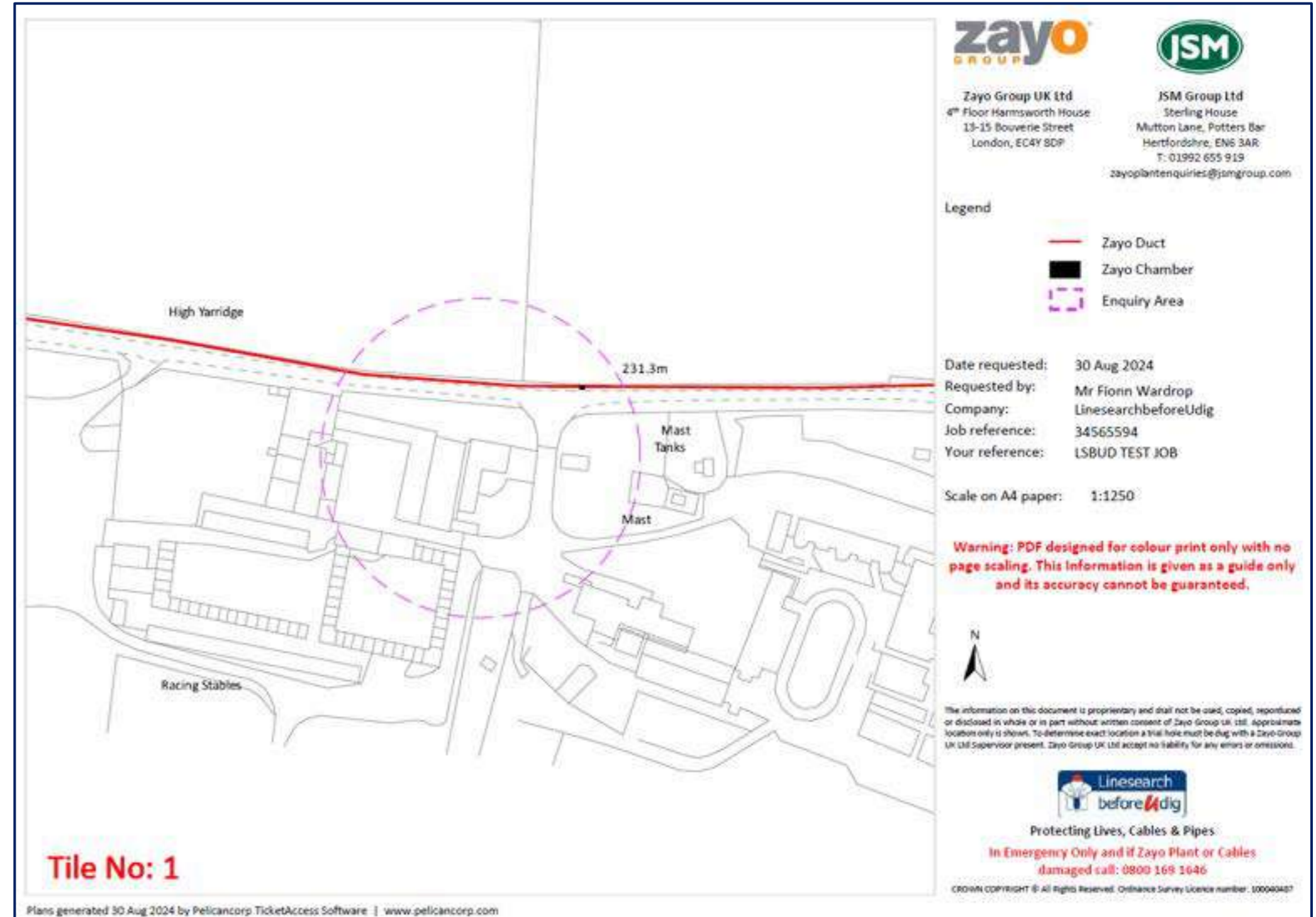
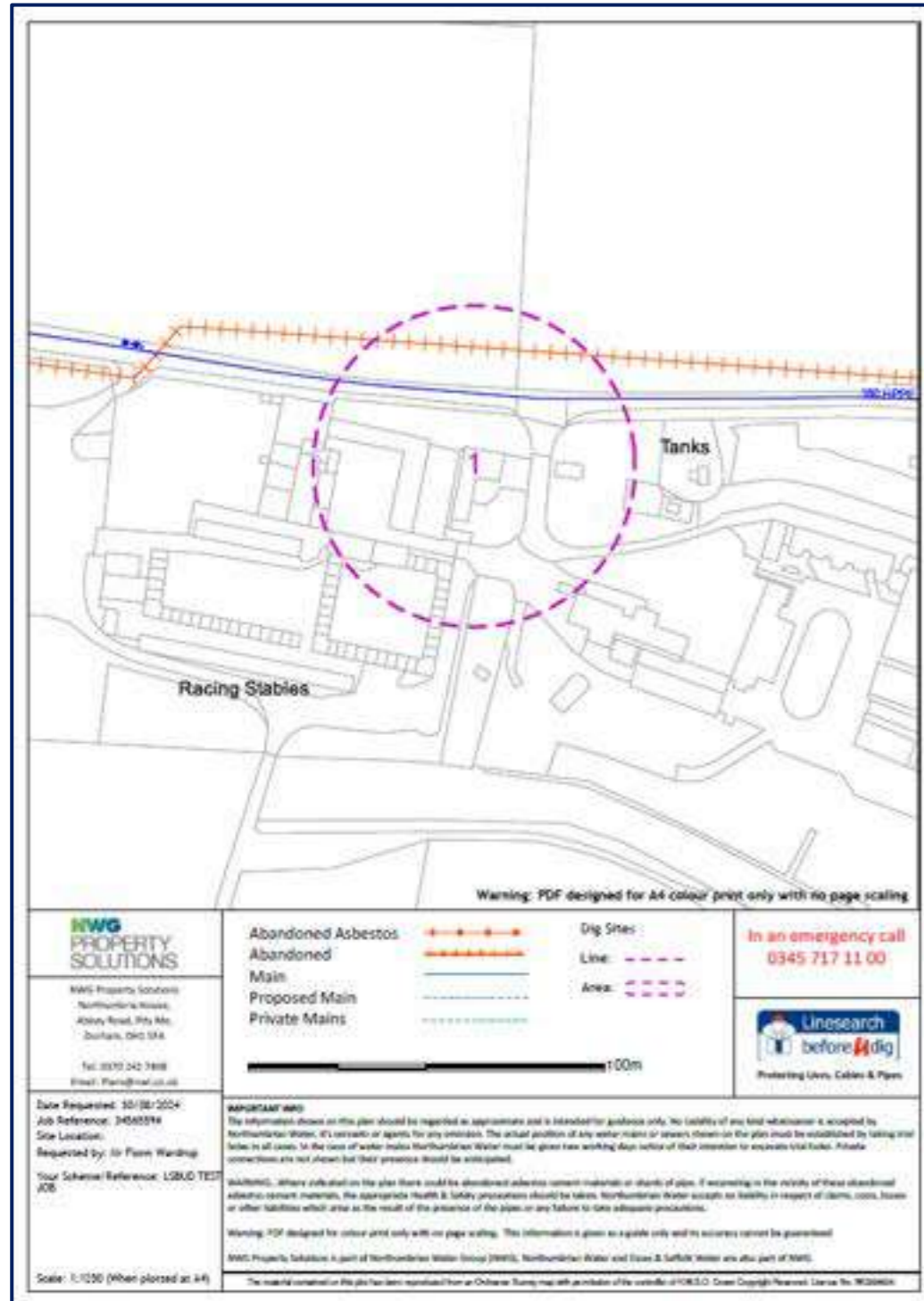
Asset Owner	Preferred contact method	Phone	Status
BT Energy	btwa@btenergy.com	0800 130 3600	Not Notified
BT	https://www.sams.bt.com/plmberwelcome-home	08000210023	Not Notified
Cityfibre	asset.team@cityfibre.com	033 3150 7252	Not Notified
Co2	plmberenquiries@calsonic.com	01227746427	Not Notified
GTCC	http://pa.gov.uk.co.uk/PlantingMembership	0139240363	Not Notified
Lumen Technologies	plmberenquiries@lumen.com	02587 314813	Not Notified
Moore Brabazon Helixon Limited	iron_plmberenquiries@lumen.com	01212 621 100	Not Notified
Northern Powergrid	Safedg@npg.com	01912394294	Not Notified
Northumberland County Council	plmberworks@northumberland.gov.uk	03456006400	Not Notified
Sota	sota.plmberenquiries@ocugroup.com		Not Notified
Utility Assets Ltd	assetenquiries@utilityassets.co.uk		Not Notified
Vertzon Business	cap-team@uk.vertzonbusiness.com	012536 11736	Not Notified
Virgin Media	http://www.virginmedia.com	08708851716	Not Notified
Vodafone	asn.enquiries@vodafone.com	01254882581	Not Notified

