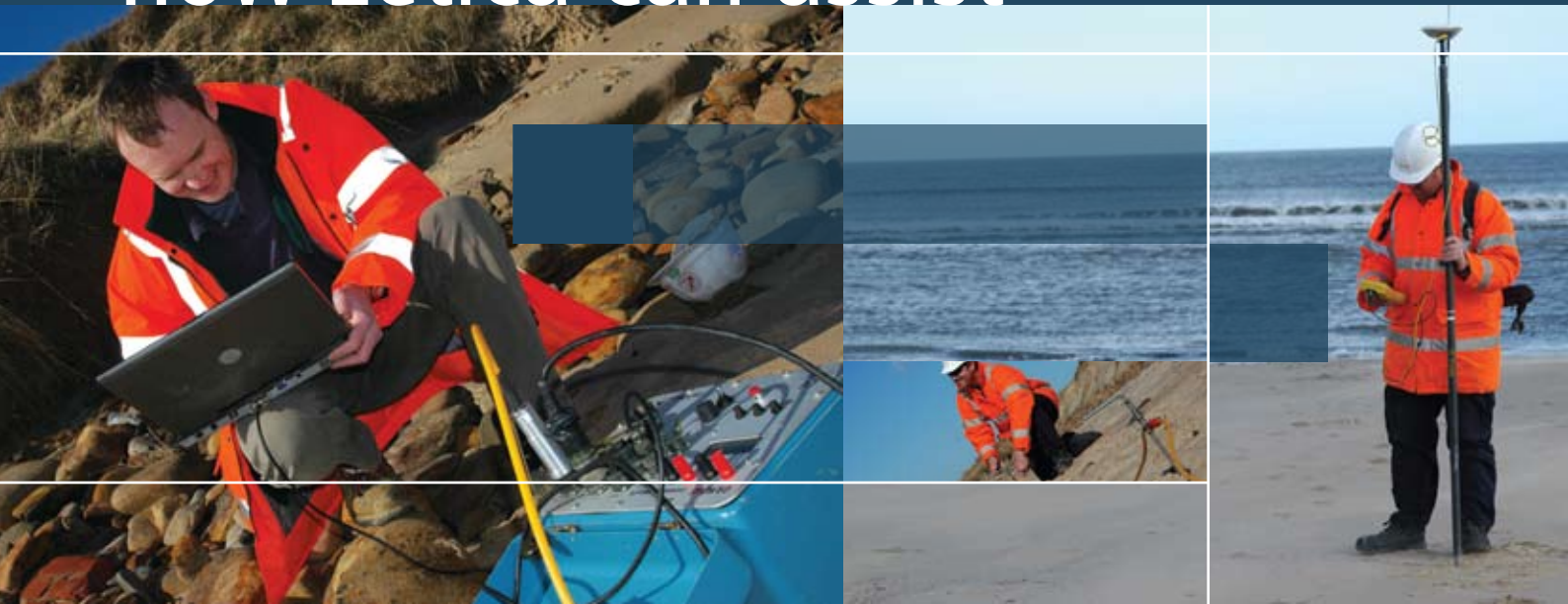


REDUCE THE RISK OF THE UNKNOWN

contents

| | |
|-------------------------------|----|
| ■ HOW ZETICA CAN ASSIST | 03 |
| ■ INFRASTRUCTURE | 04 |
| ■ ENVIRONMENT AND ARCHAEOLOGY | 05 |
| ■ FOUNDATIONS AND GEOTECHNICS | 06 |
| ■ GROUND STABILITY | 07 |
| ■ UNEXPLODED ORDNANCE (UXO) | 08 |
| ■ UTILITY SERVICES | 09 |
| ■ SURVEYING AND MONITORING | 10 |
| ■ ZETICA'S NOTABLE PROJECTS | 11 |

how zetica can assist



Zetica can help you to quickly characterise the above- and below-ground conditions across a site and reduce the risk of encountering hazards unidentified during a desk study or a traditional site investigation. Our approach can reduce the number of boreholes or trial pits required to characterise the subsurface.

