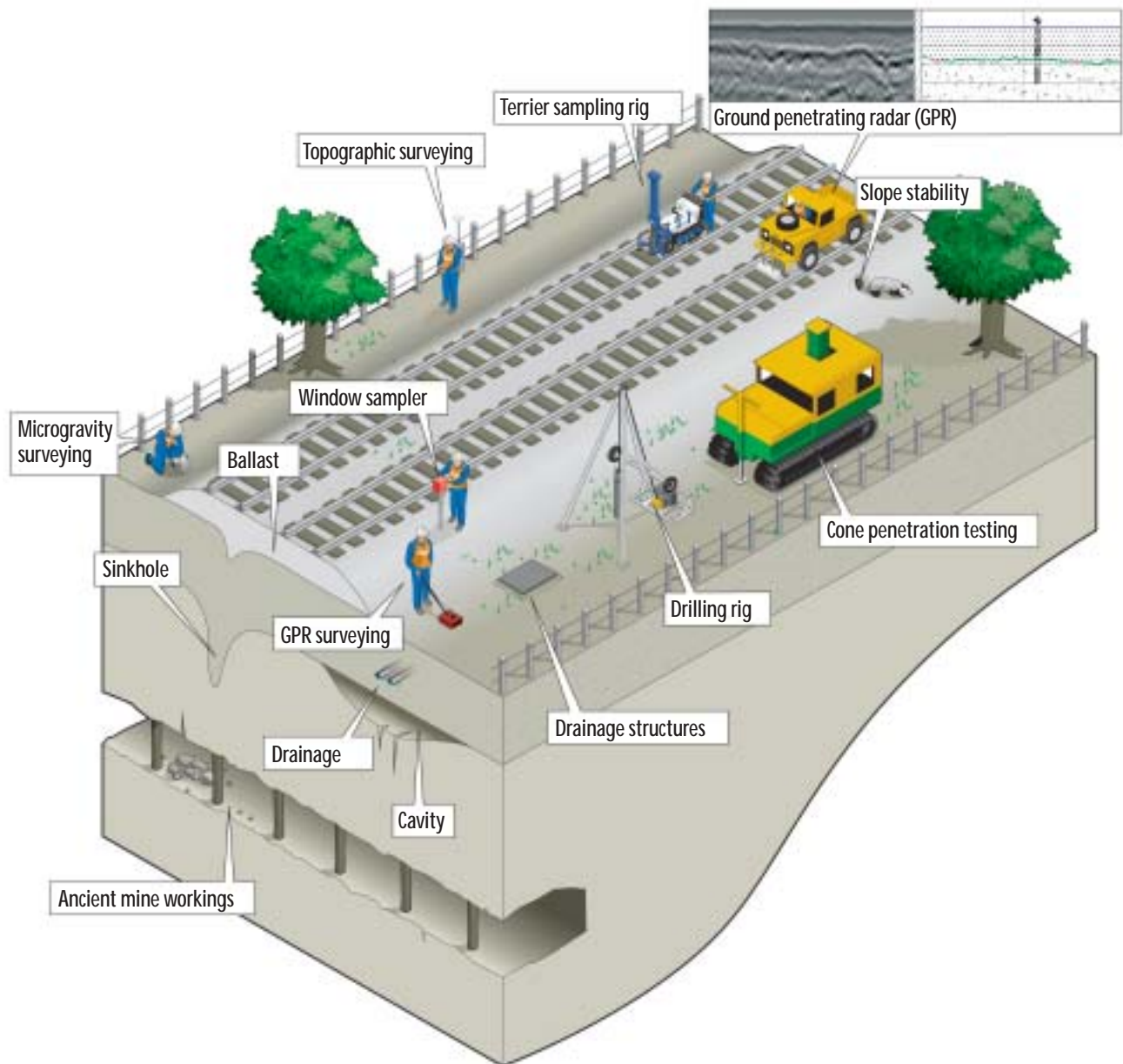


TRACKSIDE SITE INVESTIGATIONS

IMPROVING THE INVESTIGATION OF THE RAIL ENVIRONMENT



TRACK RENEWALS SI

- Drainage
- Ballast
- Formation
- Subsidence

Superior mapping of ground hazards in the railway environment using combined geophysical and geotechnical techniques. Our geophysical expertise provides the means to trace drainage, describe ballast, map the formation and find the sources of subsidence. This gives our geotechnical and geoenvironmental investigations the advantage of prior information.

FINDING CAUSES, PREVENTING PROBLEMS

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Variations in ballast thickness and condition cause problems for track stability and safety. Zetica's trackside geophysical surveys find these causes and help you to predict the problems before they occur. Uneven settlement and ballast wear is rapidly accentuated rapidly under changing loads and can cause sudden failure. Zetica uses GPR to

- map ballast pockets
- detect changes in ballast condition due to water content in fines and cavities
- find perched water tables within ballast and embankments
- check that layering of new ballast is correct
- locate sub-ballast irregularities
- ensure that the correct ballast renewal limits are defined.