Disclaimer
Please refer to LSBUD's Terms of Use for full terms of use available at www.lsbud.co.uk. The results of this Enquiry are personal to the Enquirer and shall not be shared with or relied upon by any other party. The asset information on which the Enquiry results are based has been provided by LSBUD Members, therefore LSBUD will provide no guarantee that such information is accurate or reliable nor does it monitor such asset information for accuracy and reliability going forward. There may also be asset owners which do not participate in the enquiry service operated by LSBUD, including but not exclusively those set out above. Therefore, LSBUD cannot make any representation or give any guarantee or warranty as to the completeness of the information contained in the enquiry results or accept any responsibility for the accuracy of the mapping images used. LSBUD and its employees, agents and consultants accept no liability (save that nothing in this Enquiry Confirmation excludes or limits our liability for death or personal injury arising from our negligence, or our fraud or fraudulent misrepresentation, or any other liability that cannot be excluded or limited by English law) arising in respect thereof or in any other way for errors or omissions including responsibility to any person by reason of negligence.

Safe Digging for All



LSBUD Plan Response Examples



Safe Digging for All



Connecting with LSBUD Members



Asset specific
safe digging
instruction and
contact details

Safe Digging for All



LSBUD Search App



LOGIN REGISTER SERVICE STATUS SPEAK OR TRANSLATE

Linesearch before u dig

HOME USERS MEMBERS SAFETY NEWS & CAMPAIGNS SUPPORT ADDITIONAL SERVICES THE LARRIES ABOUT CONTACT

LSBUD ANNOUNCEMENT – THE LSBUD APP IS LIVE

03/08/2023

We are very excited to announce that the LSBUD app is now live and ready to download! Please head over to your mobile phone's app store and search 'LSBUD' to download an updated mobile version of our service! Featuring a user-friendly look, geolocation and more.



It's exciting for us to share this fantastic news with you all and another way to use our free service, at your fingertips!

LATEST

- IMPORTANT UPDATE – Defence Infrastructure Organisation: Abandoned Pipelines Removed from LSBUD
- LSBUD Welcomes South Staffs Water & Cambridge Water
- LSBUD Announcement – Select Surveys Joins LSBUD Group
- LSBUD – User Webinars
- The LSBUD Search API
- LSBUD Welcomes toob
- LSBUD Welcomes Welsh

Safe Digging for All



LSBUD Advanced Services



Search API Service

The Search API Service is ideal for high volume searches



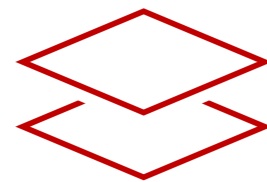
Top-Up Service

This service tops-up your LSBUD enquiry to include all known utilities



Large Site Service

The Large Site Service creates multiple enquiries from a single polygon



Digital Insight Service

This comprehensive utility report includes the option for digital asset layers



LSBUD Webinar Series 2025

Held on Teams from 14:30-15:15

- Thursday 27th February: *Meet the Member: UKPN*
- Thursday 27th March: *LSBUD Advanced Services*

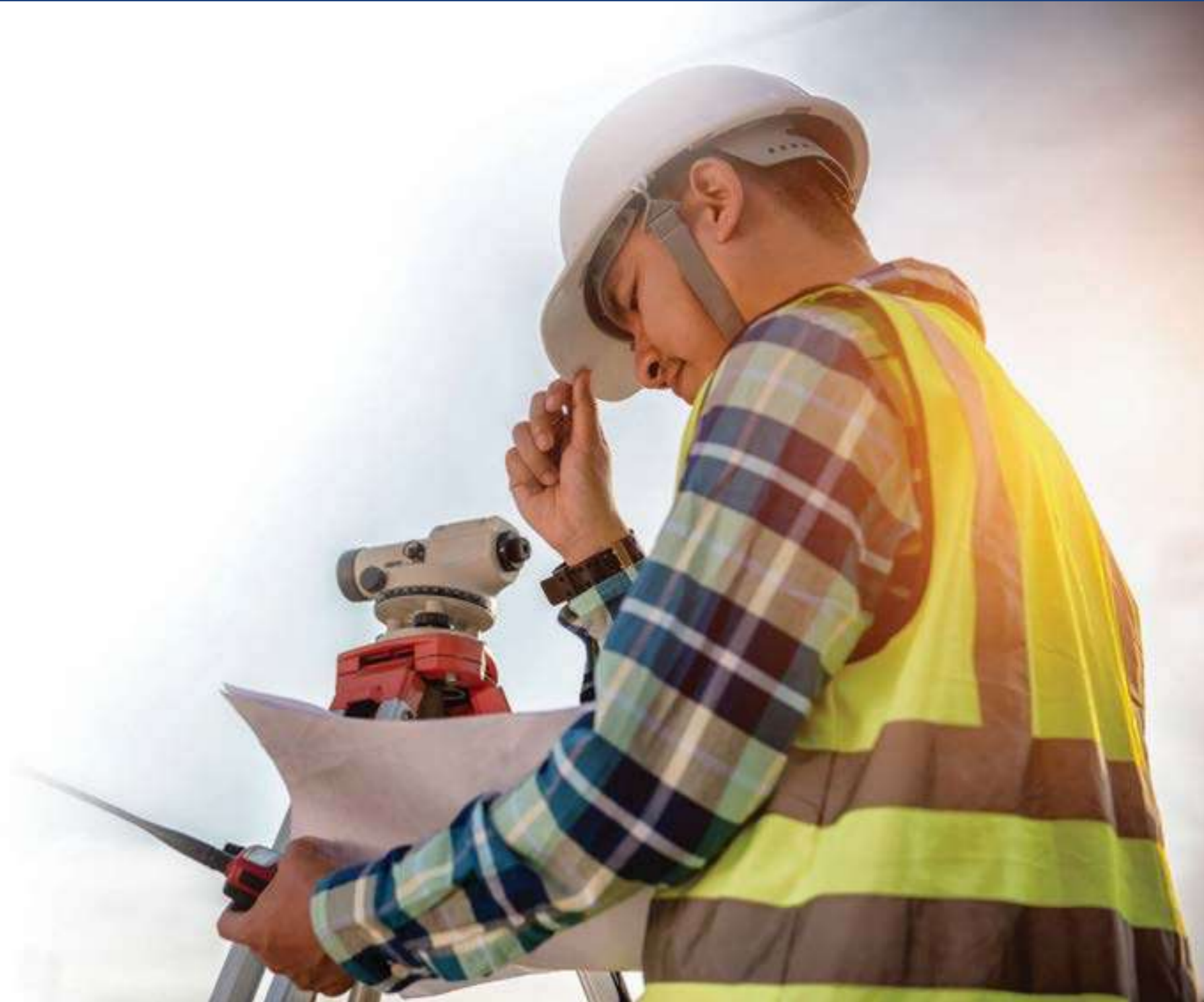


Safe Digging for All



LSBUD Safe Digging for All

LSBUD (*Linesearch beforeUdig*) is for anyone & everyone involved in construction, excavation, fencing, ditching, works likely to break ground (*of any scale*) from a highway scheme to simply replacing a garden fence.



