

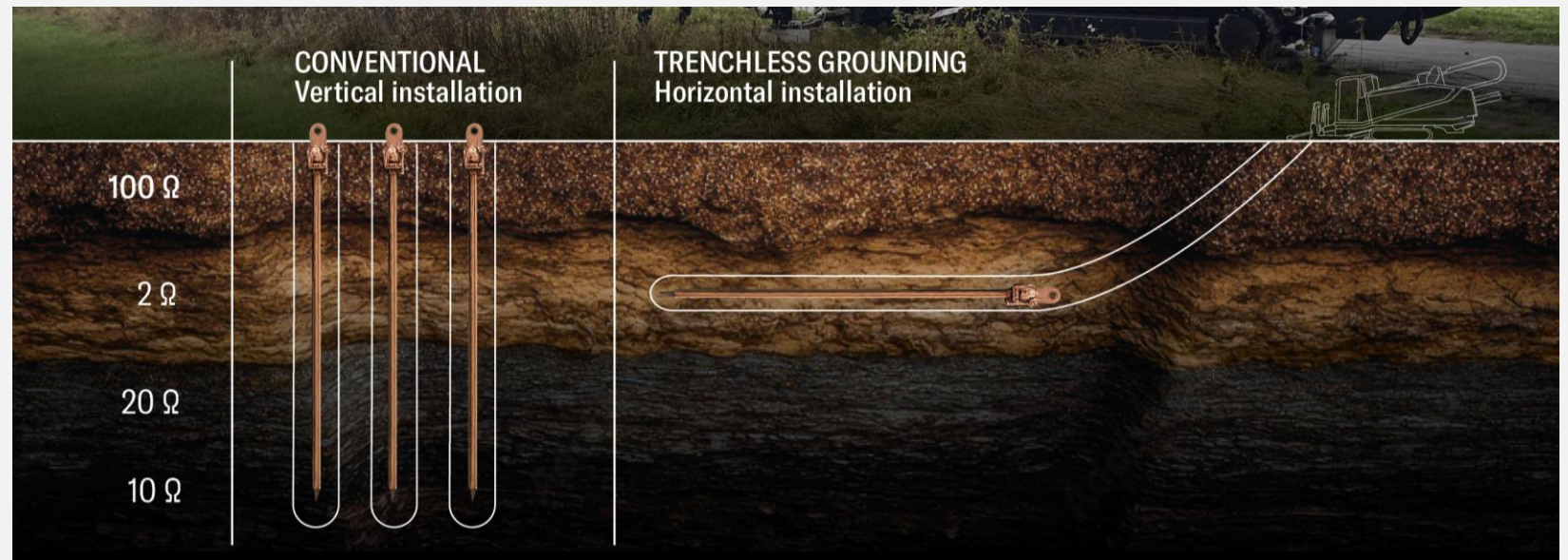
A new approach to transforming trenches to trenchless:

INNOVATIVE EARTH GROUNDING SYSTEM

DCA-Event Rome

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Tim McClure



SPEAKER



PHILIPP SCHRAGE

Product Manager

TRACTO



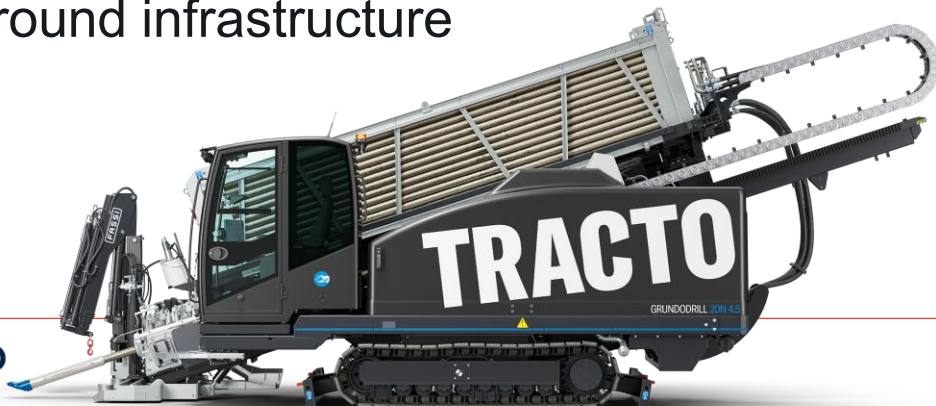
TIM MCCLURE

Company Owner

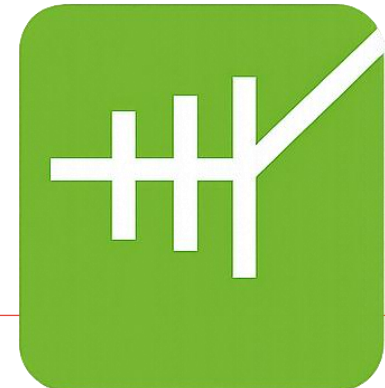
MCCLURE EXCAVATIONS

TRACTO

- Headquartered in Lennestadt, Germany
- Founded in 1962
- 60+ years of trenchless technology
- Full-range provider of trenchless solutions
- Technologies for installation & renewal of underground infrastructure



- Victoria, Australia
- Established in 1988
- trenchless installation for power, water and communication
- Developer of the Trenchless Grounding system



WHERE DO WE NEED **GROUNDING**?

