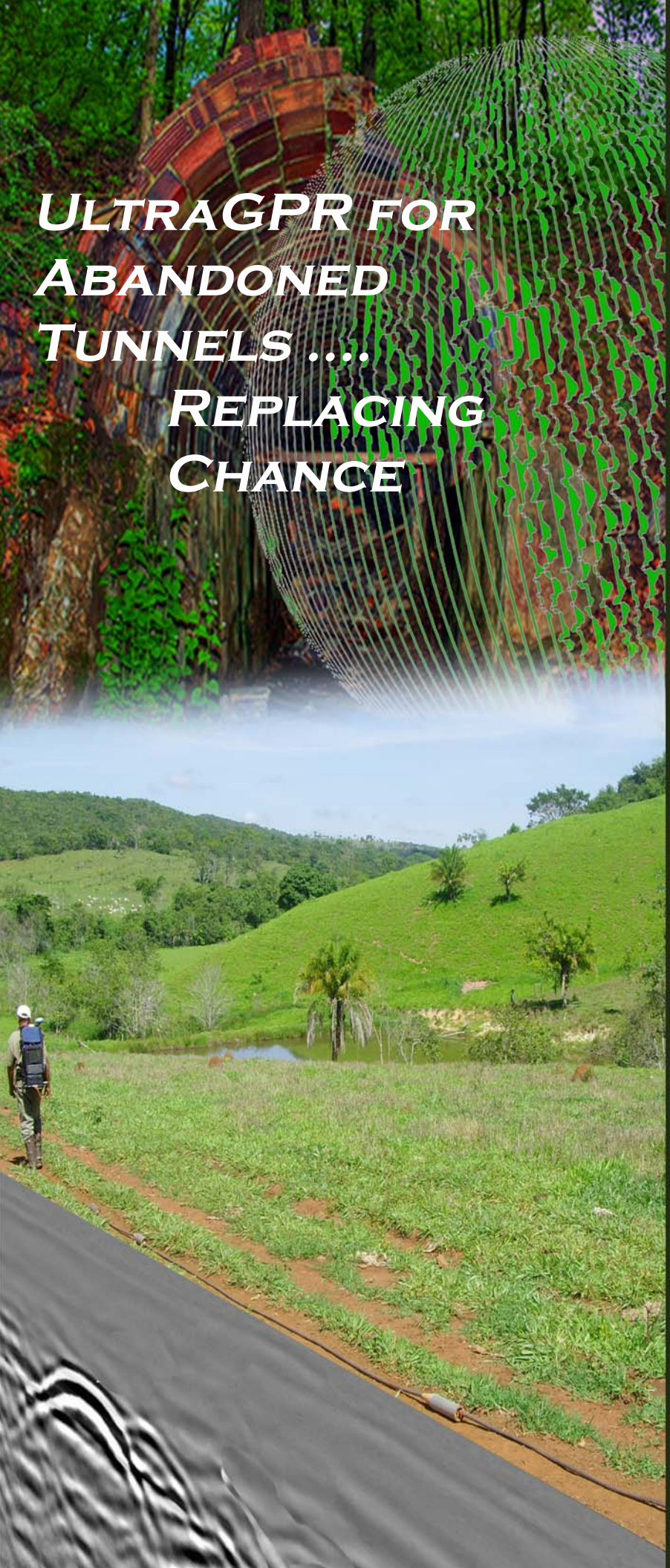


UltraGPR for Abandoned Tunnels .... Replacing Chance

Global Experience

Groundradar staff have conducted ground penetrating radar surveys for the detection of abandoned mine tunnels on all six continents in a variety of settings. Although the majority of projects have involved studies over historical coal workings, others applications have included the mapping of garimpero adits in diamondiferous gravels, as well as the location of pre-Columbian gold mines.

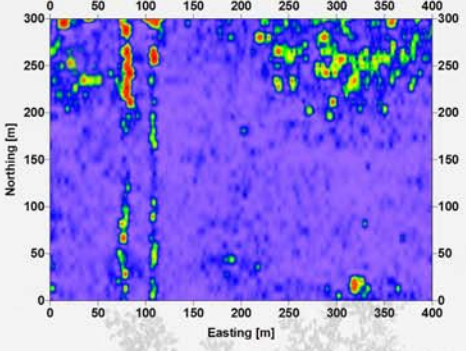
Detection of Abandoned Workings

With the increased demand for energy sources and raw minerals, contemporary exploitation activities commonly encroach upon regions of historical mining activity. Often, no reliable documentation exists as to the location of abandoned shafts or adits. Unstable ground conditions or flooding generally prevent the exploration and mapping of these workings from within. Encountering such hazards during mining activity often presents disastrous consequences which often involve the loss of life and equipment.