Safe Digging for All



Safe Digging for All



Safe Digging for All

Any questions?

Rick Crowhurst

07816 190540

richmond.crowhurst@lsbud.co.uk



Safe Digging for All



Stephen Walker, Managing Director

CSTA Global

Steve.walker@cstaglobal.com

www.cstaglobal.com

0333 3050190



CSTA Global

Innovation in Utility Protection

•Safe Digging “Lets Make a Difference”



CSTA Global

Innovation in Utility Protection

- **There is estimated to be around 4 million kilometres of buried pipes and cables in the UK,**
- **A hole is dug every 7 seconds to install, fix, maintain or repair these assets**
- **They are critical in keeping the water running, gas and electricity flowing and our telecommunications lines connected.**



CSTA Global

Innovation in Utility Protection

Department for Science, Innovation and Technology, Geospatial Commission
and Viscount Camrose

Published

23 November 2023

What is Safe Digging

- Planning
- Information Technology
- GPR
- EML
- Hand tools
- HSG47
- PAS 128
- NUAR
- LSBUD
- PUMA
- Power tools
- 360 Excavators
- 180 Excavators
- Mini Diggers
- Vacuum Excavators
- Training
- Competence
- Surveys
- Knowledge
- Experience
- Qualifications



CSTA Global
Innovation in Utility Protection

The Health and Safety at Work Act 1974

An Act to make further provision for securing the health, safety and welfare of persons at work, for protecting others against risks to health or safety in connection with the activities of persons at work, for controlling the keeping and use and preventing the unlawful acquisition, possession and use of dangerous substances, and for controlling certain emissions into the atmosphere, to make further provision with respect to the employment medical advisory service, to amend the law relating to building regulations, and the Building (Scotland) Act 1959, and for connected purposes.

[31st July 1974]



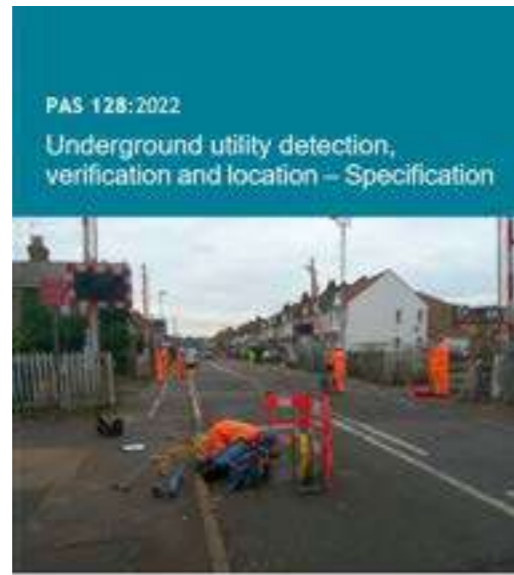
Decisions



CSTA Global

Innovation in Utility Protection

The UK has

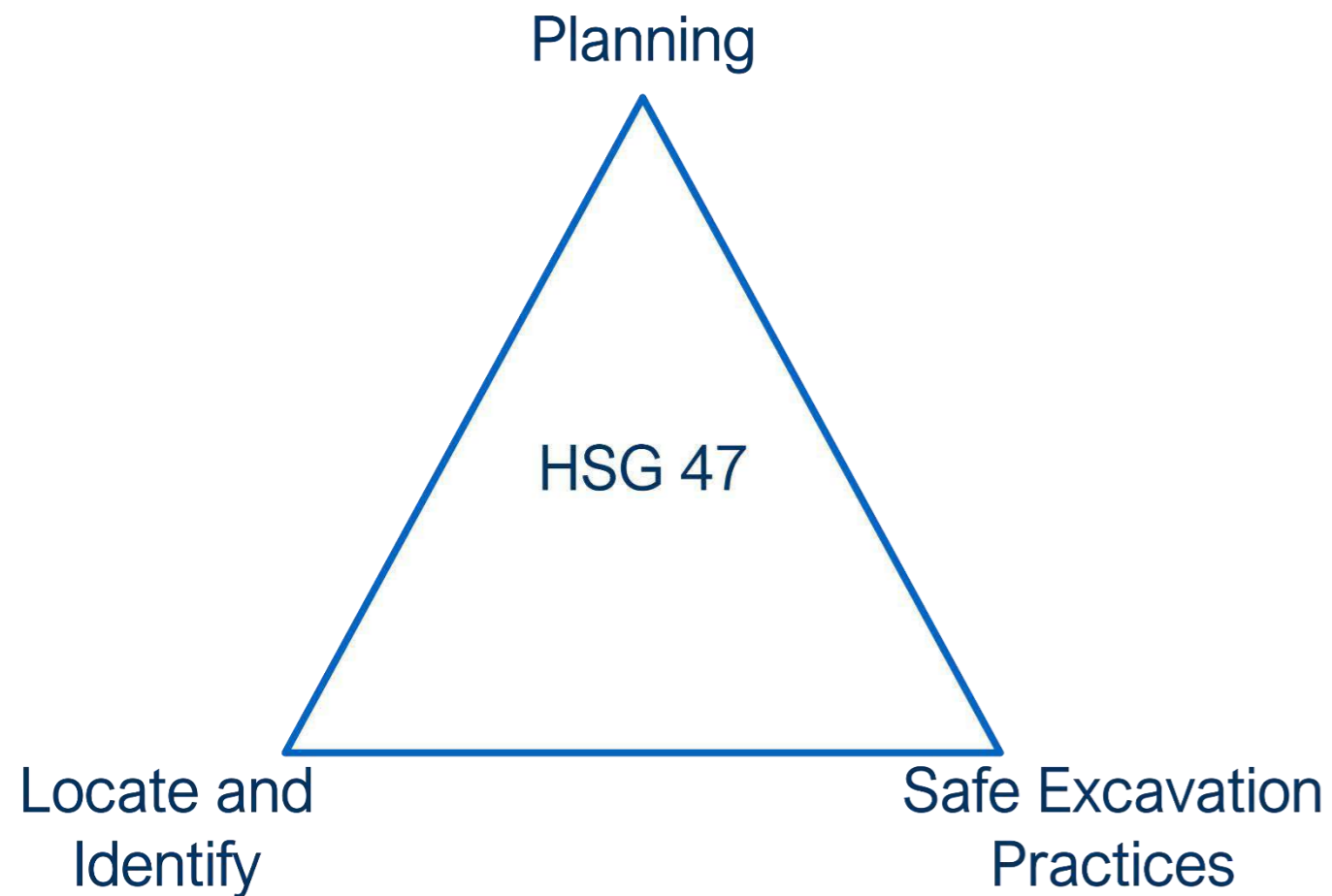


**A large number of organisations decide
not to use readily available resources**



CSTA Global

Innovation in Utility Protection



- **Planning:** It is estimated that around a quarter of service damages could be avoided with better planning,
- **While knowing the location of the service is key, it is equally important to understand exactly what that asset is, Your Technology will not tell you and you must understand it's limitations,**
- **Can we truly define any ground disturbance as a safe digging practice?**

•Good News

- The vast majority of damages are avoidable.
- The key is Collaboration, Communication and Care,
- The Decision to choose a whole life excavation process from planning through to reinstatement rather than.....