- Grounding is needed almost everywhere – mostly underground
- It is used in houses, buildings, factories, substations and power networks
- It is also essential for new infrastructure like wind and solar farms, battery systems and data centres
- Grounding helps protect people, equipment and the electrical system



SAFETY, PROTECTION, RELIABLE OPERATION

GROUNDING = A **SAFE PATH** FOR FAULT CURRENT

- Current should follow it's planned path
- Grounding provides a safe path for current into the ground when something goes wrong
- In the event of a fault, it carries current in a safe and controlled way
- It helps protection systems detect the fault and switch off the system

A SAFETY SYSTEM FOR PEOPLE AND ELECTRICAL EQUIPMENT



ELECTRICITY IS BECOMING MORE **IMPORTANT**



Heat pumps



Electric cars



Data centres



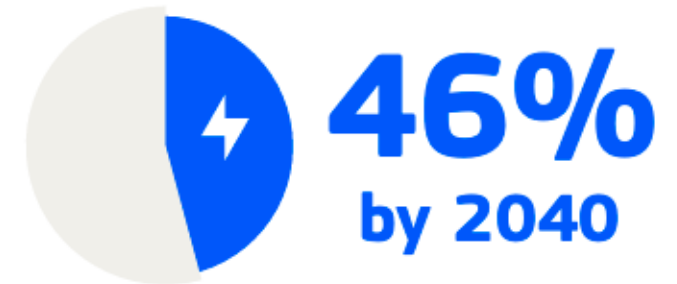
Industry

ELECTRICAL SYSTEM IS BECOMING BIGGER→ MORE ELECTRICAL INFRASTRUCTURE NEEDED.

THE EUROPEAN GRID IS CHANGING

- European Commission is planning for a higher level of electrification
- target is to move towards around 46 percent by 2040
- electricity has to be produced, moved and distributed
- Grid has to grow
- Major investments in grid expansion
- Strong growth in new infrastructure

**An indicative
electrification
target of**



to be assessed **as part of the
post-2030 Energy Union
package**

Source:

<https://ec.europa.eu/commission/presscorner/api/files/attachment/882736/Factsheet%20on%20Electrification%20Action%20Plan.pdf>

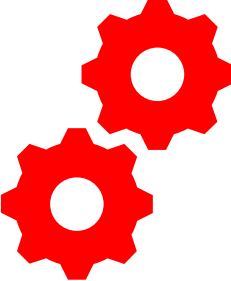
AGING INFRASTRUCTURE

- 40% of Europe's distribution grids are older than 40 years
- Networks were built for different energy needs
- Aging infrastructure requires inspection, maintenance and upgrades
- Grounding systems are also affected by long-term degradation

THE ENERGY TRANSITION REQUIRES BOTH:
GRID EXPANSION AND INFRASTRUCTURE RENEWAL.



TODAYS SITUATION

- 
- More electrical infrastructure is needed.
 - More grounding systems are needed.
 - Existing grounding systems need upgrades.
 - Some systems need replacement.

CHALLENGES



- Limited installation space
- Difficult site access
- Roads and buildings in the way
- Existing infrastructure constraints
- Environmental impact requirements
- Need to reduce installation effort



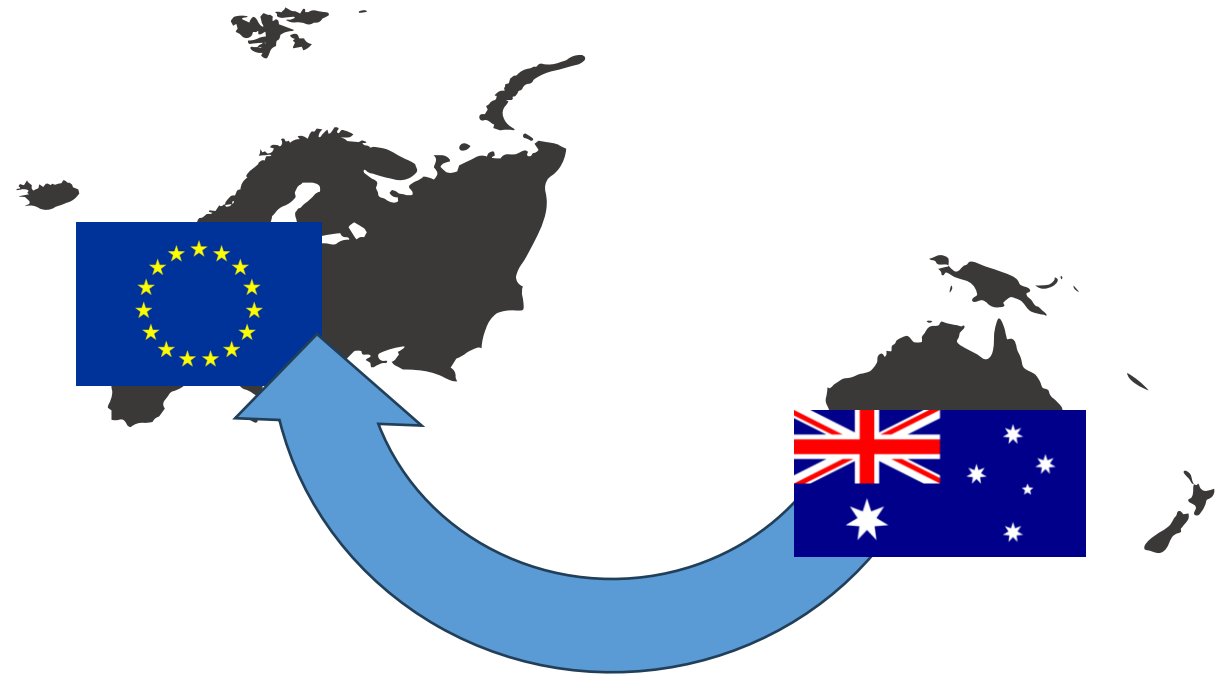
KEY QUESTION

Are there other ways to install grounding systems?

