Developing a new trenchless look ahead radar for mounting on Horizontal Drilling Equipment

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Who is Tracto-Technik

1962 Founding of TRACTO-TECHNIK

It all started in a little workshop for rent in Saalhausen.

The little workshop...

Company founder Paul Schmidt

Who is Tracto-Technik

1970 The first German soil displacement hammer

The first generation of Grundomat hammers

The Grundomat hammer today

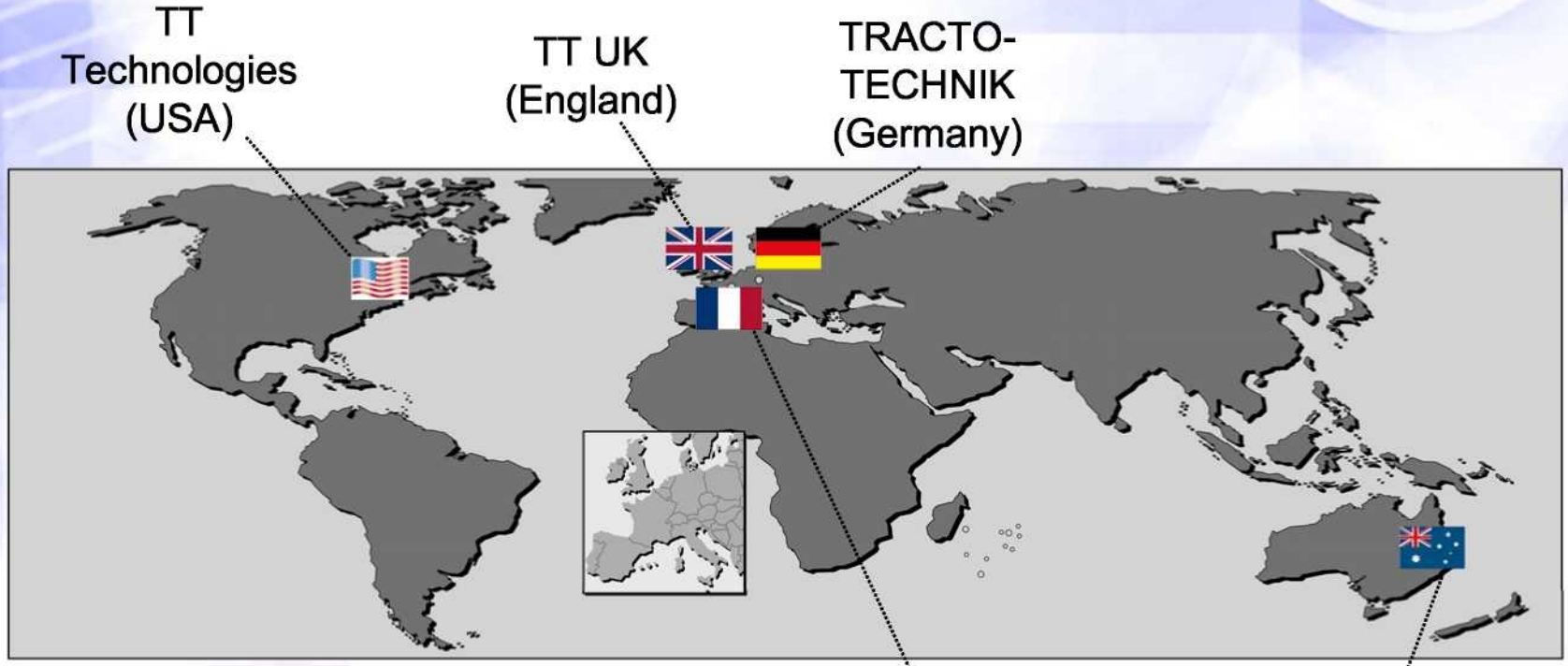
Horizontal Directional Drilling

1987 Production of the first HDD systems

First dry-bore unit GRUNDOMOLE

GRUNDODRILL today

TT international

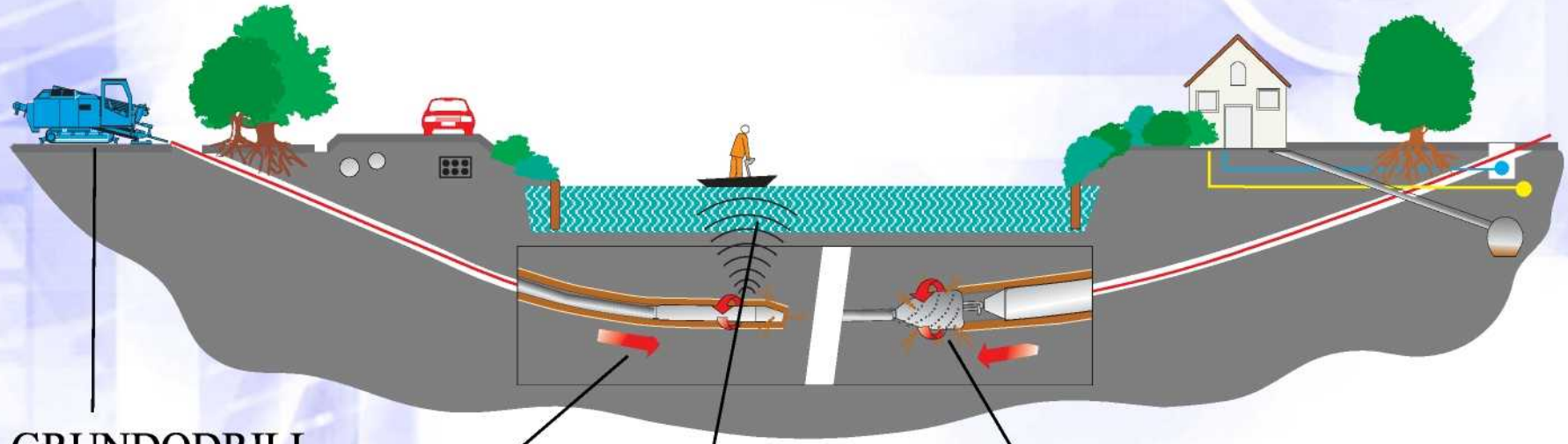


What is HDD

- **H**orizontal **D**irectional **D**rilling

- Trenchless installation of pipes and cables in the ground
- Useable for all kind of ground conditions
- Used for approx. 15% of new installed underground Infrastructure in Germany
- Dimensions from 50 up to 800 mm

Method of HHD drilling



GRUNDODRILL

Detection system

Pilot bore

Expander with attached pipe

Mini Drill Rig - GRUNDOPIT

GRUNDOPIT in transport position.

The compact dimensions enable starting from the smallest of pits and shafts.

Grundodrill 25N

HDD vs. open Trenching

- Required construction time 2.5 to 3 times shorter
- Less affected traffic areas
- Noise and dust factor at least 10:1