NON-INTRUSIVE SURVEY METHODS

We use non-intrusive methods to

- Inform infrastructure planning and maintenance
- derive geotechnical properties using surface and borehole geophysical measurements
- detect buried utility services and shallow voids
- detect buried hazards such as solution features, underground storage tanks and buried pits
- locate unexploded ordnance (UXO)
- inform route selection for cable routes, pipelines, railways and roads
- characterise geological structures for carbon capture and storage, and nuclear waste disposal
- monitor containment structures, e.g., dams and landfills
- monitor landslide-prone slopes
- map archaeological features.

We map above-ground features and settlement using traditional topographic survey methods and advanced 3D LiDAR and inSAR technology.

WHY CHOOSE ZETICA?

Zetica has a fast-growing customer base. Our customers tell us that we have a reputation for providing practical and innovative solutions. Our service is based on

- making an effort to fully understand your requirements
- offering objective and straightforward advice on a range of mapping requirements
- supplying survey designs that deliver the information you need at the least cost
- providing surveys that are always of high quality and have reliable and repeatable results
- presenting clear survey results with information that is accessible to all levels in your organisation
- constant innovation. If the technology is not available to help, we can develop it for you

infrastructure



seismic · electrical · electromagnetic · magnetic
microgravity · ground penetrating radar · radiometric

WHAT DO WE DO?

Our non-intrusive survey methods can be applied throughout the life cycle of an engineered structure. This extends from an initial ground investigation, providing design and safety information, monitoring the impact of construction on surrounding structures and ongoing monitoring of the integrity of structures through to helping to determine when to schedule essential maintenance tasks.

EXAMPLES OF OUR WORK

- Detecting shallow voids beneath proposed or existing structures
- Mapping detailed pavement construction
- Characterising structure reinforcement and thickness
- Mapping trackbed condition
- Measuring the length of existing piles
- Measuring low-strain elastic moduli
- Detailed mapping of soils and soil cover thickness
- Determining flood defence composition and integrity
- Monitoring containment structure integrity

WHAT CAN OUR SURVEYS HELP YOU WITH?

- Optimising the selection of a linear route
- Optimising the location of foundations and containment structures
- Maintaining flood defences
- Preventing damage to existing infrastructure (e.g., drilling through reinforcement)
- Filling in the missing detail between intrusive sample locations
- Information for proactive maintenance of roads and rail trackbeds
- An early warning of a threat to a containment structure
- Parameters for foundation design

WHO USES OUR SURVEYS?

- Energy infrastructure operators
- Geotechnical and structural engineers
- Nuclear installation operators
- Road and rail trackbed maintenance contractors
- Flood defence managers
- Waste facility operators
- Facility managers

environment and archaeology



seismic · electrical · electromagnetic · magnetic
microgravity · ground penetrating radar · radiometric

WHAT DO WE DO?

Our non-intrusive survey methods can be used to map a wide range of man-made features and possible hazards to uniquely inform environmental and archaeological studies and to reduce uncertainty in the site concept model.

EXAMPLES OF OUR WORK

- Mapping the location and extent of buried pits and landfills
- Identifying variations in the composition of buried waste
- Detecting buried structures such as cellars, culverts and drains
- Locating underground storage tanks
- Identifying geological boundaries, aquifers and aquitards
- Identifying saltwater ingress into a freshwater aquifer
- Detailed mapping of industrial and pre-industrial archaeological features
- Monitoring leaks in landfill liners using permanent installations and to quality control liner construction
- Monitoring the integrity of containment structures such as waste dams and tanks

WHAT CAN OUR SURVEYS HELP YOU WITH?

- Reducing the uncertainty associated with encountering buried hazards
- Quickly identifying the source of contamination (avoids peppering the site with boreholes)
- Identifying pathways for contaminants (e.g., drains, culverts and granular soil channels)
- Reducing the number of intrusive exploratory points that may exacerbate the contamination
- Early warning of a breach in a containment structure
- Identifying the occurrence of archaeology to assist in planning

WHO USES OUR SURVEYS?

- Energy infrastructure operators
- Brownfield site developers
- Environmental engineers
- Earthworks contractors
- Regulators
- National parks and reserves
- Waste facility operators
- Landowners

foundations and geotechnics

seismic · electrical · electromagnetic · magnetic
microgravity · ground penetrating radar · radiometric

WHAT DO WE DO?