GPR ballast surveys reduce your costs by

- finding the root causes of problems
- proactively maintaining the track – reducing emergency repairs
- determining if renewals need to include the formation layer – thereby saving unnecessary expenditure or reducing the costs of rework
- providing quality control for new renewals or an inventory of ballast condition – benchmarking ballast condition so that deterioration can be monitored, compared and prioritised for repair.

RECENT TRACKSIDE PROJECTS

Mainline station, West Midlands – traced unmapped drainage and catch pits, and profiled the ballast condition to locate ramping

Midlands – used vehicle-mounted GPR to investigate ballast condition and thickness on 10-mile section of track

CTRL 240 – investigated ground conditions after major tunnel collapse and verified stability allowing tunnel boring machines to restart with permission of the Health & Safety Executive

North East – traced unexpected route of culvert suspected to be a source of subsidence

North Wales – located suspected mineworkings using resistivity imaging

South East – mapped sinkholes in chalk and used cone penetration testing to prove location

CTRL – accurately determined the depth of existing bridge piles to ensure they were not encountered by the tunnel boring machine

Midlands – provided unexploded ordnance risk desk study ahead of groundworks

North East – provided cable percussive drilling services and in situ geotechnical testing for new structures at sidings



Road/rail vehicle-mounted GPR



Ballast sampling



Cone penetration testing

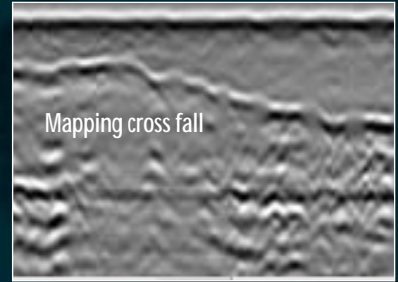


Structural surveys

DRAINAGE

Tracing drains, locating catch pits and monitoring condition

Zetica can assist in characterising existing drainage, including visual catch-pit inspection, mapping the location (GPR and EM) and investigating the condition (CCTV) of existing drains, and assessing the sufficiency of existing cross falls (GPR).



BALLAST

Non-invasive mapping of thickness and condition, and targeted sampling

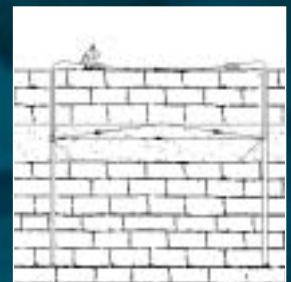
Ballast investigation using GPR and targeted sampling locations is useful during the various stages of the life of a trackbed. These stages include targeting renewals, designing trackbed, quality control following renewals, and interim assessment of ballast condition.



FORMATION

Mapping weathered layers, bedrock stiffness and water tables

Zetica offers non-invasive geophysical techniques and minimally invasive cone penetration testing methods combined with conventional intrusive site investigation methods such as trial pits and cable percussive boreholes.

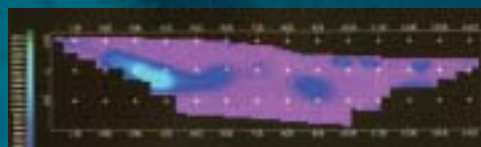


SUBSIDENCE

Detecting causes of subsidence such as sinkholes, mineworkings and badger setts

Subsurface features such as former mineworkings and infilled sinkholes can represent a significant risk to the safety of a railway owing to the potential for catastrophic collapse or subsidence.

Zetica offers a range of geophysical methods suited for use in the trackside environment that can help to identify the location, depth and size of structures before they become a problem.



LABORATORY ANALYSIS

Geotechnical and chemical analysis of ballast and formation samples

In-situ and laboratory geotechnical and chemical testing services are provided. These include soil and rock classification and strength tests, such as uniaxial and triaxial compression, CBR, shear strength and dynamic tests. Laboratories are UKAS accredited and all testing is to BS1377 or ISRM standards.



ONE-STOP SERVICE

Zetica offers a holistic, fit-for-purpose approach to site assessment. Our modern, cost-effective survey techniques turn complex streams of valuable data into clear images of the underground environment. This helps clients to avoid costly practical problems and reworking.

Zetica has extensive experience of working on projects where an informed understanding of the subsurface environment provides support to engineering improvement and investment work. Through strategic alliances with Lankelma CPT Ltd (cone penetration testing) and Norwest Holst Soil Engineering Ltd (drilling), Zetica is able to offer the most comprehensive geotechnical and geoenvironmental investigation service available to the rail industry.

Other applications of our trackside site investigation service include detecting contamination, disturbance, erosion, areas of poor compaction, cavities, buried channels, abandoned services, concealed mineworkings and unexploded ordnance.

TOTAL ROUTE INVESTIGATION

- Ballast condition surveys
- Ballast sampling
- Ballast contamination assessment
- Asset condition reporting
- Drainage inspection
- Utility mapping
- Detailed topographic mapping
- Slope stability surveys
- Cavity detection
- Detection of mineworkings
- Borehole geophysics
- Cone penetration testing
- Non-destructive testing
- Thermal imaging



Zetica is Link-up registered to carry out geophysical and geotechnical work (registration no. 20107).


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