- Required amount of reinstatement material (1/100)
- Reducing the indirect costs, caused by:
  - Traffic disturbance
  - Damage to flora and fauna
  - Health cost
  - Road surface costs
  - Repair cost

What to do before drilling

- Check the infrastructure in the ground
- Study plans of all network owners
- Use surface information like fireplugs and house valves
- Re-check these information about the buried objects by using a location system on the jobsite

Why Bore Head Radar

Conventional location system:

- delivers (too) much information
- time consuming to interpret
- far away form the target

Bore head Radar:

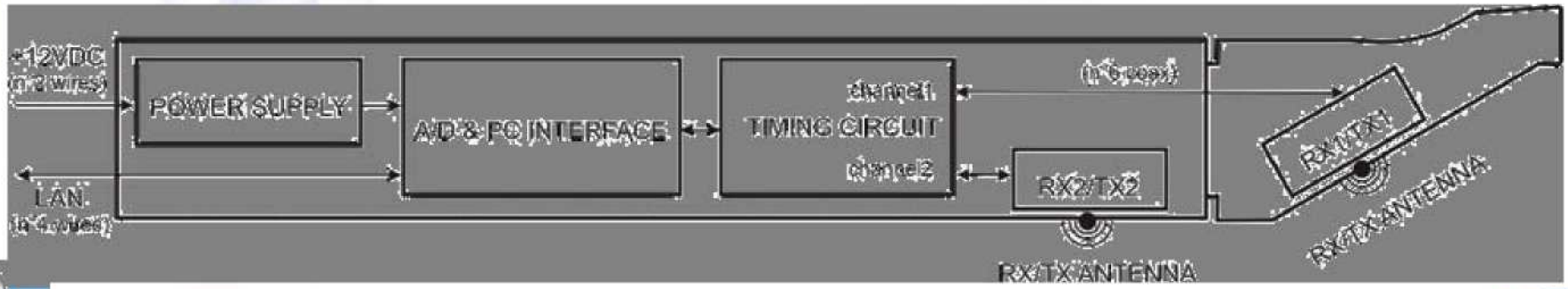
- close to the target
- only information around the critical area
- independent from ground layers above the target

HDD and Radar

- A radar system mounted on the bore-head of the HDD system could be a method of further reducing the risk of damage to adjacent plant during operations
- Because the radar will be as close as possible to the drilling head, the probability of obtaining a warning of objects that could be damaged, or deflecting the path of the drill string, is maximised
- The bore-head radar should have the capability to look in the forward and sideways directions
- Information from the radar have to be passed to the operator on the surface so that objects that would otherwise be struck may be steered around and thus avoided

