GPR technology
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Subsurface Views

Sensors & Software Inc.

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20 years of innovation

GPR data displaying modes

The Power of the Plan Map

One of the best features of GPR is that it provides a real-time, interpretable cross-sectional view of the subsurface. Despite many mapping and 3D visualization developments and advances, some people think that this is the only way to display GPR data. Going to the next step of generating plan map images from data collected in grids greatly enhances the ability to understand and interpret survey data.

Displaying GPR data as a series of plan maps slicing deeper into the subsurface allows users to see the spatial correlation of targets. Important targets can then be differentiated from targets of no interest. For example, responses from utilities will produce linear targets while rocks will appear as point targets.

A series of parallel cross-sections collected with a Conquest system is shown on page 2. The hyperbolas (inverted U's) from the rebar are easily visible. In fact, it would be a simple matter to use the cross-sections alone to mark the locations of the rebar on the surface.

The plan map image (or depth slice) of

(continued on page 2)

From our pulseEKKO PRO customers files:

Namib desert uranium

The zebras in the Namib Desert must have been curious about the small group of people strangely wobble-stepping across their plains. They could not have been aware of the extensive deposits of secondary uranium resting in ancient buried river channels beneath their hooves.

The African way of transporting the 12.5 MHz antennas.

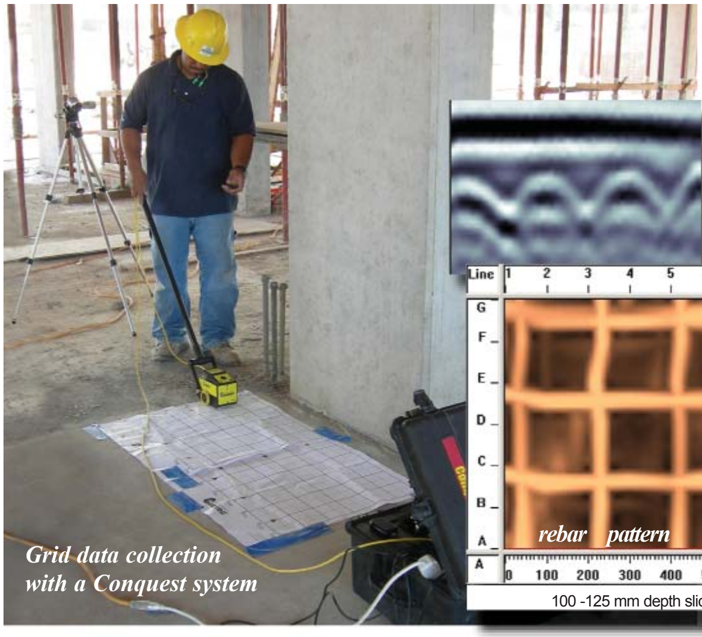
Namibia has quickly become one of the leading producers of uranium with the opening of the Langer Heinrich Uranium Mine. In this area the uranium is leached from granites and re-deposited in buried river channels called paleo-channels, some up to 60 m deep. These consist of Cenozoic gravels and sands, partly cemented by calcium-carbonate (calcrete) and gypsum (gypcrete).

EarthMaps Consulting took on the challenge of mapping and identifying these paleo-channels with their pulseEKKO PRO GPR system. Low frequency antennas were obviously best suited to achieve the deepest penetration and to battle the conductive

(continued on page 3)