As such, it is critical to garner as much a priori information on the location and condition of any unmapped workings before lives are risked. Historically, drilling or electrical geophysical methods have been applied from the surface in an attempt to detect potential hazards. Both methods suffer from significant drawbacks of insufficient resolution.

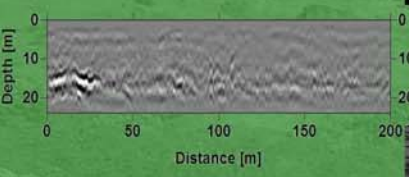
Ground penetrating radar offers the highest resolution remote sensing method for tunnel detection in the geophysical toolbox, in suitable environments. Whilst older geophysical equipment has been able to image tunnels from the surface to depth of up to 10 m, UltraGPR has been successful at detecting workings to depths of 26 m. In addition, GPR surveys can be conducted from within active mine tunnels.

Groundradar
Measured resources



Although the ideal environment for tunnel detection is homogeneous rock with no surficial soils or weathering, surveys are often conducted through coal seams to detect previous mining activity.

The orientation of the radar equipment and the success of the survey often depend on the geometry of the seam. A unique feature of GPR surveys through coal seams is that their inherent variations in conductivity due to coal's anisotropy often inhibit radar propagation in some directions. Generally, radar propagates best along a seam, rather than through it. Careful planning and a thorough understanding of the seam geometries is essential to a successful survey.



Real-Time Sampling GPR

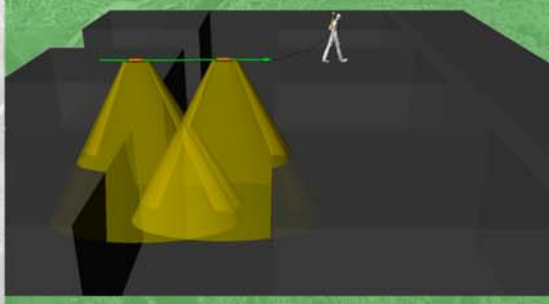
UltraGPR has been designed specifically for the long range imaging requirements common to the mining and geotechnical sectors. Compared to commercial GPR instruments, UltraGPR offers increased penetration, accuracy, ease of use, speed of surveying and reliability.

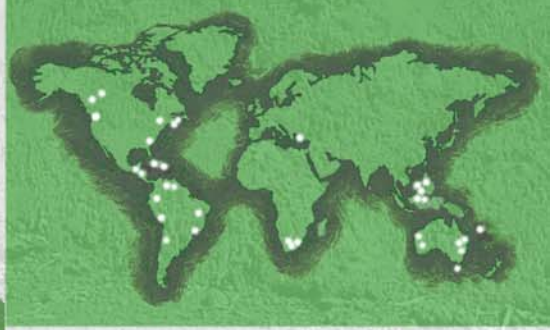
Real-time sampling technology has enabled the imaging of deeper targets than ever before possible. Tunnels have been detected at depths of greater than 25 m.

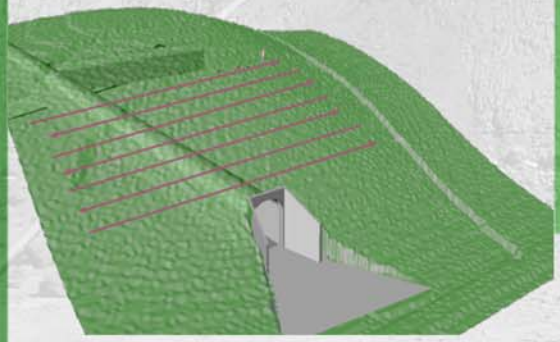
By eliminating all wires and fiber optic cables, as well as cumbersome control units and batteries, UltraGPR has been reduced to a single 9 m long tube. The traditional laptop computer used on commercial GPR systems has been superseded by the use of a mobile phone or PocketPC to control acquisition parameters and store data. Communication between components employs Bluetooth technology. The unit is waterproof and can be deployed over the most challenging of terrains.

Positioning is accomplished using both a built-in GPS receiver capable of SBAS or RTK differential corrections, which is supplemented by a highly-accurate distance measuring device. These complementary methods preclude the need for fiducial markers or pre-established survey grids.

UltraGPR requires a narrow cut line or trail, rather than the 3 m wide smooth roads necessitated by commercial GPR systems. Not only does this dramatically reduce the environmental impact of surveying, but site preparation logistics and costs are minimized. In addition, by towing the unit beyond the surveyor, large areas may be covered in a single day.







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