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“I’ll just take the top off mate then we’ll start digging,

“Give it a quick scan then we’ll crack on”

“We don’t need to pay for a survey there’ll be nothing there”

“There won’t be anything for the first few feet”



CSTA Global

Innovation in Utility Protection

Stephen Walker
www.cstaglobal.com



CSTA Global

Innovation in Utility Protection



Clancy Group CECA - Safe Dig/Service Avoidance

18th February 2025

George Foulger – Head of H&S South

Chris Birnie – H&S Manager



What we do



100km+

Water mains
laid

25,000+

Water leaks
repaired

130,000+

Reinstated
excavations

57km+

Electric cable
laid

Service Damages Performance to date.

Year on Year performance (April to
January)

- Overall damages 25.0%
reduction
- Electrical damages 22.5%
reduction



So why do we damage services

- Pressure – Perceived/Self Imposed/Actual
- Taking short cuts
- Not following process – Intentional rule violation
- Mistakes/Errors – Unintentional rule violation
- Productivity incentive schemes
- Lack of training
- Lack of experience
- Poor communication Poor Attitude, Behavior, Culture



Clancy Service Avoidance & Safe digging training

NRSWA Streetworks Operative

NRSWA Streetworks Supervisor

- Minimum requirements
 - NRSWA Genny & C.A.T
 - EUSR Underground Service Avoidance – Cat 1
 - EUSR Safe Digging – Cat 2
 - USAG Member
 - On-site Competency assessment
 - Dedicated Training areas
 - Competency Assessments
 - ARC Protective PPE/Clothing
 - Coaching conversations



Training Specifications

The below documents outline the training framework and criteria for the provision of training. USAG DOES NOT provide training. A selection of courses and training providers can be found by visiting the Energy and Utility Skills Register (EUSR) [here](#).



[EUSR Training for Designers and Planners](#)

[EUSR Training Specifications - Utility Avoidance](#)

[EUSR Training Specifications - Safe Digging Techniques](#)



What detection 'kit' we use & how we monitor

- Dedicated planning and enabling teams
- Site Visits and walk overs
- PAS 128 Surveys - LSBUD/Open reach/DigDat/Select Surveys



C.A.T Manager Online Clancy Group Rebecca Glendinning

← ↑ PDF

Date: 12/06/2020 C.A.T. Operator: Adrian Peel C.A.T. SN: 10/C4EN03-9262 Area: North East England Depot: Sunderland

Survey: 1

Genny	00:02:1	100%
Power	00:01:5	100%
Radio	00:02:3	100%
Avoider	00:00:0	0%
Total	00:06:43	
Max Gain	100	
Min Gain	16.4	
Swing	9	
Warnings		
GPS	Yes	

10 The Promenade, Consett, England

Reset to Survey View
Reset to Day View

Area	Depth	SN	Operator	Gain	Swing	Warnings	GPS
08/06/2020	1	000001	0	100%	10	0	Yes
08/06/2020	2	000002	0	100%	10	0	Yes
08/06/2020	3	000003	0	100%	10	0	Yes
08/06/2020	4	000004	0	100%	10	0	Yes
08/06/2020	7	000007	0	100%	10	0	Yes
12/06/2020	1	000001	0	100%	10	0	Yes
09/06/2020	1	000001	0	100%	10	0	Yes
09/06/2020	2	000002	0	100%	10	0	Yes
21/06/2020	1	000001	0	100%	10	0	Yes
21/06/2020	2	000002	0	100%	10	0	Yes
09/06/2020	1	000001	0	100%	10	0	Yes

Area: South East Wales, Depot: Akehol, Supervisor: Lee Hobbs, C.A.T. Operator: Chris Jones, SN: 10/C4EN03-1400

Area: South East Wales, Depot: Akehol, Supervisor: Lee Hobbs, C.A.T. Operator: Lee Gills, SN: 10/C4EN03-0027

Area: South East Wales, Depot: Akehol, Supervisor: Lee Hobbs, C.A.T. Operator: Lee Gills, SN: 10/C4EN03-0027

NOTE: Standard surveying and detection procedures for the C.A.T. Manager online system comply with the industry standards. The performance of this operator and the quality of their surveys is an assessment that will be made by individual companies with reference to their codes and procedures.



What excavation 'kit' we use



'Reinforcing the message'

Start Point (SP)

Breaking ground and excavating is one of the most high-risk activities you will carry out.



Don't ever dig on your mark-up



Service Avoidance Campaign

Launch Campaign with AD video to give safety message and commence campaign	DPS Management Team and Client Team joint site visits to discuss service avoidance with teams
DPS Management Team and HSEQ Team joint site visits to discuss ABC's of service avoidance with teams	Implement Team Workshop feedback
Team Workshops – Fishbone root cause analysis (extend invite to client water techs)	Introduce joint depot/team reward (bacon rolls etc) If zero strikes for the week
Hard hitting video viewings – To highlight why Service Avoidance is critical and the consequence of getting it wrong (Electric strikes with graphic images x2)	HSEQ Team to facilitate Supervisor UDC/Investigation Workshops – introduce mandatory video of 'Rescan on site' To improve quality of investigations
Service Avoidance near miss observations to be submitted – Prize for best feedback	Team video showing 'Best Practice' site surveying, excavating & service identification/avoidance Lessons video message by teams who have had recent service strikes (RI-Weekly call)
Supervisor and HSEQ Advisor weekly inspections targeting service avoidance R&M/DS week 1 and 2, Capital Works either Week 1 or 2	Supervisors to complete monthly downloads and feedback performance to Teams – review 6 months performance and reward to best supervisor(s)
Reward Most Improved Team CAT/Genny use & longest duration without a strike	G Cats – Remote usage monitoring with one to one 'live' feedback Need to access/set up Radio detection portal
	SLT to conduct targeted service avoidance practical compliance checking of teams Support National 'Safe Dig Week' 4 th July



Zero Harm – The Clancy Way

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.1 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.2 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.3 'Zero Harm the Clancy way' - No Plans No Dig 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Golden Rule 4 – 'Zero Harm the Clancy way' - Genny & CAT Scan and Visual Survey 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.5 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.6 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.7 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.8 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.9 

Safety
Environment
Fleet
Wellbeing
Quality

Toolbox Talk – Group Communication reminder
Service Avoidance Golden Rule No.10 

'Zero Harm the Clancy way' – Assume Everything is Dangerous
 In support of 'Zero Harm the Clancy way' remember that safety is so important to **all our families** that it cannot be done safely and without harming health or the environment.
Underground services are widespread. Assume they are present until you have confirmed location/present or been shown otherwise.



Damage Panel Reviews and findings



- Panel Reviews are held after every damage
- Purpose to learn and understand root cause and implement any recommendations
- Any learnings are shared throughout Clancy (and clients)

Panel Review Findings.....common themes

- Incorrect/lack of use of Genny & C.A.T
 - No/minimal rescan as you dig
 - Not using all 4 modes
- Digging directly over a known service/utility

Changing Behaviours

- Refresher Training
- Competency assessments
- Increased monitoring – site visits & ‘Extended permits’
- Weekly & Monthly downloads and 1-2-1 feedback
- Campaign workshop participation
- Video messages from Operatives





Bi-Weekly HSEQ Comms Update

- Incident updates and Lessons Learnt
- Toolbox Talks – Group and contract specific
- Focus Areas
- Best Practice
- Close by Operations Director



H&S Attitude, Behaviour & Culture (ABC's)



Risk perception is the ability of an individual to recognise a certain amount of risk

Risk tolerance refers to a person's capacity to accept a certain amount of risk.