System architecture

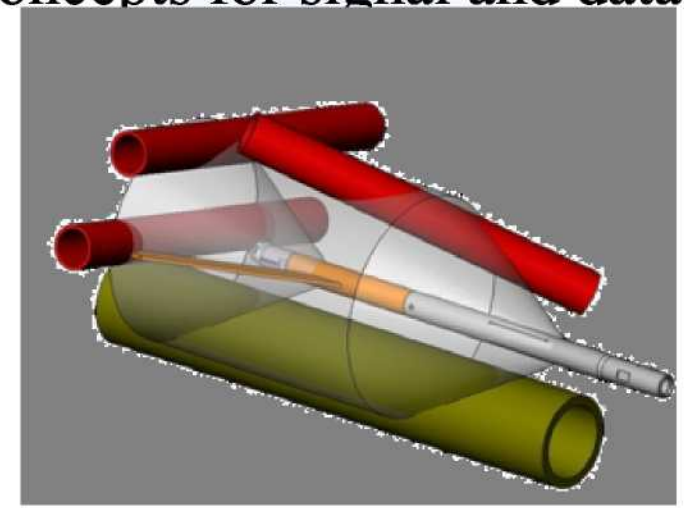
- TX and RX antenna hosted in the drilling head to look-ahead
- TX and RX antenna hosted in the drill rod to provide the side looking capability
- multi-channel timing circuit for controlling both the antennas
- an A/D conversion board and the interface to the control computer
- the power supply module



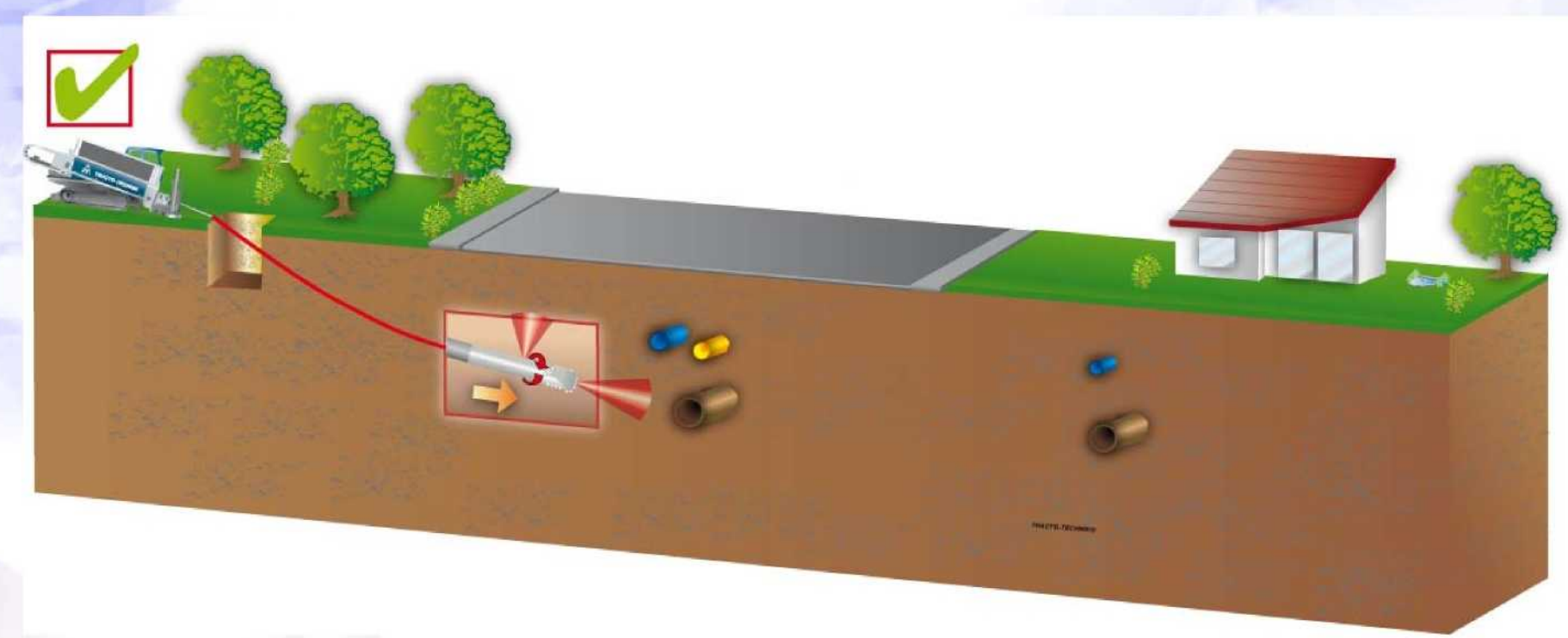
The Bore Head GPR

Therefore, main design tasks are related to:

- The provision of durable antennas and "look-ahead" and "look-sideways" capabilities
- The design of ruggedized microwave sources and receivers
- The development of new concepts for signal and data processing algorithms



