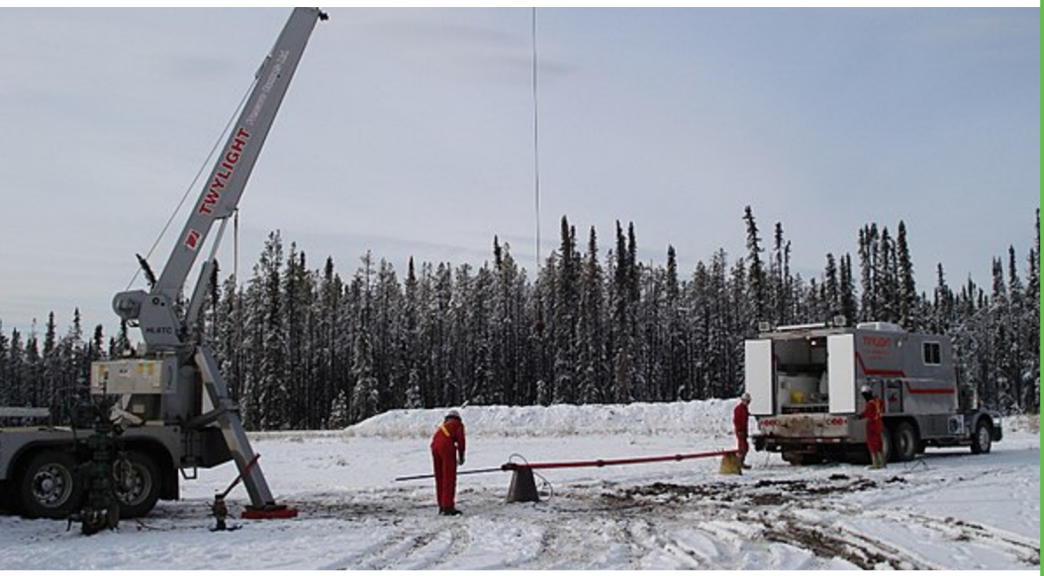
NOVEMBER 2024

Wireline Logging in Ground Investigation

A good practice guide



Project P3299
Version 01

loretta.tann@ciria.org
07933 181778

About CIRIA

CIRIA is the Construction Industry Research and Information Association, a neutral, independent and not-for-profit member organisation.

Our vision is to be the leading enabler and preferred partner for performance improvement, to drive collaboration across the built environment and construction sectors to research, develop and transfer knowledge.

CIRIA Products

CIRIA delivers robust, authoritative and independent good practice guidance applicable across sectors and designed for a range of users, from policy makers to practitioners.

Our guidance is developed collaboratively with industry and academic experts. Our methods ensure consensus, quality and the latest thinking underpin everything we do. Our work contains case studies to share knowledge and illustrate practice through examples.

We raise awareness of our good practice guidance through training, events, communities of practice, social media, blogs and press releases. Key messages from our projects are widely disseminated to help embed good practice into industry.

CIRIA Research Ambitions

CIRIA's 60+ year history and future purpose are aligned to our ambitions, designed to make a tangible difference to the sectors in which we work. We take a holistic, systems-based approach to critical industry challenges within our five core research ambitions.

Embedding Sustainability

Achieving Net Zero Carbon

Increasing Resilience

Improving Delivery

Harnessing Innovation

Wireline Logging in Ground Investigation

A good practice guide

Background and Justification

For many if not most construction projects, uncertainties around the local ground conditions present a significant risk to the project programme and budget. Unexpected ground conditions are usually listed as one of the main reasons for project cost overruns as they can make it necessary to consult topic experts, such as archaeologists or environmental scientist, and change the project design. Uncertainty in soil parameters can lead to overly cautious and ultimately inefficient design in terms of material use and therewith cost and carbon.

To reduce uncertainty and risk associated with ground engagement in the built environment, ground investigations (G.I.) are carried out before construction activities begin. The G.I. provide a variety of parameters to aid in the design of the structures, and can be acquired using a suite of techniques, designed to get the best information in a cost-effective way. Physical intrusive investigations beyond the depth limits of trenches are usually done by drilling boreholes, which can provide varying amounts of information and samples for assessment and testing. Driller logged rotary open holes, cable percussion and fully cored boreholes provide deeper geotechnical and geological data to help characterise the subsurface as part of the design process.