The inability to accurately perceive risk may lead to higher risk tolerance levels, which can encourage high-risk behaviour.

Occupational and non-occupational risk taking are related – The greater risk tolerance individuals are accepting of a wide variety of tasks, impact behaviours both on- and of-the-job



Behavioural Programme – Think Safe

Purpose:

Reinvigorate the Clancy Culture and Behaviour change programme **Think Safe: Work Safe - Home Safe**



- The programme is aligned to our company values – **Clancy Cares**. Over the years it has gone through several developments to reflect the changing needs of the business
- The refresh builds on the existing foundations and provides a solid basis for anticipated growth over the next few years
- **Certified to CITB Standard to GE3032 Behaviour safety awareness in construction**



Work Safe > Home Safe



Climate Survey

Purpose:

- To obtain colleague feedback regarding for the Clancy Group and individual Contracts.
- To act on concerns raised
- Base level to measure future improvements and where we are now.
- Update and refresh Behavioural Safety programme Work Safe Home Safe



I have a Work-Safe Home-Safe Card



I have used or know when to use my Work Safe Home Safe card



16. Reactive - We work using natural instincts

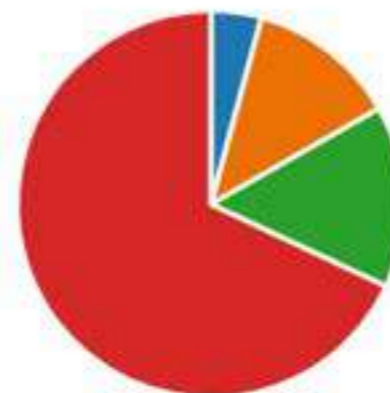
Supervision - We just 'do as we are told'

Self - I look after myself

Teams - We look out for each other

[More Details](#)

- Reactive - People do not take re... 33
- Dependent - People see safety a... 98
- Independent - People take resp... 119
- Interdependent - Teams take ow... 532



What we are doing to reduce incidents – food for thought & ‘take aways’

- Management of Service Avoidance – Robust procedures periodically reviewed, updated and communicated.
- Panel Review for every service damage – learnings (just and fair culture)
- Improved/Consistent Communication
- Targeted Service Avoidance Campaigns
- Safe digging videos
- 12 Golden Rules to Service Avoidance
- gCATS linked to RD Portal – live system
- Service Avoidance detection equipment - SUPERusers
- VacEX and mini VacEx
- New Technology – AML Pro, HydroVac
- Behaviours, Climate Survey, ABC Tours – Attitude, Behaviour, Culture

Leadership, Engagement and Communication



Safe Digging: Let's Make a Difference;



HSG 47

Peter Crosland
CECA National Civil Engineering Director

Safe Digging: Let's Make a Difference; HSG47



Health and Safety
Executive

Avoiding danger from underground services



HSG47 (Third edition),
Published 2014

This guidance is aimed at all those involved in commissioning, planning, managing and carrying out work on or near underground services. It will also be of use to the owners and operators of such services.

It outlines the potential dangers of working near underground services and gives advice on how to reduce any direct risks to people's health and safety, as well as the indirect risks arising through damage to services.

It explains the three basic elements of a safe system of work during excavation:

- Planning the work
- Locating and identifying buried services
- Safe excavation

This third edition brings the guidance up to date, but the basic requirements remain the same.

Safe Digging: Let's Make a Difference; HSG47

Buried Utility

- Gas
- Electricity
- Water and sewer
- Telecoms/Fibre/Broadband
- Other utilities:
 - Traffic lights/ Street lights
 - Oil/Gas Pipelines
 - District Heating Networks

482,000 km buried
electricity cables



Difficult to estimate
but could be up to
2m km of buried
cable



396,000 km
water supply
mains

353,000 km
sewers
(England and
Wales only)

275,000 km buried
gas pipelines



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Framework - Essential

We must all work within a framework to manage health and safety.

We all play a key part in helping to encourage safer construction practices and to prevent dangerous acts that could lead to accidents.

In terms of the Law - **IF** there is a conflict between health and safety legislation, contract requirements, company policy, site rules or professional ethics, **THEN health and safety legislation takes precedence.**



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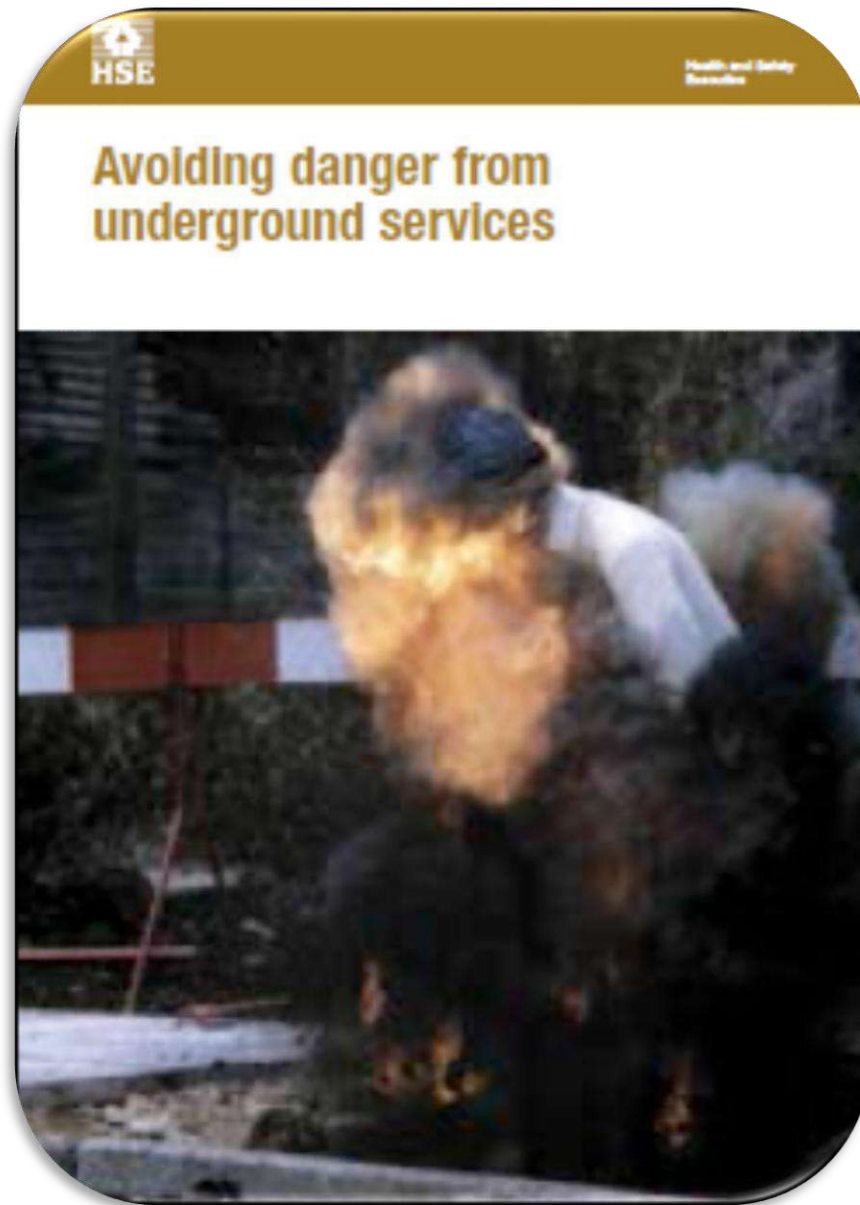


Excavations in locations where services may be encountered must be consistently carried out safely.



Then.....Now.....

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The guidance is aimed at all those involved in commissioning, planning, managing and carrying out work on or near underground services.

It is also of use to the owners and operators of such services.