Drilling with bore head radar



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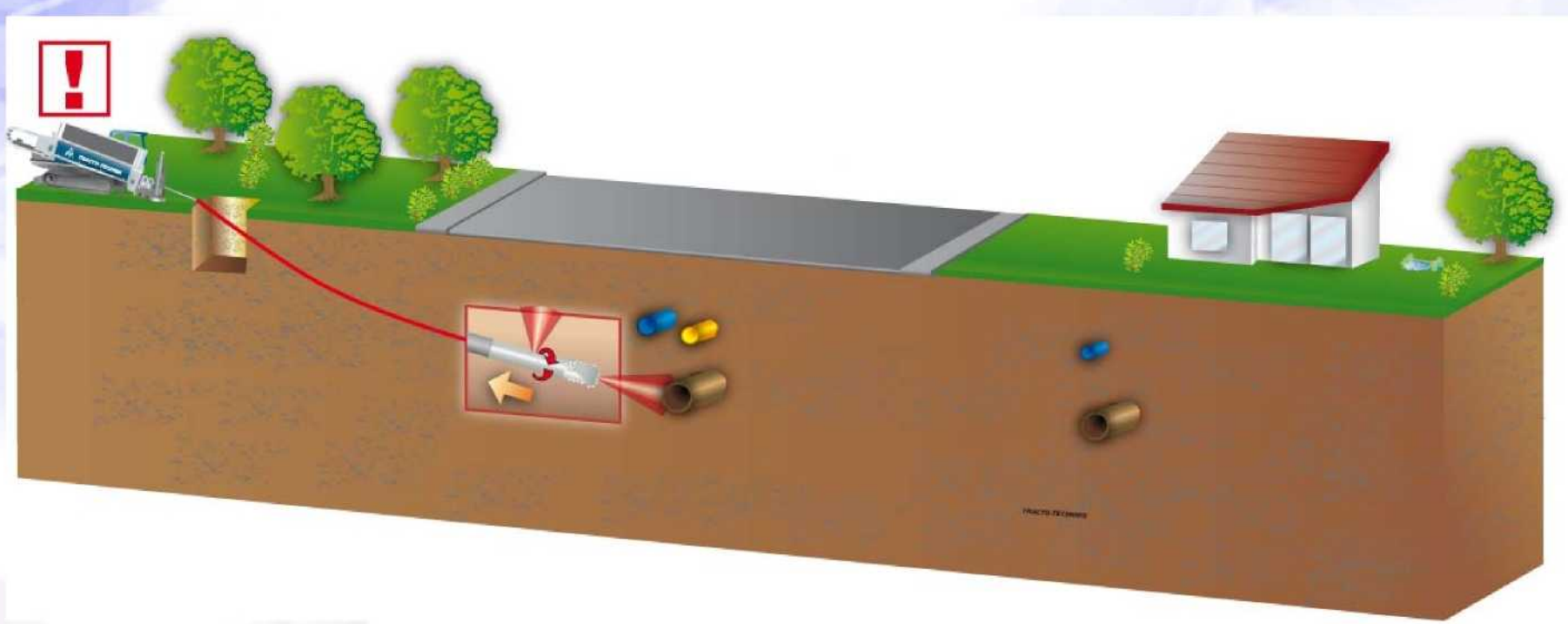

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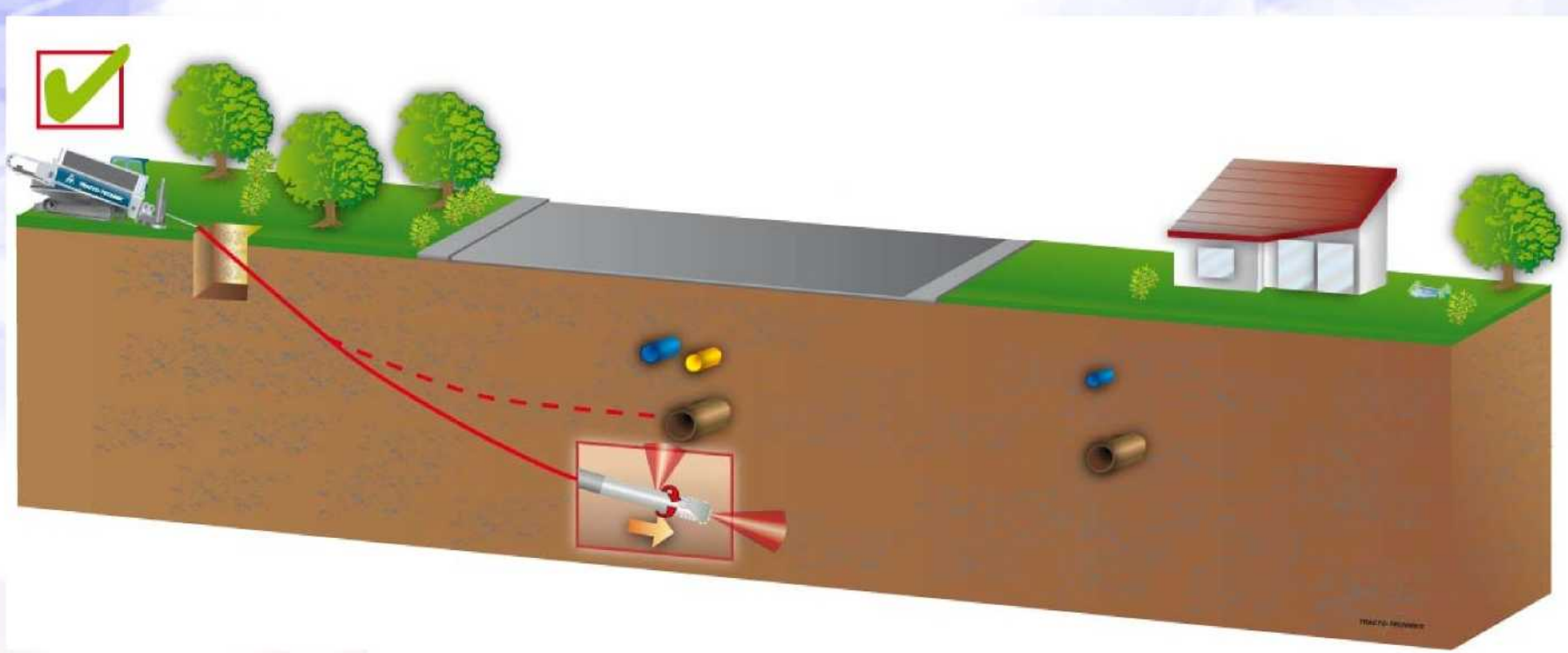