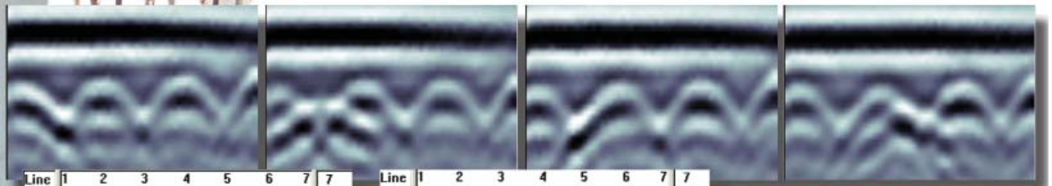
In This Issue

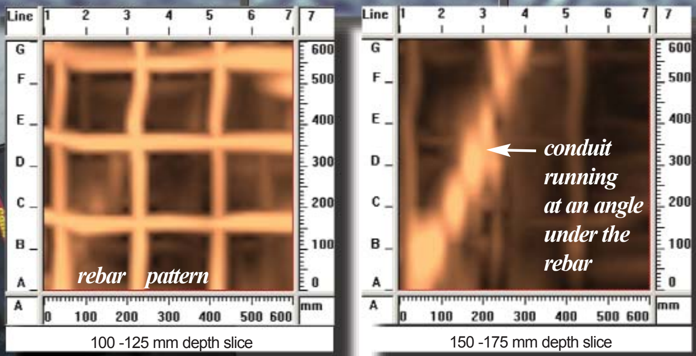
The Power of the Plan Map *(continued from page 1)*



Grid data collection with a Conquest system

A series of parallel cross sections collected 10 cm (2 inches) apart. The rebar in the Conquest cross-sections are easily interpretable, but the conduit crossing the lines at an angle is not as obvious .

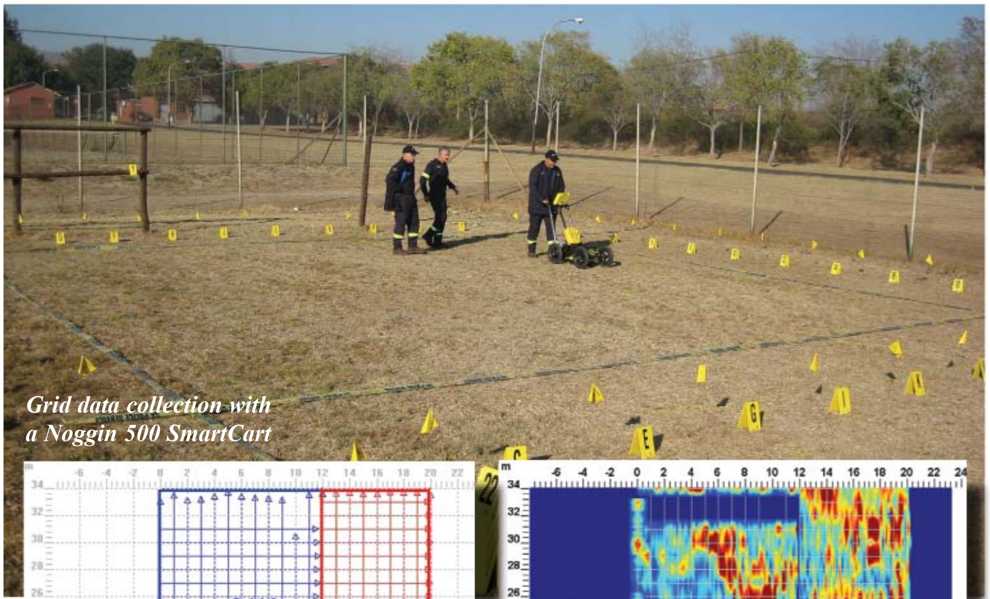




100 -125 mm depth slice

150 -175 mm depth slice

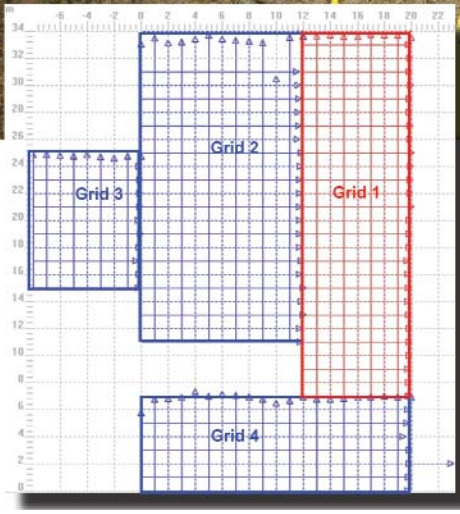
the rebar at 100-125 mm beneath the floor shows no real surprise. What is not obvious in the cross-sectional data is the conduit that runs at an angle under the rebar. This is revealed in a deeper depth slice at 150-175 mm.