It has been estimated that over 50% of construction claims and change orders are related to insufficient subsurface information. Our surveys aim to properly characterise subsurface conditions to assist in developing structures, including foundations and drainage and communication infrastructure. We help to reduce the uncertainty and the risks associated with the design and construction process.

EXAMPLES OF OUR WORK

- Mapping boundaries between soil and rock types
- Measuring low-strain elastic moduli
- Contouring the depth to pile-bearing strata
- Mapping the presence of groundwater
- Locating sinkholes, voids and fractures
- Mapping the extent of disturbed ground
- Assessing the risk of trench collapse
- Determining the need for cathodic protection on below-ground installations

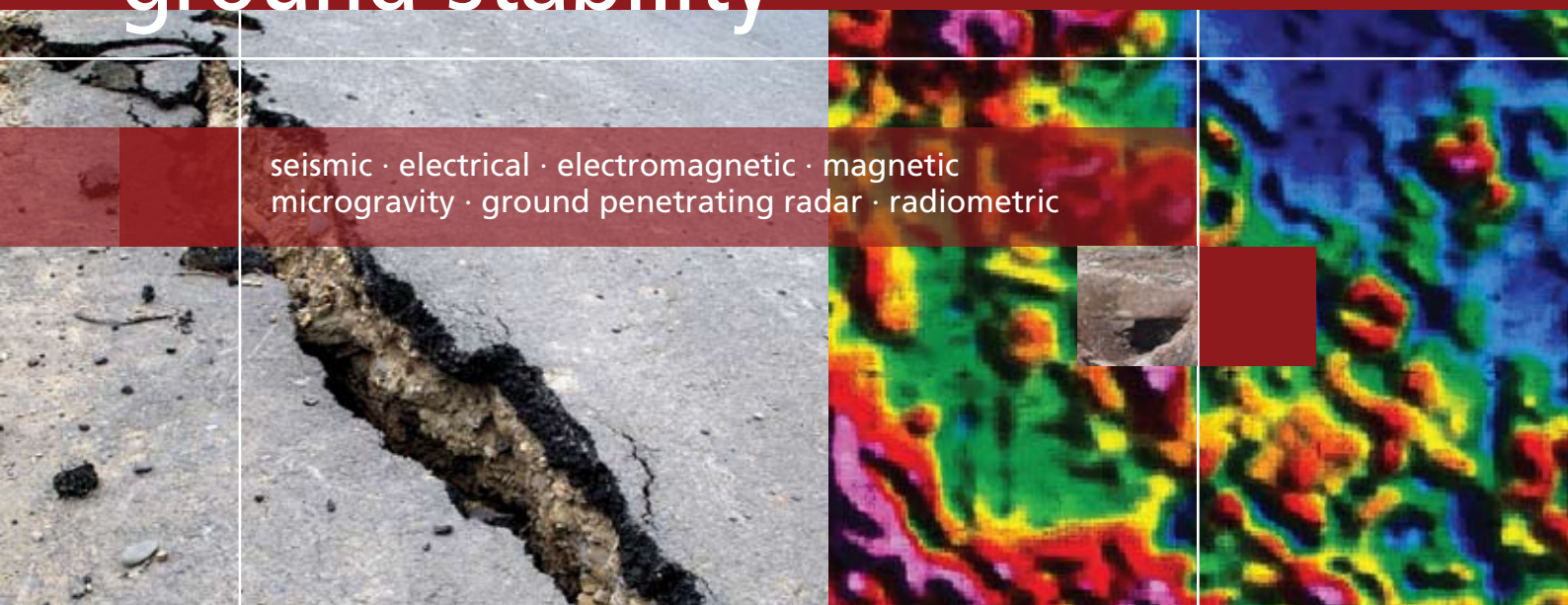
WHAT CAN OUR SURVEYS HELP YOU WITH?

- Survey resolution and area coverage many times greater than is achievable with boreholes or probing
- Taking the guesswork out of conceptual models by identifying features that would be missed by a borehole investigation
- Saving money through more accurate targeting of subsurface features
- Avoiding ground disturbance on sensitive sites

WHO USES OUR SURVEYS?