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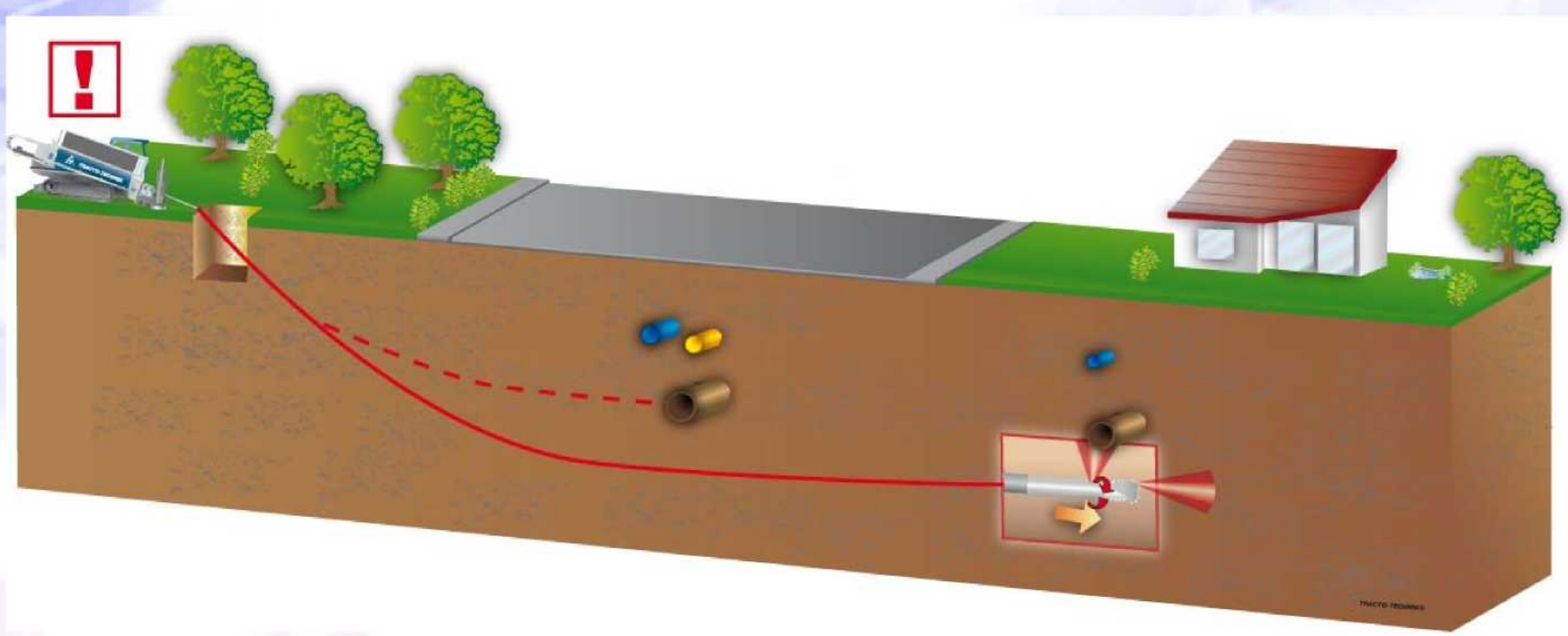