It outlines the potential dangers of working near underground services and gives advice on how to reduce the risks. It deals principally with risks to health and safety rather than damage to services.

It explains the three basic elements of a safe system of work during excavation:

- **Planning the work**
- **Locating and identifying buried services**
- **Safe excavation**



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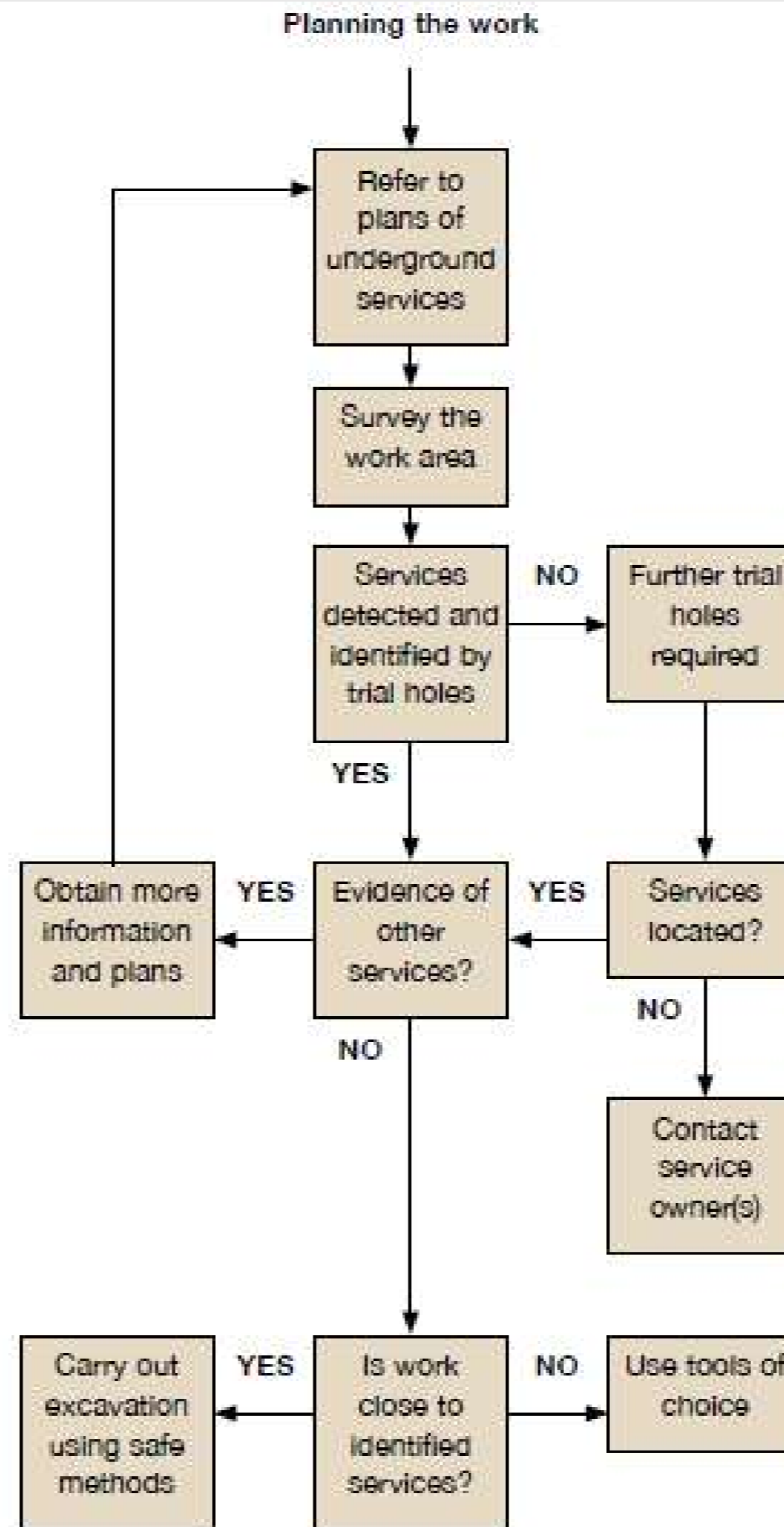


Figure 2 A safe system of work

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Planning the Work

All construction projects are subject to risks.

- Risk assessment and management will not necessarily prevent risks from occurring; however, they should enable the consequences of the occurrence of a risk to be planned for and minimised.
- **Two key definitions are:**
 - HAZARD** – Is something with the potential to cause harm (substances or machines, methods of work, and other aspects of work organisation)
 - RISK** – Is the likelihood of the potential being realised and the consequences in terms of severity and number of persons affected, if it isRisk is therefore the combination of the likelihood of harm occurring and the resulting severity and scale if it does.



2 HV Cables, 1 LV Cable, Street light Cable, BT duct and drain pipe under reinforced concrete

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The Assessment of Risk:

The main purpose of risk assessment is to protect workers and others from harm caused by hazards at work

There are no fixed rules for undertaking risk assessments

A number of alternative risk assessment methods exist, though most follow the same format:

- Identify the hazards
- Decide who might be harmed and how
- Evaluate the risks and decide on precautions
- Record your findings and implement them
- Review your risk assessment

Whatever procedure is followed it must incorporate the HSE's

General Principles of Prevention



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General Principles of Prevention - provides a framework to identify and implement measures to control risks on a construction project. (see Man H&S at Work Regs 1999)

In summary they are:

- Eliminate risks where possible
- Evaluate and reduce those risks that cannot be avoided and
- Put in place proportionate protective measures that isolate or control them at source
- Provide appropriate instructions to employees

<https://www.youtube.com/watch?v=xyANahuhGs0>

HSE's Health & Safety Risk Assessment and Management Video

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In Summary

Identify clearly the extent of the work area and find out what underground services are within the site before considering whether they are likely to be disturbed.

- Obtain service drawings from utilities companies and other organisations with relevant information about the site.
- Survey the site to identify and other underground structures. Record the location of any services.
- Review/assess the planned work to avoid disturbing services where possible.
- **Allow sufficient time and provide sufficient resource to do the work safely.**
- **Emergency work still requires planning and assessment of the risks arising from the work. A precautionary approach must be taken when breaking ground.**

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Locating and identifying buried services

In summary

Locate the services identified at the planning stage survey as being in the work area.

Make sure those involved in detecting and identifying services are competent in the proper use of survey tools and detecting devices as well as reading/interpreting plans.

Once detected, identify and mark the services and confirm their status – ie whether electricity cables are live, whether gas pipes are pressurised – and then record their location.



Competence & Common Sense
vs
Compliance & Control

A CAT is not just for Christmas, it's for LIFE!



Don't leave me behind when you put the CAT out!



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Permits



A *Permit to Break Ground* forms part of the safe system of work for ground-breaking operations.

Permits for breaking ground **must be produced by a formally appointed and competent person** eg Site Manager.

Everyone involved in breaking ground must be briefed on a Permit to Break Ground.

Excavation supervisors must review permits daily to ensure that ground-breaking operations are compliant with the permit requirements.

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Safe Excavation Practices



When breaking ground within an exclusion zone:

- Assume all utilities are 'live'
- Anyone likely to be exposed to fire or explosion must wear flame retardant clothing, including gloves
- Workers must only use electrically insulated tools
- A Cable Avoidance Tool (CAT) and signal generator (Genny) must be used to re-scan for utilities as an excavation progresses
- You must employ non-contact methods such as vacuum excavation and / or air picks to loosen and remove soil from around utilities
- Utilities encased in concrete **MUST** be isolated **BEFORE** being exposed; if possible

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Incidents do happen!