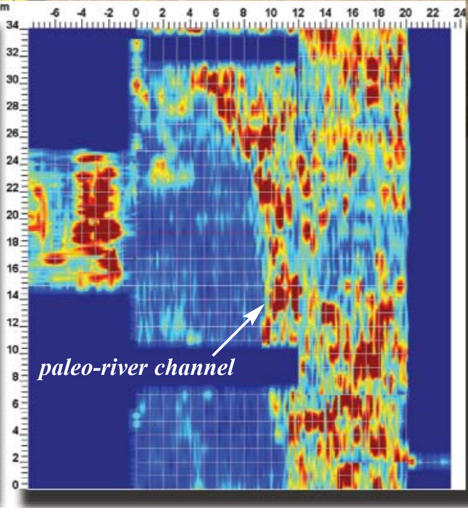


Grid data collection with a Noggin 500 SmartCart

Missing the conduit and subsequently drilling or cutting into it could have resulted in expensive damages and possible injury.

Working and displaying map data has never been easier. pulseEKKO PRO, Noggin and Conquest systems are all designed to facilitate grid data acquisition. ConquestView and EKKO_Mapper make grid data imaging and manipulating simple and user friendly.





EKKO_Mapper displaying a combined grid depth slice from four grids transforms rather confusing cross-section data into area zoning defining a paleo-river channel.

Use plan maps to:

- *Unscramble complex subsurface structures*
- *Make it easier to communicate results to your customers*
- *Simplify interpreting large volumes of GPR data.* ■

Namib desert uranium

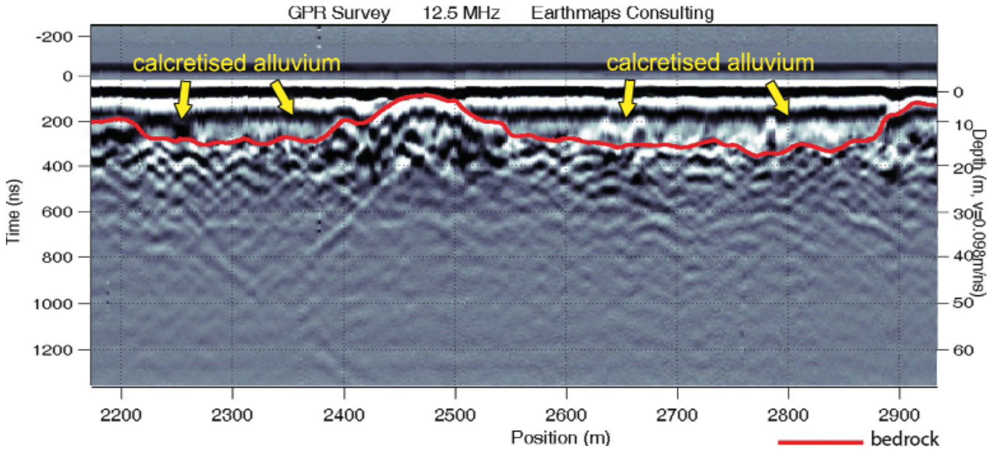
(continued from page 1)

desert sediments. Fortunately space to maneuver the large antennas was not an issue.

Penetration was limited to about 15 m with the 25 MHz antennas so the 12.5 MHz frequency was used. Bedrock was detected to about 25 m with the lower frequency. The adjacent figure shows a typical 12.5 MHz GPR profile. The uranium-bearing sediments act as a homogeneous, near-surface unit but the underlying Proterozoic bedrock can be clearly identified but its multiple, complex reflectors.

Although the 12.5 MHz antennas did not penetrate 60m to the depths of some of the paleo-channels, the survey was successful in identifying many smaller uranium-rich channels at 15 m. As well, if the bedrock was not visible in the first 25 m, the explorers assumed that the sediments were at least that thick and they were able to prioritize target areas and plan appropriate drilling programs.

25 MHz pulseEKKO PRO in the Namib Desert.



A typical 12.5 MHz GPR profile. The homogenous uranium-bearing sediments do not show any reflectors. The underlying Proterozoic bedrock is identified by multiple, complex reflectors.