FROM AUSTRALIA TO EUROPE

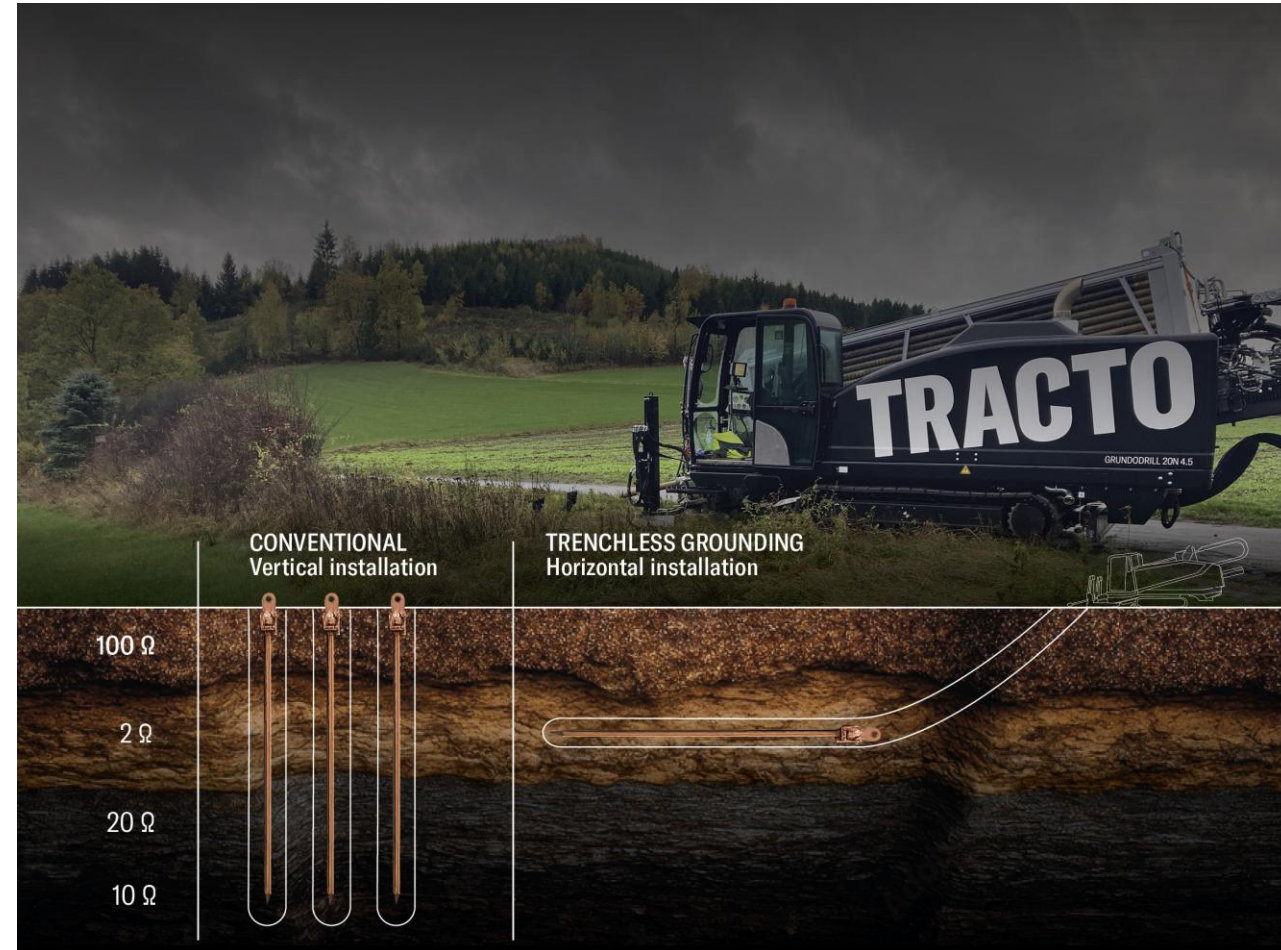
Can this be a new application for HDD in Europe?

Trenchless Grounding was pioneered in Castlemaine, Australia, and was originally developed to resolve problems with high soil resistivity and difficult geologies for electrical substations. Today it's now a globally patented system covering Australia, USA and Europe.



GROUNDING WITH HDD

- The new **Trenchless Grounding** approach demonstrates how earthing systems can be precisely installed in conductive soil layers using HDD technology – without digging and with full control
- This opens up **new applications for HDD** users – particularly in situations where conventional methods reach their technical or economic limits



HOW DOES IT WORK?

“The system utilizes Horizontal Directional Drilling (HDD) for earth grounding installation rather than conventional vertical electrodes.”



HDD APPLICATION

While horizontal directional drilling (HDD) is widely used across electrical utilities for conduits, its application in electrical **earth grounding** remains largely un-tapped.



TRENCHLESS GROUNDING, AUSTRALIA

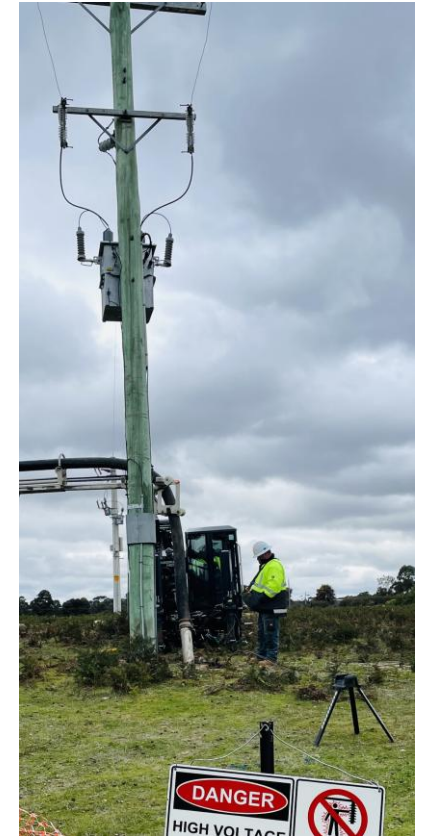
A trenchless approach that is already in use providing solutions for earth grounding.