Most utility strikes happen as a result of one or a combination of the following reasons:

- inadequate or poor planning
- rushing to complete work
- lack of information, or inaccurate information (i.e. utility plans)
- poor excavation techniques
- lack of care around services
- limited or improper use of instruments eg Genny & CAT
- plant items (such as excavators and drilling machines) can also be a major culprit due to the lack of fine control and visibility that the driver has (or hasn't!).



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Consequences of Striking Utilities

Direct
and
Indirect

- Fatalities
- Fire or explosion
- Electrical shock
- Serious injuries
- Injuries to third parties / public
- Loss of earnings / fines
- Delays on site
- Inconvenience / delays to road users
- Loss of service to local homeowners
- Damage to equipment and machinery
- Flooding of excavation (drowning or collapse or environmental damage)

WHAT DO UTILITY STRIKES REALLY COST?

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04/01/2016

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For more information, please contact:

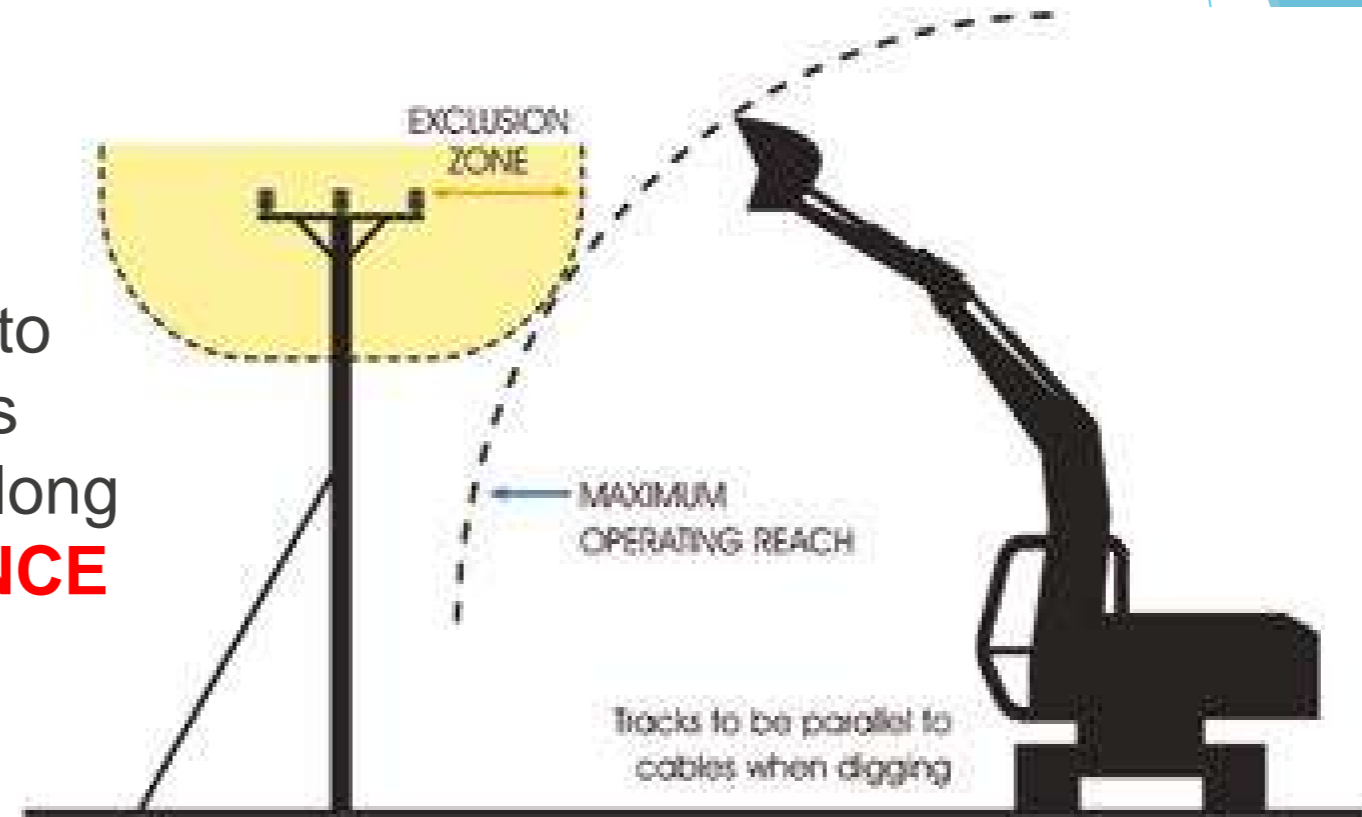
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Overhead Electric Power Lines

If a mechanical excavator is being used to dig parallel to an overhead line, it is good practice to position the excavator with the tracks or wheels parallel to the line, so as the machine moves along the excavation the **SAFE STAND OFF DISTANCE** is easily maintained.



If your vehicle touches a power line:

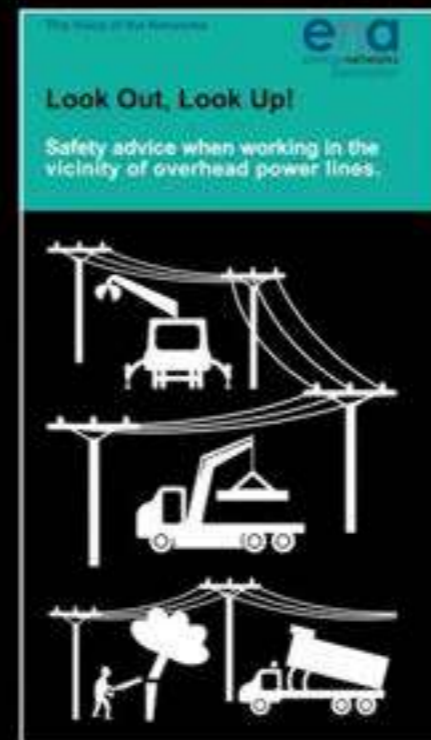
When you're in the cab, **stay in the cab**

If you're outside the vehicle, **do not approach**

The vehicle may still be **live**

Call **105** and wait for help

Find out more: www.energynetworks.org
www.hse.gov.uk



<https://www.energynetworks.org/campaigns/look-out-look-up>

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Overhead Electric power Lines



- Treat all overhead utilities as live and dangerous;
- Any contact may be fatal or cause very serious injuries;
- Electricity can 'jump gaps';
- Stop and Look Up before setting up or using items of plant in the vicinity of overhead lines;
- Take special care and use lights in the hours of darkness or during poor lighting conditions;
- Set up items of plant with care to reduce the chance of contact.

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SUMMARY



- You must be competent to undertake ground-breaking tasks
- Refer to issued utility plans and any other issued information
- Genny and CAT; use before and during the work
- Always assume utilities are 'live'
- You must comply with exclusion zone rules
- A Permit to Break Ground to accompany every ground-breaking operation
- Everyone involved must be briefed on the Permit
- You must use the safest excavation methods near live utilities
- Do not expose live utilities encased in hard material; unless you have an approved safe system of work in place
- You must wear protective clothing
- Use insulated tools

