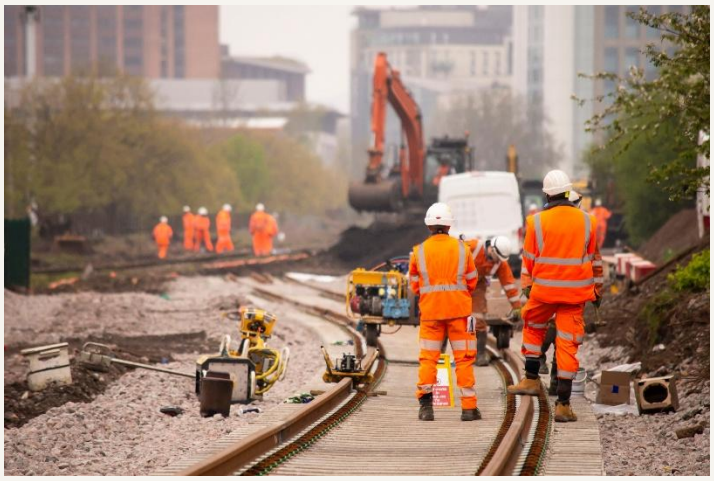
USING ACSW ON THE RAILWAY

Guidance Note SSGN004

The Need for Reliable Ground Stiffness Data

Reliable ground stiffness data is vital for the safe and economical design of both trackbed and structures on the railway. Conservative ground stiffness parameters lead to increased trackbed thickness, deeper or larger foundations and/or unnecessary ground treatment - these have very significant cost implications for large schemes such as electrification or trackbed renewal.

Problems with Current Practice



Obtaining ground stiffness data often involves large plant or disruptive activities which can pose a considerable risk in a rail environment. The equipment required is often unsuitable for access to remote or restricted locations and unsuitable for use during limited duration possessions. As a result, often only, limited investigations are undertaken and ground stiffness is unreliably and therefore conservatively estimated via empirical relationships with other tests.

The ACSW Solution

In contrast to traditional intrusive or laboratory methods, Advanced Continuous Surface Wave (ACSW) testing is a portable, non-intrusive technique which directly determines the ground stiffness profile to typical depths of 10-15m from the ground response to a surface mounted vibratory source or 'shaker'. The high quality, repeatable stiffness data reported is ready for immediate use in simple geotechnical calculations whilst also being appropriate for use in complex numerical analysis.

USING ACSW ON THE RAILWAY

Guidance Note SSGN004

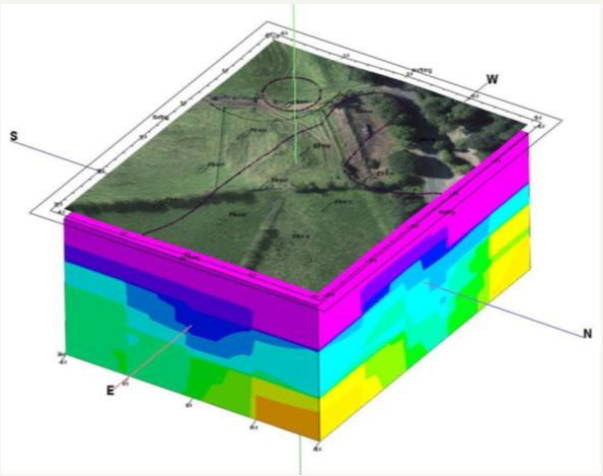
ACSW testing offers the following key features relevant to the railway environment:

- **Rapid & cost effective with good access 12 to 20 tests can be completed in an 8hr shift.**
- **A low risk of delay or disruption as all equipment can be rapidly moved by hand clear of the track.**
- **Non-intrusive with no need for services clearance.**
- **Needs only a small linear area for testing (approximately 6x1m) permitting testing at most locations.**
- **Can be undertaken in the 1.2 metre way with no requirement to unclip sleepers.**
- **Computer controlled test procedure undertakes automated checks to ensure data quality.**
- **Immediate production of test results.**
- **Data can be provided in 3D model format suitable for BIM.**

Rail Application of ACSW Data

ACSW ground stiffness profiles provide the basis for efficiencies in the investigation, design and assessment of the following:

- **OLE or signal bases**
- **Bridge foundations**
- **Crane bases**
- **Earthworks**
- **Ground improvement works**
- **Rayleigh Wave & Trackbed stiffness**
- **Tunnelling**
- **Design for settlement sensitive assets**



USING ACSW ON THE RAILWAY

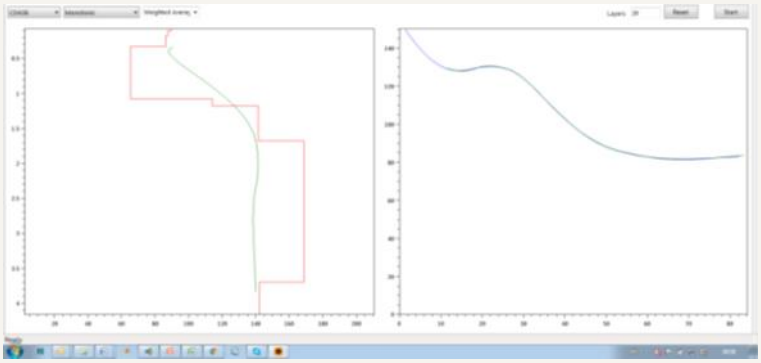
Guidance Note SSGN004

ACSW Testing on the railway

ACSW testing services, minimise risks and maximise efficiencies in this emerging, innovative technology. Recent rail ACSW projects include:

- **HS2 pipeline diversions**
- **Croydon Tramway**
- **Harlesden East Retaining Wall**
- **Northern Hub & Electrification scheme**
- **Barking Riverside**
- **TransPennine Route Upgrade scheme**

Case Study: Blackburn Stabling



ACSW testing was undertaken with Buckingham Group Contracting to inform track bed and retaining wall designs for a new train stabling and servicing yard in Blackburn. The results were used to verify existing ground investigation information without undertaking additional on-site intrusive testing. The surface stiffness measured by ACSW testing provided good agreement with LWD testing undertaken at the site and the 6-8m profile depth provided the information required for completion of detailed design. The risk reduction associated with avoiding excavation offered by the ACSW testing technique avoided the need for a Handback Engineer.