- New Installation
- Network Upgrade
- Grid Maintenance
- Emergency Fault Response



600+

INSTALLATIONS

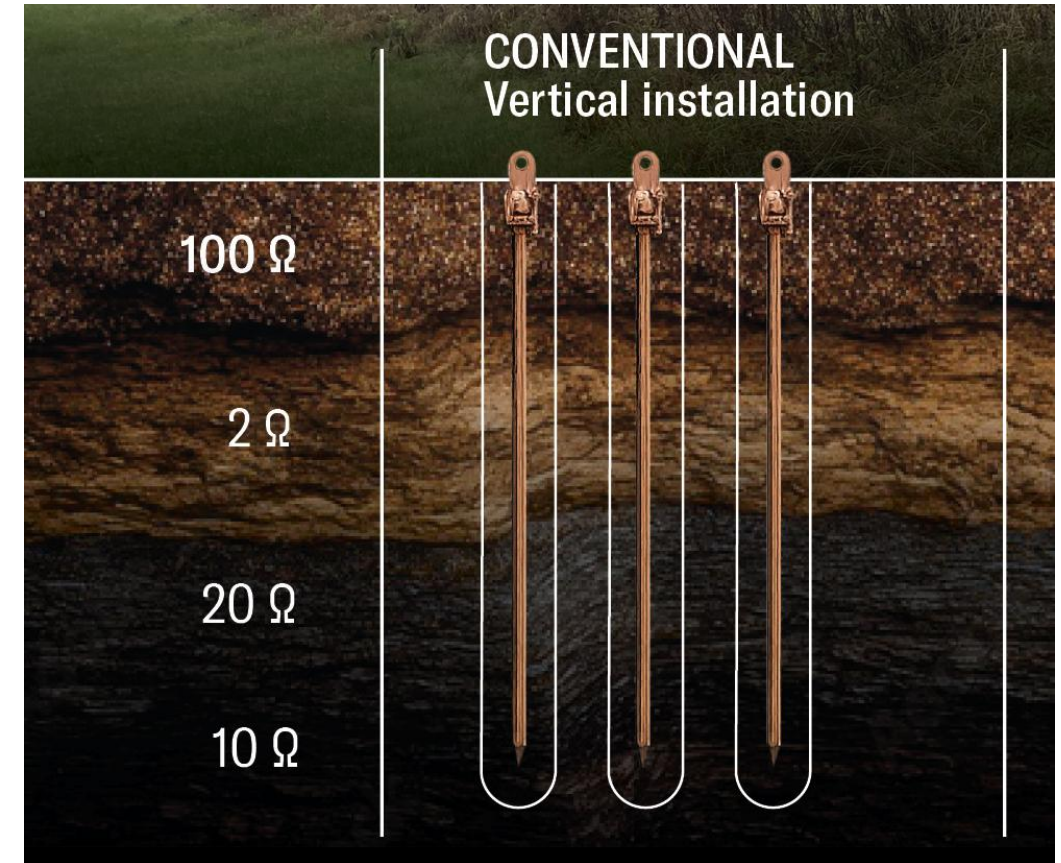


WHAT IS RESISTANCE & RESISTIVITY?

- **ELECTRODE RESISTANCE** is measured in **ohms (Ω)** and is the opposition to the amount of electric current that can flow through the electrode
➡ “You will need low **Resistance** for high current to flow through the electrode”
- **SOIL RESISTIVITY** is measured in **ohm-meters ($\Omega \cdot m$)** and is a measure of the resistance of the soil to the flow of electric current.
➡ “Low **Resistance Soil** will dissipate electric current into the Earth efficiently”