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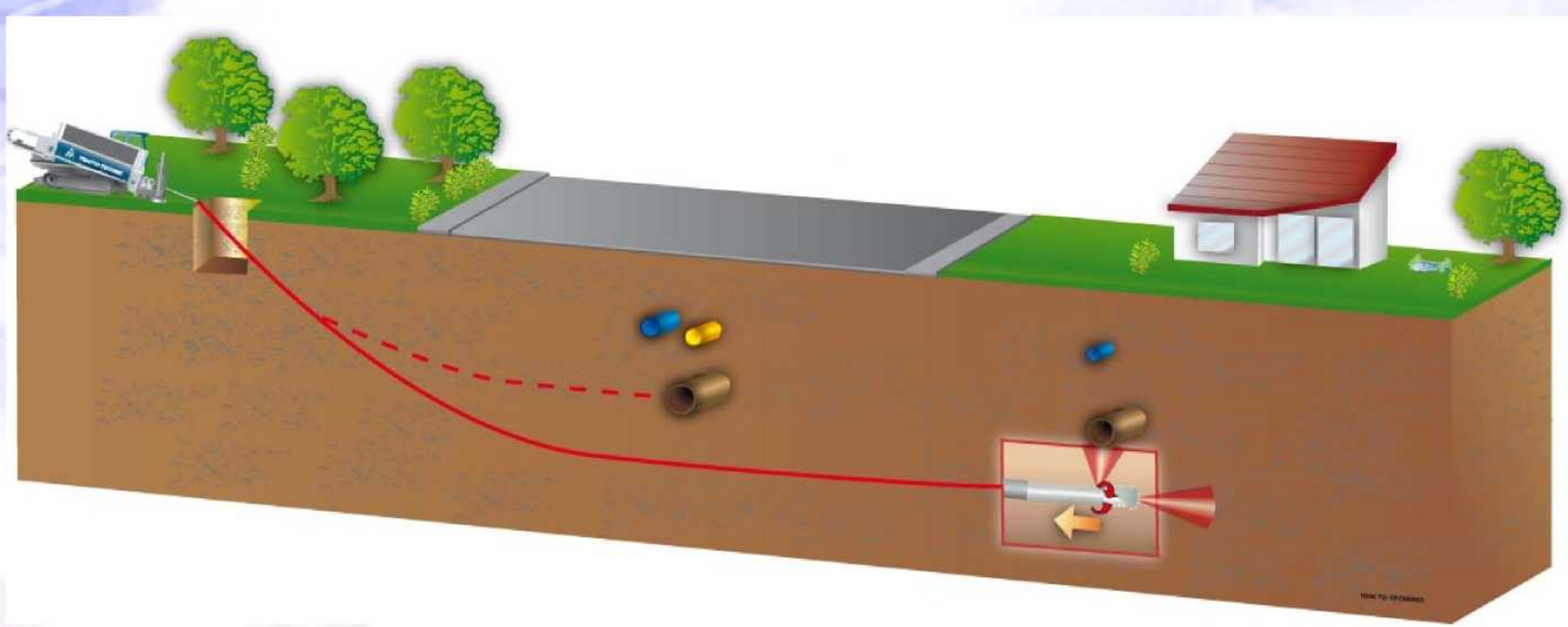

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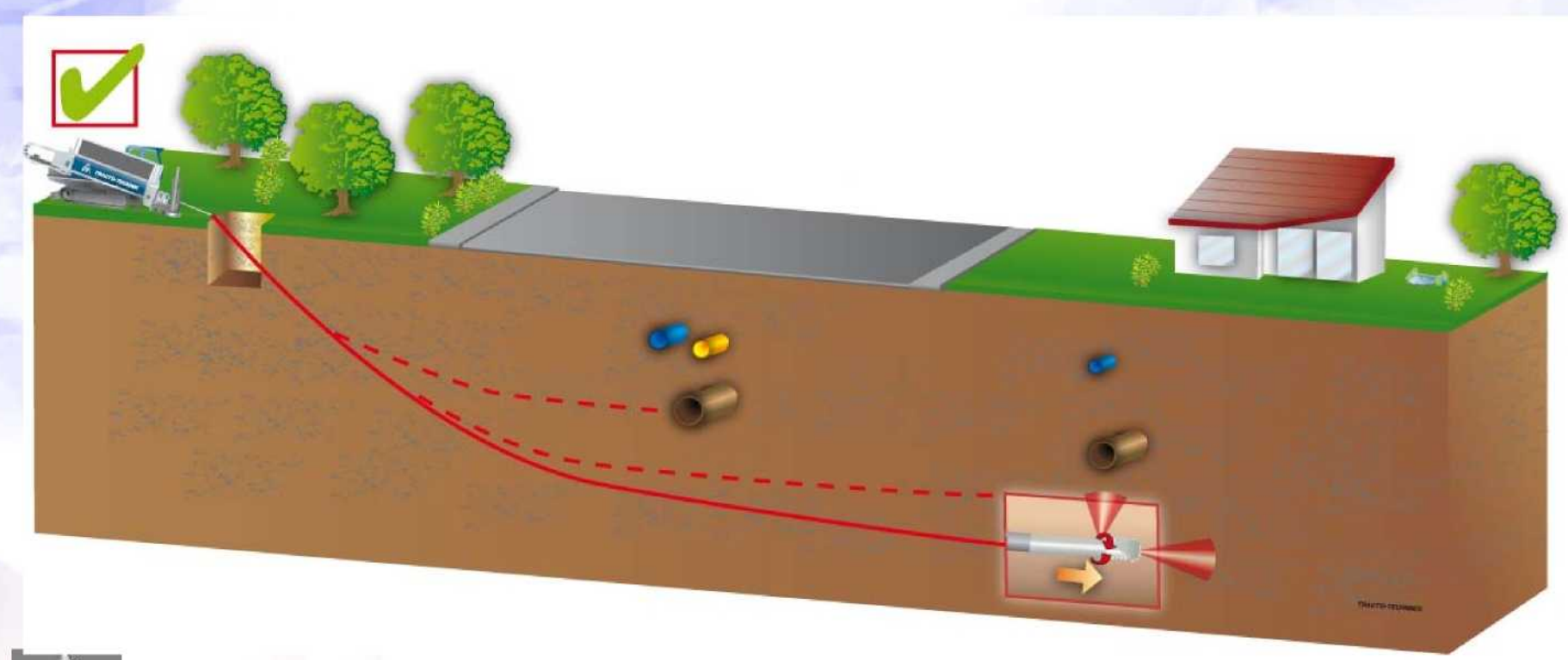