Wireline logging is defined as the measurement of downhole formation attributes using special tools or equipment lowered into the borehole. Using electronic and mechanical probes or devices, additional information can be obtained from the borehole about, for example, lithology, cavities, geological discontinuities, direction of rock stresses, or hydraulic parameters.

The use of wireline logging goes back to the early 1900's with electrical measurements of the strata encountered. Advances in the 1940's added nuclear measurements, and miniaturisation of the devices used in detection has added imaging, magnetics and other parameters to the suite of techniques available.

Used extensively in the oil, gas and mining industries, the use of wireline logging in civil engineering has grown as the relative cost of carrying out wireline surveys has reduced. To achieve greater certainty of project cost and programme, improved upfront understanding of the ground and the risks associated with it are necessary.

Good practice guidance on wireline geophysical logging methods is needed to enable the industry to better understand its use within G.I. and to ensure that its application follows good practice, ultimately helping to minimise both, cost and environmental impact of future construction projects.

Proposal & Products

CIRIA proposes develop a new good practice guide on the application of wireline logging for civil engineering projects It will complement the recently published CIRIA “Good practice guide to using geophysics in ground investigation. A client's guide (C812)” which introduced the use of borehole geophysics and build on the importance of a quality and appropriately scoped site investigation programme as described in the recent CIRIA guide C807 “Geotechnical baseline reports: a guide to good practice”.

The project will bring together a team (project steering group) of experts from the ground investigation industry, consultants, academics, clients and equipment suppliers to produce guidance on the current techniques available, the results that can be reasonably expected from them, application and timing of the logging, scoping, procurement and relative costs, and interpretation of the data. A selection of examples from projects will be given and an insight into the potential future direction for the technologies involved.

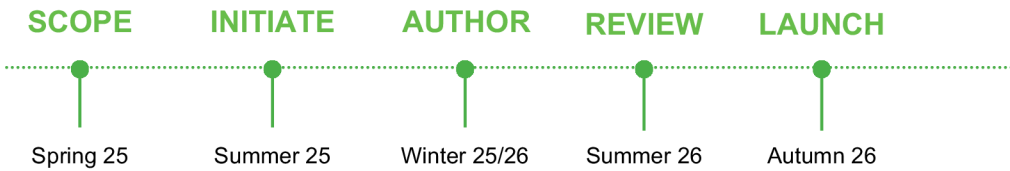
Scope

Following CIRIA’s established procedures for developing good practice guidelines, the final copy of the guidance will be developed together with the project steering group (PSG) once established. The guide will show when it is pertinent to use wireless logging techniques to deliver high resolution data about in situ properties in a time efficient manner.

The guidance will cover the whole range of applied wireline logging techniques, including mechanical logs (e.g., calipers), electrical logs (e.g., induction logs, SP logs), natural radiation logs (e.g., simple and spectral gamma ray logs), acoustic logs (e.g., sonic logs), magnetic logs (e.g. BMR logs), pressure and temperature logs, artificial radiation logs (e.g., density and neutron logs), imaging logs (e.g., dipmeter and various other types), and special logs (e.g., NMR logs).

Case studies will show the multiple potential benefits of application of these techniques, such as reduction of the risk of ground engagement on projects, correct identification of environmental issues, and maximisation of the reuse of excavated materials.

Indicative Timeline



Why invest in a CIRIA project?

The benefits to your company from contributing to our projects

Our reputation

Our reputation in the industry is long established and widely recognised. The principles of quality, sustainability and collaboration have been a foundation for what we do for many years.

Our downloads

Our guidance is downloaded over 50 000 times per year

Our reach

Our members and downloads span over 50 countries worldwide

Your benefits

The benefits of being involved in a CIRIA project are various:

- Deliver significant corporate value for modest levels of investment.
- Raise awareness of your corporate brand through logo on outputs and submission of case studies and content.
- Network with peers, clients and thought leaders in the sector.
- Get your message heard and influence industry direction.
- Demonstrate tangible leading contribution to improvement in the sector, fulfilling ESG goals
- Provide CPD for your staff, aiding routes to chartership and personal career growth
- Assist future work winning though involvement with industry leading good practice

Want to know more?

CIRIA Research

Dr Andy Moores
DIRECTOR OF RESEARCH
andy.moores@ciria.org
07933 181766

CIRIA Membership

Tam Simmons
HEAD OF MEMBERSHIP
tam.simmons@ciria.org
07933 181780

Get in touch

07933 181765

enquiries@ciria.org

www.ciria.org

... or follow us

CIRIA

@CIRIAUpdates

124 City Road | London | EC1V 2NX