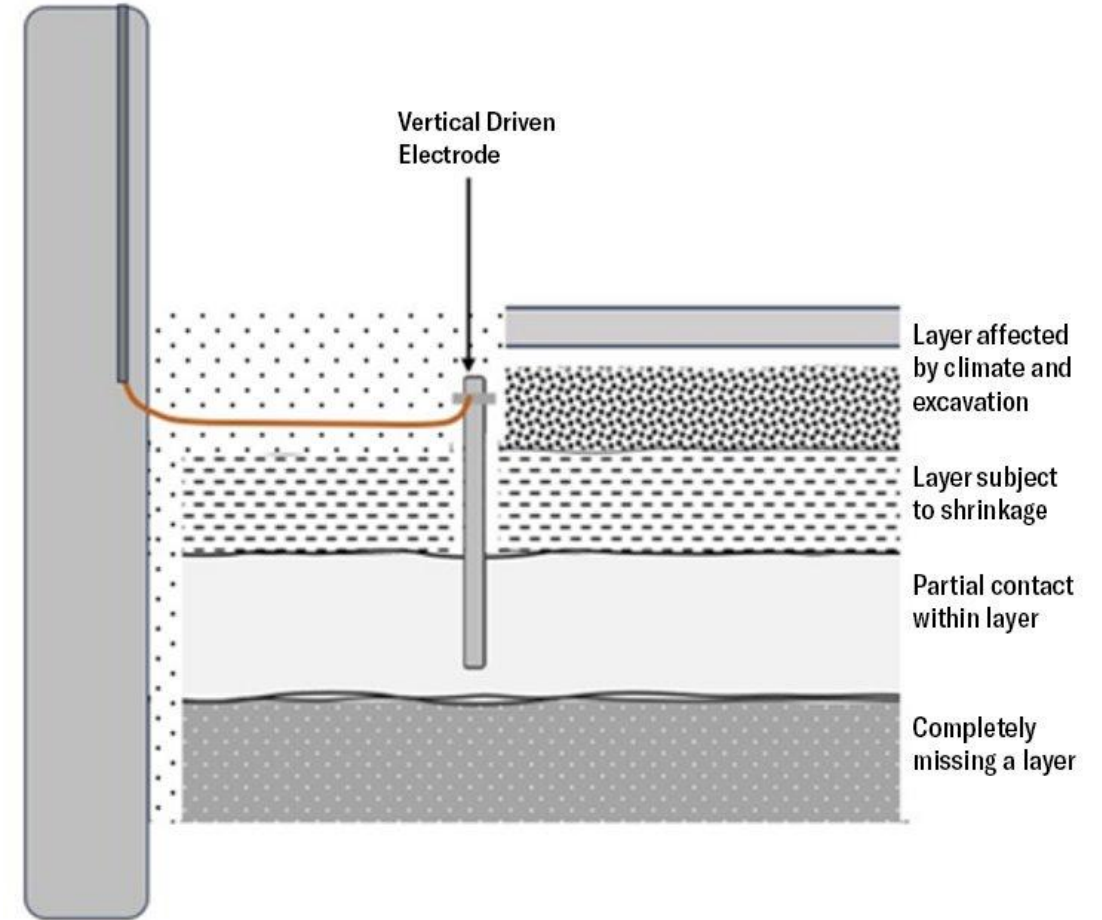
CONVENTIONAL INSTALLATION USING VERTICAL ELECTRODES

- Requires driving or drilling the electrode into the ground
- Installing a conductor and connecting between electrodes
- Once all the electrodes are installed and connected, they are tested for total resistance measured in ohms Ω
- If the TOTAL electrode resistance measurement is not achieved additional electrodes are installed



PLACEMENTS OF ELECTRODES IN THE SOIL

- Placement of the electrodes within low resistivity soil is very important to reduce total resistance
- The lower the resistance means optimal electrical performance and safety



VERTICAL INSTALLATION IN HORIZONTAL LAYERS

The method for installing electrodes has remained relatively unchanged since the early 1900's

- Not necessarily benefit from making full contact with favourable resistivity layer
- Passes or misses it completely
- Subject to impact from changes in climate

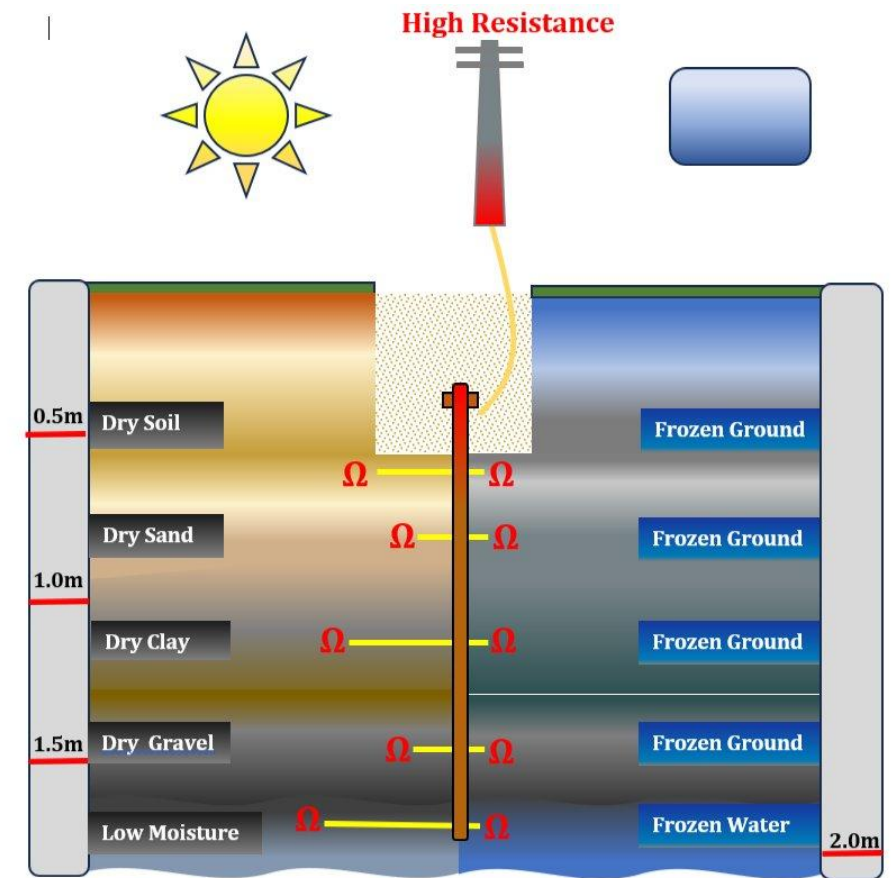


Figure 1. Illustration of vertical driven electrode with varying ground layers in different climate conditions.

CHALLENGES FOR EARTHING

- High Soil Resistivity
- Environmental overlays
- Multi – layered geologies
- Rock and hard ground
- Easements and boundaries
- Limited access to work site
- Varying climate such as hot **dry** conditions or **frozen** ground



A TRENCHLESS SOLUTION (HDD)

- Trenchless Construction
- Target Horizontal Ground Layers
- Measure total resistance as drilling progresses
- Installed in all ground including rock
- Resilient to changes in climate
- Avoid disruption to surfaces
- Directional Drill Sizes from 2,000kg to 20,000+kg



WHAT IS TRENCHLESS GROUNDING?