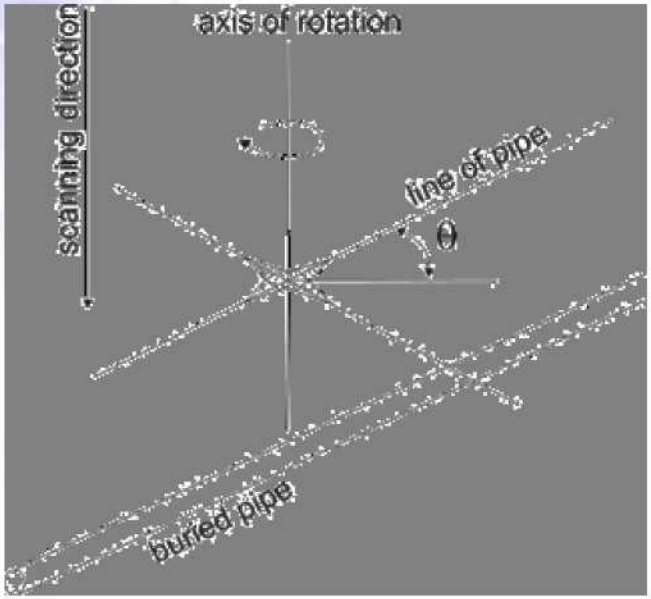
The end-user requirements

A comprehensive (and demanding!) set of requirements has been developed by the end-user including the requested

- detection distance (50 cm – 100 cm)
- minimum detectable object size (10 mm)
- Resolution (300 mm)
- axial and radial accuracy (10% of the range)
- target detection percentage (>95%)
- false target generation percentage (< 1%)
- Form of the display

Data processing

- The form of the display is different from those that have been developed for interpreting data collected by GPR operating from the surface
- A test site was implemented and used to collect some preliminary data sets