- Energy infrastructure developers
- Geotechnical and structural engineers
- Environmental engineers
- Construction companies
- Road and rail contractors and operators

ground stability



WHAT DO WE DO?

We can help to reduce the risk associated with structures built on potentially unstable ground. This help may be proactive by identifying the ground that is best suited to development (i.e., avoiding risky areas) or reactive by monitoring ground movement that could threaten existing structures.

EXAMPLES OF OUR WORK

- Mapping underground voids associated with former structures
- Mapping dissolution features
- Mapping natural caves and mine workings
- Mapping settlement
- Identifying changing soil and rock types
- Providing soil strength information and identifying the presence of groundwater
- Characterising the shear modulus along embankments and the slopes of cuttings
- Mapping and monitoring unstable ground such as slopes and embankments

WHAT CAN OUR SURVEYS HELP YOU WITH?

- Efficient identification of hazards without the expense of a dense grid of boreholes
- Identifying the areas most prone to structural failure
- An early warning system to identify when a failure could occur
- Identifying potential hazards during construction (e.g., voids hazardous to heavy plant)
- Revealing areas that require remediation
- Identifying areas where trench stability is lower
- Geotechnical information for structural designs

WHO USES OUR SURVEYS?

- Energy infrastructure developers and operators
- Geotechnical and structural engineers
- Construction companies looking to understand ground stability during excavation
- Port, marine and waterway infrastructure operators
- Road and rail contractors and operators
- Government waterway and coastal agencies
- Regulators

unexploded ordnance



(UXO)

electrical · electromagnetic · magnetic
ground penetrating radar · radiometric

WHAT DO WE DO?

We provide a full range of services relating to the management of potential UXO risks. We offer a seamless service from risk assessment through to risk mitigation. Our services have set the quality benchmark for the industry.

EXAMPLES OF OUR WORK

- Detailed desk studies and risk assessments
- Peer review of third-party risk assessments and detection surveys
- Providing a formalised statistical approach to assess risk and quantify the impact on site investigation and construction
- Guidance and advice on options to mitigate identified risks
- Services to detect, locate, identify and remove UXO
- Liaising with local authorities on our clients' behalf

WHAT CAN OUR SURVEYS HELP YOU WITH?

- Pragmatic and realistic assessments of risk
- Zoning of the risk instead of common designation of the entire site under a single risk category
- Reducing and removing the health, safety and environmental hazards of UXO
- Ensuring you understand the risks and helping you to make an informed judgment on mitigation
- Detection assurance by quantifying detectability across a site
- Reassurance for your stakeholders with respect to this potentially emotive issue – after all, UXO is just a type of contaminant

WHO USES OUR SURVEYS?

- Military and brownfield site developers
- Construction companies working in cities that were bombed during the First and Second World Wars
- Operators of vulnerable establishments such as nuclear sites
- Energy infrastructure developers
- Port, marine and waterway operators
- National parks and reserves
- Transport infrastructure operators
- Government agencies

utility services



electrical · electromagnetic · magnetic
ground penetrating radar

WHAT DO WE DO?

We survey utility services to build accurate asset registers and minimise the risk of damage during construction. Confirmation of the position and the depth of existing utilities facilitates the planned diversion of essential services and ensures that excavations, construction or site investigation exploratory points can be safely positioned to avoid damaging utilities.

We approach utility services detection with a broad suite of passive and active techniques. One benefit of an integrated approach is that we can also report on other in-ground features, such as buried tanks, piles and infilled ground, and depth to bedrock.

EXAMPLES OF OUR WORK

- Standard utility services detection using techniques such as radio frequency location and ground penetrating radar
- Surveying to any of the specified TSA or ASCE levels
- Enhanced utility services detection for sites unsuitable for industry-standard techniques
- CAD drawings of detected utility services
- Basic marking out of cable or pipe locations
- Statutory undertaker plans in CAD format

WHAT CAN OUR SURVEYS HELP YOU WITH?