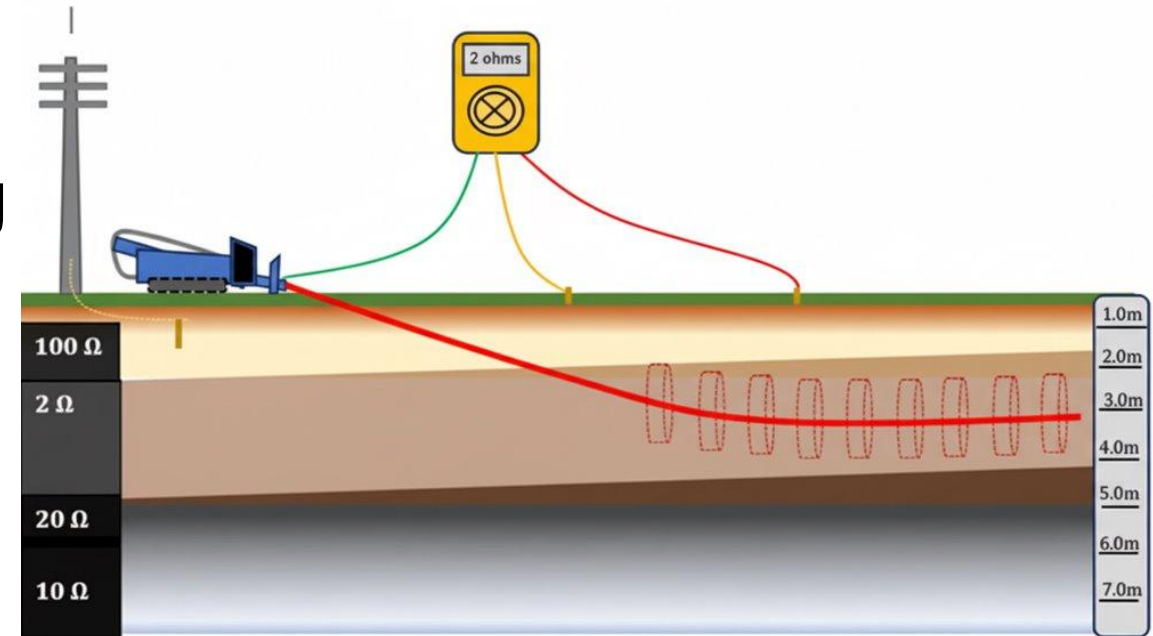
- **Trenchless Grounding** uses Horizontal Directional Drilling (HDD) to install earthing conductors while being able to verify total soil resistivity (ohms-meters) and total resistance of the electrode (ohms Ω) in real time and as drilling progresses



Trenchless Grounding Work Site in Australia

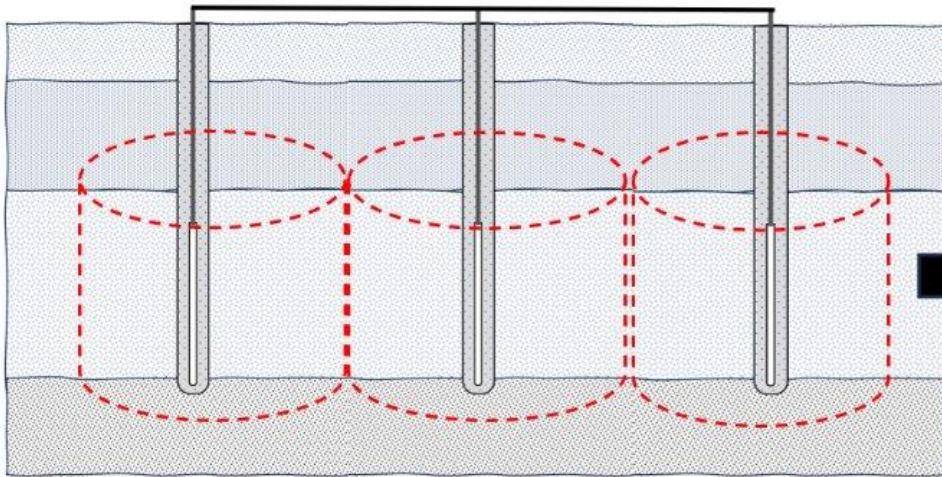
TRENCHLESS GROUNDING SYSTEM

- Installation of conducting electrodes within the horizontal layers of the ground
- Verify total soil resistivity as drilling progresses
- Measure total resistance for the electrode as drilling progresses
- Promote electrical efficiencies by increasing the lateral area within the favourable ground layer