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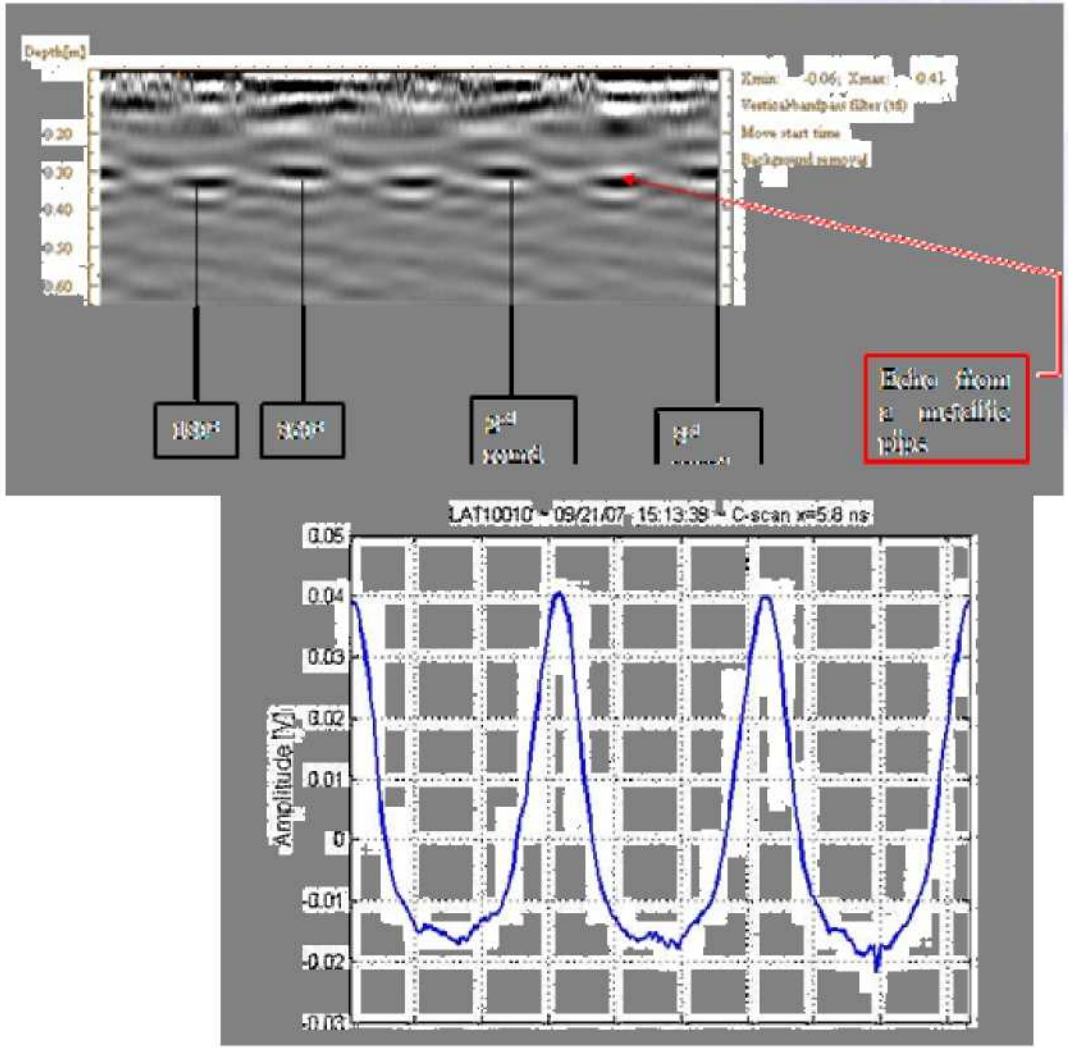
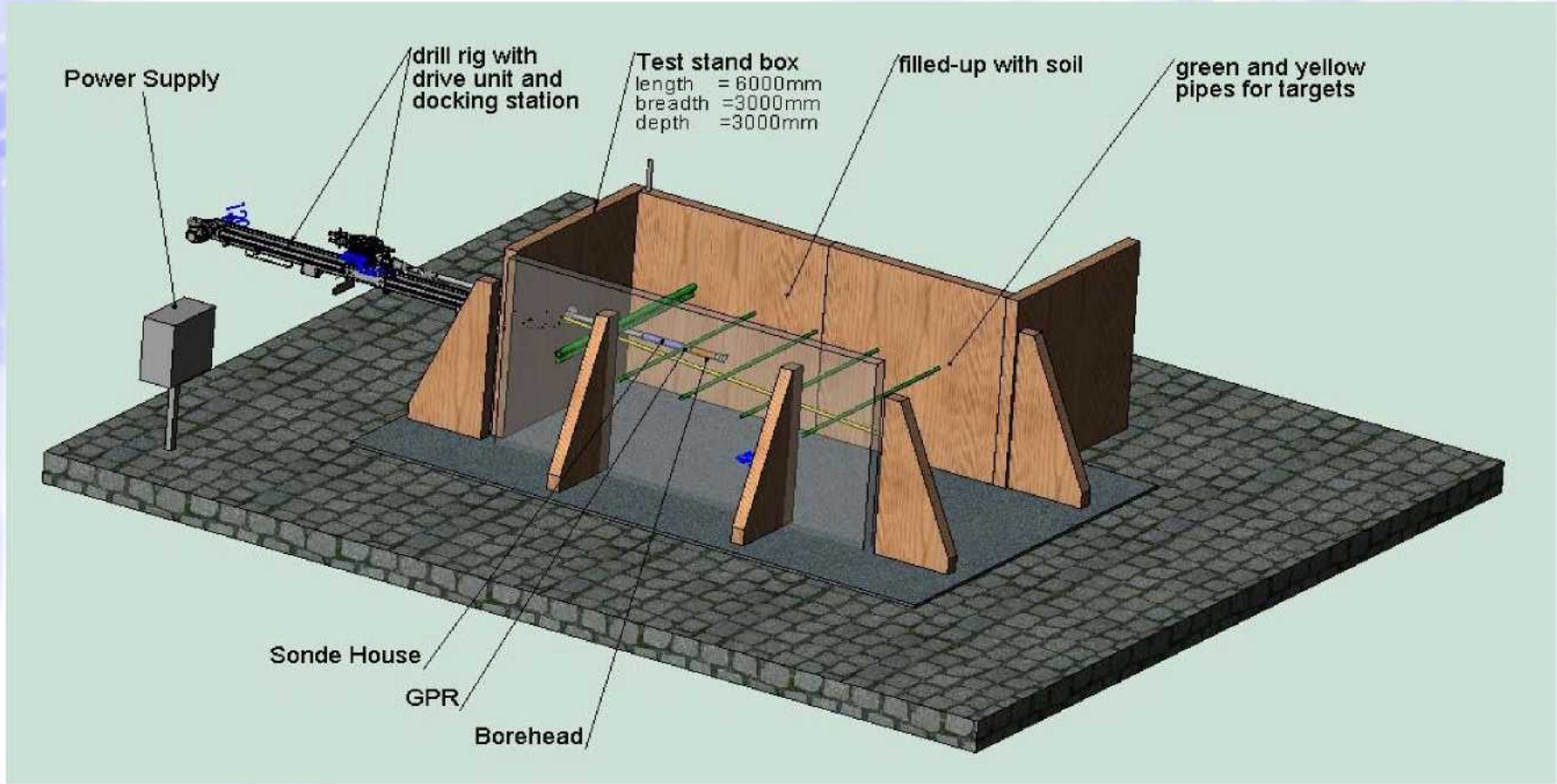


Artificial Test Chamber



Artificial Test Chamber

Information sources

- www.orfeus-project.eu
- Periodic User workshops
- Join the Mailing list

Any Questions ???

Acknowledgment

The ORFEUS project is partly supported by the European Commission‘s 6th Framework Program for Community Research ("Thematic Priority" area of sustainable development, global change and ecosystems), managed by Directorate General for Research under the contract n° FP6-2005-Global-4-036856 and would not have been possible without the support of the Commission