- Preventing the health, safety and environmental consequences associated with damaging a utility service
- Reducing the costs associated with damaging a utility service
- Enabling an assessment for the reuse of existing infrastructure
- Improving the accuracy of asset mapping by combining utility and topography surveys

WHO USES OUR SURVEYS?

- Energy infrastructure developers and operators
- Utility service and infrastructure operators
- Site investigation contractors
- Construction companies
- Operators of sensitive establishments such as power generation or nuclear sites
- Transport infrastructure operators

surveying and monitoring



total station · 3D LiDAR · inSAR
remote sensing · seismic · electrical

WHAT DO WE DO?

We offer a broad range of topographic survey and monitoring solutions. Geophysical measurements of changes in shear modulus, moisture level and fluid flow acquired using seismic and electrical methods can provide a unique, relatively early warning system.

EXAMPLES OF OUR WORK

- Pre-development surveys for planners and engineers
- Measured building and elevation surveys
- Structure and ground stability monitoring
- Rail and road route and infrastructure surveys
- Cable substation and overhead line surveys
- Earthwork and quarry volumes
- Setting out
- Structure clearance LiDAR surveys on rail and road infrastructure
- Satellite-based ground movement surveys (inSAR)
- Monitoring leachate migration and containment structure leaks
- Volume measurements

WHAT CAN OUR SURVEYS HELP YOU WITH?

- Mapping of developments
- Accurate positioning of development and exploratory points
- Baseline measurements or permanent records of site development
- Accurate measurement of the movement of structures and ground
- Early warning of possible ground movement
- Indications of relative changes in site development
- Quantity measurements
- Proving ownership boundaries

WHO USES OUR SURVEYS?

- Railway and road operators and contractors
- Energy infrastructure developers and operators
- Infrastructure operators
- Architects
- Consulting engineers and contractors
- National parks and reserves

zetica's notable projects

| PROJECT | STAKEHOLDER | SERVICE |
|---|---|---|
| CrossRail, London | CrossRail | Mapping of utility services, structures and topography. UXO risk assessments and mitigation |
| Nord Stream gas pipeline, Baltic Sea | Nord Stream | Peer review and guidance for a marine UXO survey |
| National carbon capture and gas pipelines | National Grid | Various mapping services to inform route selection and reduce construction costs |
| Olympic development, London | Olympic Development Authority | UXO risk assessment for the whole development |
| South African freight railways | Transnet | Trackbed quality measurements |
| Capital city, Abu Dhabi | Abu Dhabi Urban Planning Department | Peer review and advice on a geophysical survey to map voids |
| National parks and nature reserves | RSPB, English Nature and National Parks | UXO risk assessment and risk mitigation, including disposal |
| Station redevelopment, Reading | Network Rail | Utility services and buried structures mapping before the redevelopment a major junction and station |
| Nuclear facility | British Nuclear and Sellafield Ltd | Mapping of structures and utility services before drilling of sensitive structures. Geotechnical characterisation of deep soils |
| UK road network | Highways Agency and Atkins | Measurement and assessment of road pavement construction |
| Proposed power station, Northumberland | RWE npower | Geotechnical and bedrock profiles for a proposed power station |
| UK rail network | Network Rail | Provision of a trackbed quality assessment system |
| International port development, Central America | Mouchel | Survey to map voids associated with dissolution features |
| Coventry | Rolls-Royce | Provision of geotechnical parameters and location of buried structures |
| National framework | Environment Agency | Utility services mapping, UXO assessments and geophysical surveys |
| National Electricity Network | National Grid, Electricity Alliances | Mapping of utility services, structures and topography. UXO risk assessments and mitigation |
| Central Asia, Kyrgyzstan and Kazakhstan | Arup | Mapping of soil cover changes, bedrock depth and fault locations |
| US rail network | BNSF and UP | Assessment of trackbed condition |
| RAF sites | Ministry of Defence | Mapping of utility services, buried waste, structures and topography. UXO risk assessments and mitigation |

contact us

UK HEAD OFFICE

15–16 Hanborough Business Park

Long Hanborough

OX29 8LH

UK

Tel: +44 (0)1993 886682

Fax: +44 (0)1993 886683

Email: info@zetica.com

www.zetica.com