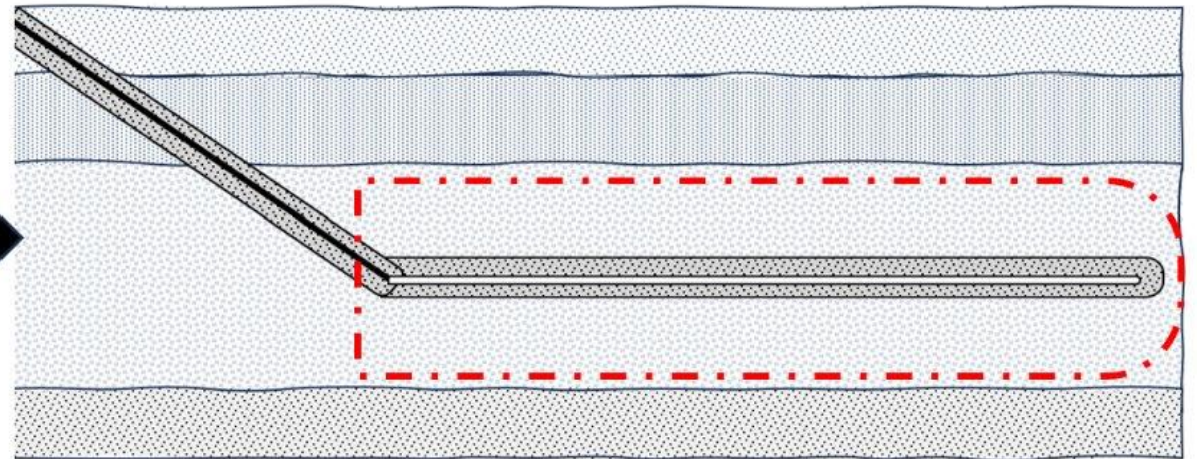
INCREASED GROUND LAYER VOLUME

Installed through the layer



Conventional Vertical

Substantially installed within the layer



Horizontal Directional

NEW INSTALLATION - 22KV

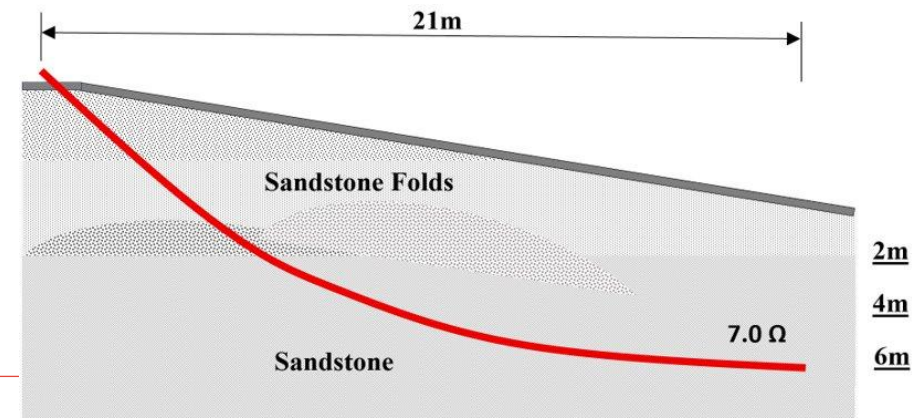
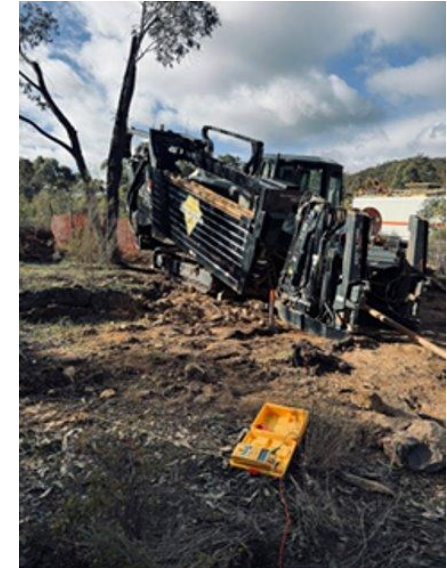
CASE STUDY - 22Kv HV SWER, Central Victoria, Australia

Work Site

- Installed under LIVE existing overhead powerlines
- Measured total resistance for electrode in real time as drilling progressed
- Substantially installed within the favorable ground layer
- Bore exit hole was not required
- Reduced electrode resistance from 27 ohms (Ω) to 7 ohms (Ω)

Environmental

- Extension under existing native vegetation
- Avoided environmental overlays
- Installed into hard sandstone and quartz



NETWORK UPGRADE – 22KV TRANSFORMER

Grampians National Park, Australia

Using directional drilling to extend an existing earth system where easements, vegetation and high resistance sand layers were present.

- Continuously measure and test the ground resistivity for the total electrode target resistance as drilling progresses
- Steered and adjusted within and towards the favorable low resistance ground
- Earthing installed substantially within the clay layer
- Work was completed within the same day