OR - blue-3 - <https://www.youtube.com/watch?v=aVq6-kjUG-I>

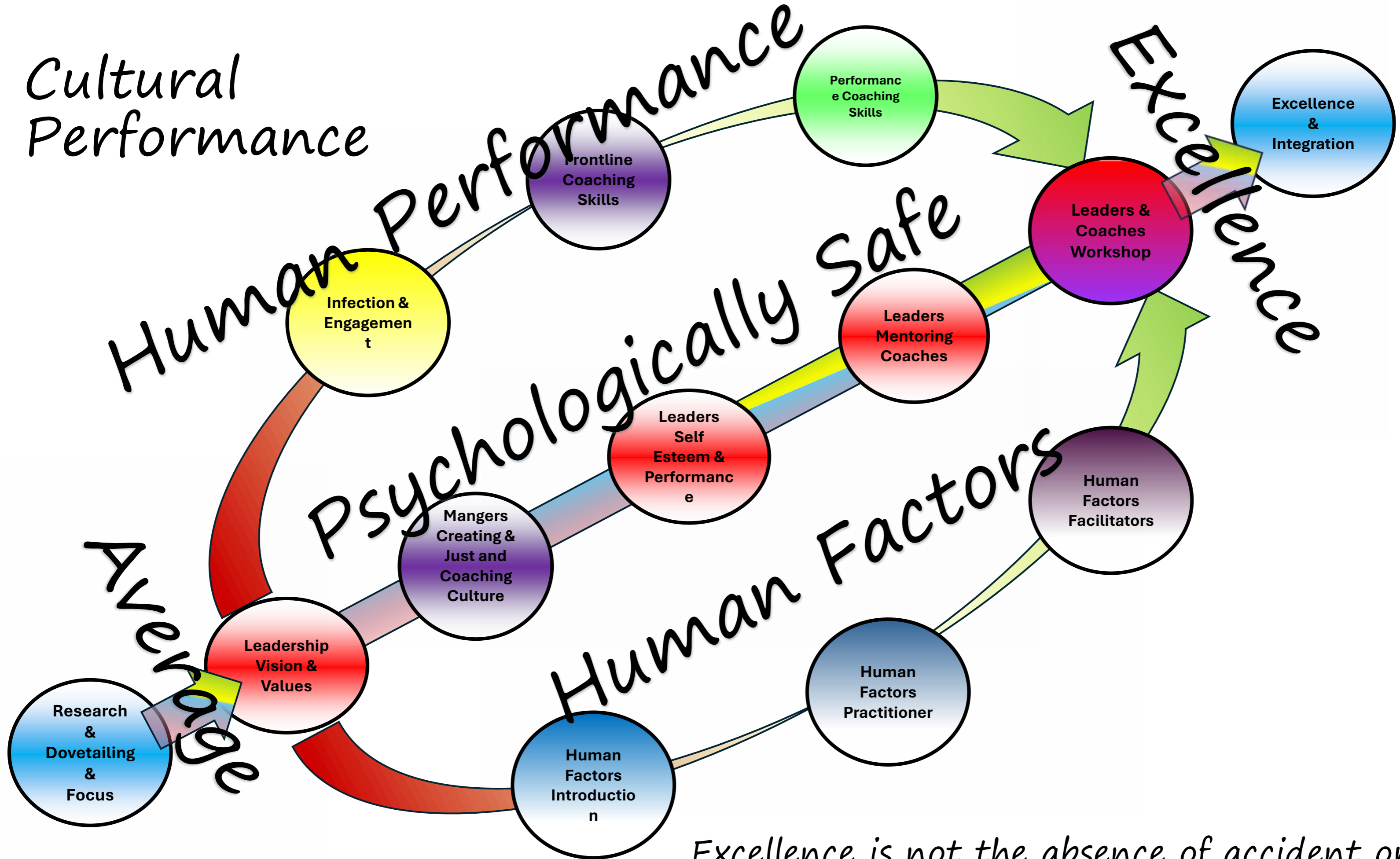
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CULTURAL COACHING SOLUTIONS

Peter Sillett
Performance Coach & Operations Director

Cultural Performance



Excellence is not the absence of accident or error

Who's choice counts the most?

Mission Vision Values

Process systems Metrics

Get stuff done

Do the Stuff

Pay for the Stuff



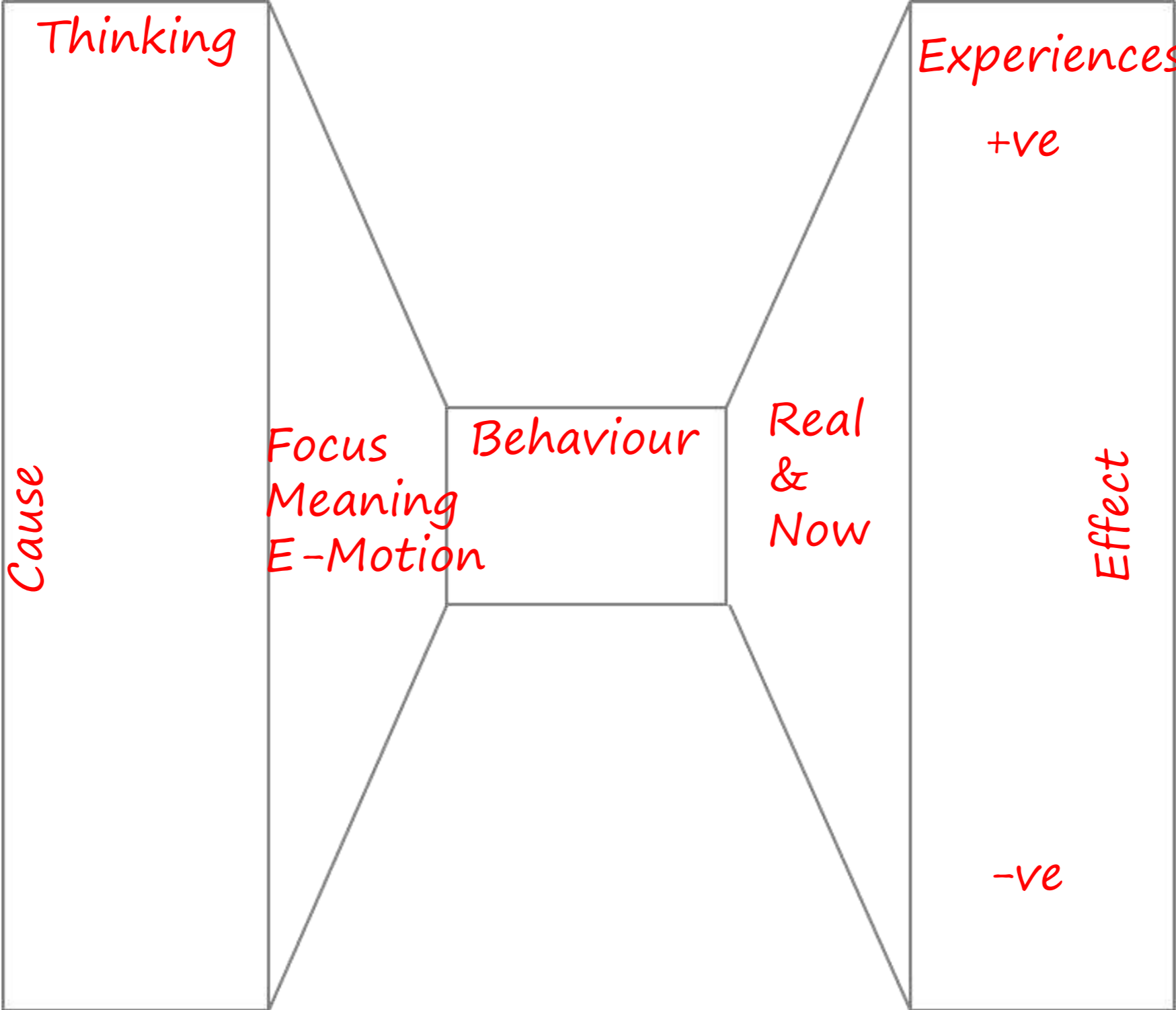
Customers or Public

You get the Culture
& Performance
you deserve as a

Leader
Manager
Supervisor

Excellence in
everything we do

How do most organisations change behaviours



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THANK YOU



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PANEL DISCUSSION



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Summary



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SUMMARY

**David Allen, CECA Southern
Executive Director**

NETWORKING

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**PLEASE TAKE A MINUTE TO
PROVIDE YOUR FEEDBACK**