GRID MAINTENANCE – 22KV TRANSFORMER, AUSTRALIA



Ground Mounted HV / LV Transformer
Replacement



HDD targeting deeper
Low resistance layers



Installing the conducting
electrode using HDD

EMERGENCY FAULT RESPONSE – BUSHFIRE

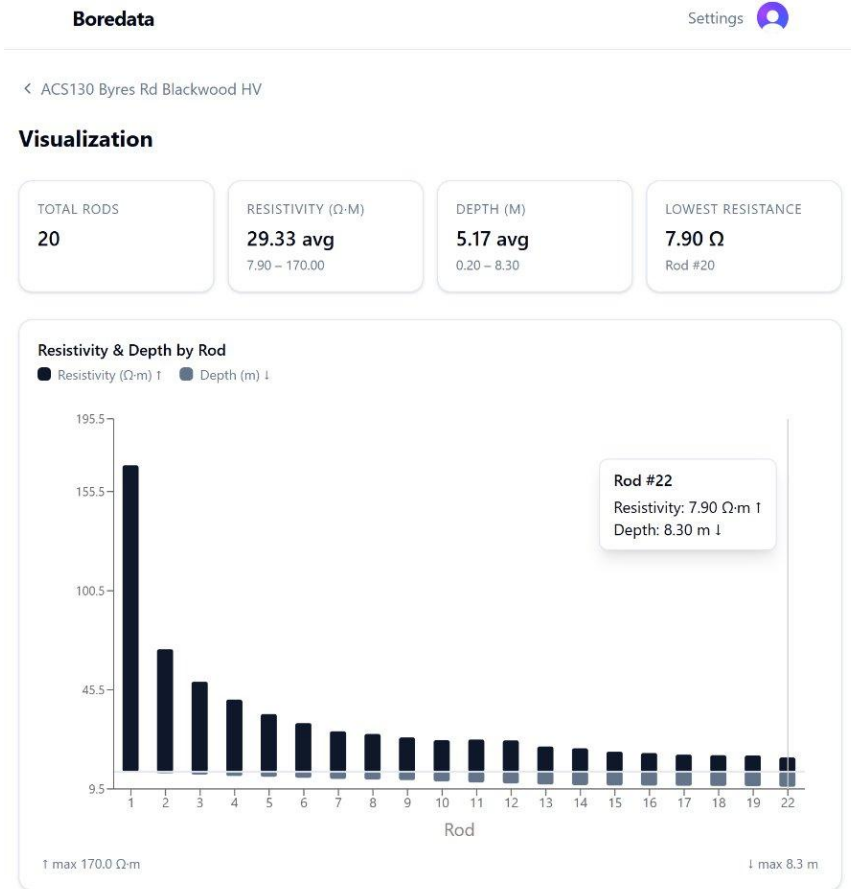
Central Victoria, Australia

Grid infrastructure destroyed during extreme Bushfire event in January 2026

- Emergency repair to earth grounding
- Avoided high resistance soil layers
- Installed within hours
- Successful resistance to earth allowing work crews to energize grid
- Access site with compact drill rig



DATA AND REPORTING



ELECTRODE TEST SITE

Castlemaine, Victoria Australia

In March 2025 Trenchless Grounding was installed at a testing site with sandstone geology to evaluate:

- Total resistance to earth
- Integrity of the bore hole
- Native material and bentonite backfill
- Resilience to seasonal change
- Bore drilling data
- Monthly test using 3 pole fall of potential



EVALUTION OF BORE BACKFILL

Castlemaine, Victoria Australia

- Conducting electrode exposed by suction excavation
- Native material backfill was in direct contact with conducting electrode
- Integrity of bore hole was integrated directly with conductor
- Moisture content during summer



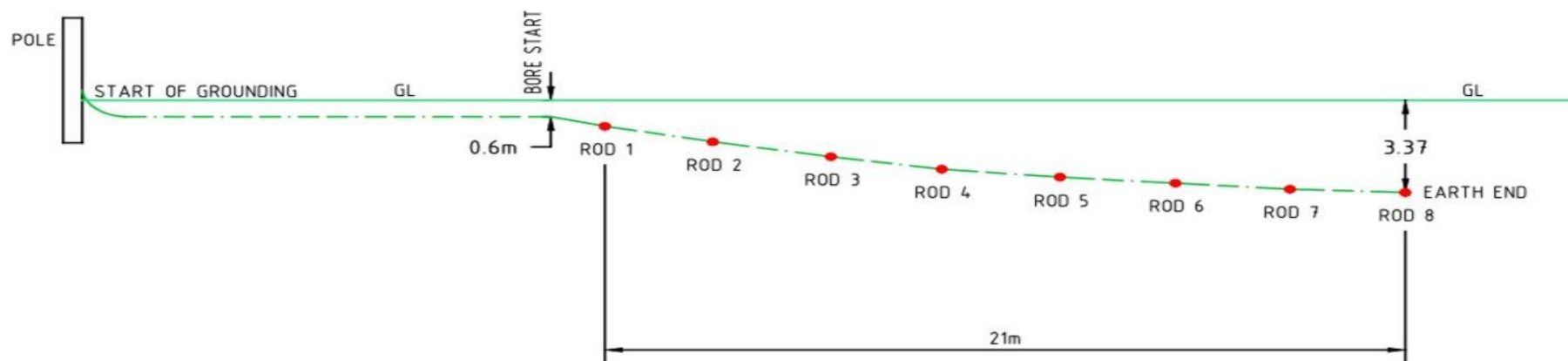
Native material and bentonite



Pugging ball from native backfill after 10 months

EVALUTION OF ELECTRODE RESISTANCE

ELECTRODE RESISTANCE ohms (Ω)											
May 2025	June 2025	July 2025	Aug 2025	Sep 2025	Oct 2025	Nov 2025	Dec 2025	Jan 2026	Feb 2026	Mar 2026	Apr 2026
1.1	1.13	1.45	1.4	1.39	1.35	1.31	1.36	1.31	1.27	1.25	1.35



COST EFFICIENCY

Under what circumstances is **Trenchless Grounding** a cost benefit compared to conventional installation?

- Where design requires low resistance
- Soil with high resistivity or multi - layer geologies
- Can be installed without shut down of electrical network.
- Reinstatement of surfaces
- Efficiency of installation using trenchless
- Can be installed within existing easements
- Reduction in material length and connections

INSTALLATION EFFICIENCY

Does **Trenchless Grounding** benefit from installation efficiency when compared to conventional installation?

- Trenchless Grounding 500+ Installations
- Decreases in resistance by 50% to 90%
- Reduced reinstatement cost by 100%
- Installation time cut in half
- Reduced material cost up to 50%
- Network outage time reduced by days or weeks



CONCLUSIONS USING TRENCHLESS GROUNDING

- Time efficiency using directional drilling
- Verifying soil resistivity as drilling progresses
- Measure electrode resistance as drilling progresses
- Target geological layers with favorable resistivity
- Increased electrical efficiency within ground layers
- Environmental impacts reduced
- Significantly reduced reinstatement of surfaces
- Less disruption to the work site and community
- Resilient to climate and seasonal changes

WHY TRENCHLESS GROUNDING MATTERS

A growing market. A practical HDD application. New business potential for all stakeholders.

- **For planners:** more efficient design options, especially in difficult soil and space conditions
- **For HDD contractors:** new applications, new business fields, and additional revenue potential
- **For equipment and tooling manufacturers:** added sales potential through a new use case for existing technology
- **For the market:** grounding is becoming more relevant through the energy transition, grid expansion, renewables, industrial infrastructure, and modernization

THANK YOU FOR YOUR ATTENTION!

DO YOU HAVE ANY QUESTIONS?