By using GPR, track damage to the fragile desert soils were kept to a minimum and the company was able to substantially reduce their exploration drilling cost.

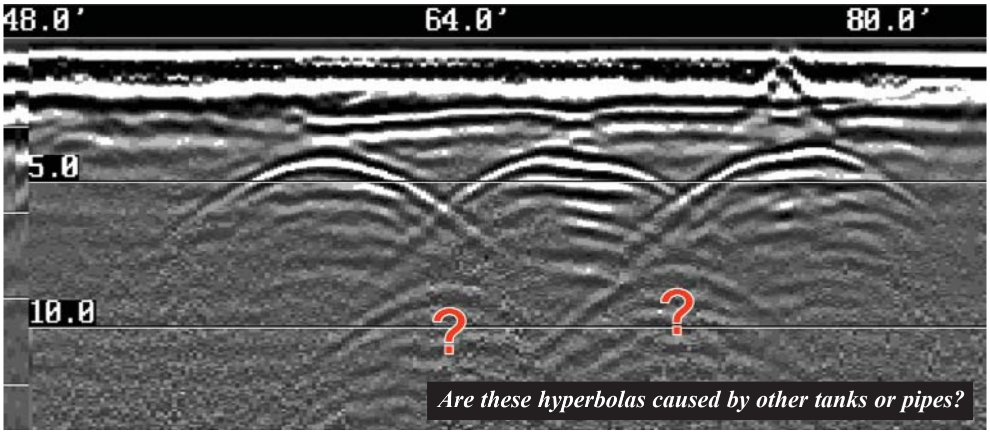
Story courtesy of Klaus Knupp from Earthmaps Consulting, Namibia. ■

Ask-the-Expert

I collected some Noggin 250 data over a set of three underground storage tanks but in the data image there are hyperbolas between the tanks that seem to indicate there are two other tanks or pipes present. Is this the correct interpretation?

When interpreting GPR data you need to remind yourself that GPR waves are an electromagnetic wave just like light waves. Just imagine what light would do in the same situation if the soil was not present around the target. We know that the shallower hyperbolas are caused by the GPR waves reflecting directly back from the circular tanks to the Noggin.

Light rays can also ricochet from one object to another if they travel at the correct angle. The hyperbolas between the tanks are *(continued on page 4)*



Recent Technical Papers

1. Creating an Isosurface Image with Voxler using Exported HDF Files from ConquestView 3 / EKKO_Mapper 3, 2008
   By: Adam Fazzari — ***ref 379***

Upcoming GPR courses

One Day Noggin® Short Course
July 7, 2008
September 8, 2008

Our Noggin® short courses are offered throughout the year to anyone interested in learning more about GPR and subsurface imaging.

One Day Conquest™ Course
July 8, 2008
September 9, 2008

Our Conquest™ courses are offered to anyone interested in learning more about our concrete imaging instrument.

3 Day GPR Short Course - July 9 -11, 2008 - Mississauga, ON
Imaging Concrete with GPR - July 22, 2008 - Dallas, TX
Imaging Concrete with GPR - July 24, 2008 - Houston, TX

See us at ...

Locate Rodeo
Atlanta, GA
July 30 - August 2, 2008
www.locaterodeo.com

TAC-ATC
Toronto, ON
September 21 - 24, 2008
www.tac-atc.ca

NRWA
Reno, NV
October 5 - 8, 2008
www.nrwa.org

WEFTEC 2008
Chicago, IL
October 19 - 22, 2008
www.weftec.org/home.htm

OSP Expo 2008
Baltimore, MD
October 22 - 23, 2008
www.ospmag.com/expo

Information Request

Please check off information required below and fax or Email back:

- ☐ pulseEKKO® PRO
- ☐ Conquest™
- ☐ ConquestView
- ☐ Noggin® Systems
- ☐ OEM Noggin^{plus}
- ☐ EKKO_Mapper
- ☐ EKKO_View
- ☐ Rental Information
- ☐ 3 Day GPR Short Course
- ☐ 1 Day Noggin® Short Course
- ☐ Image Concrete with GPR
- ☐ Other (please specify) ____________________

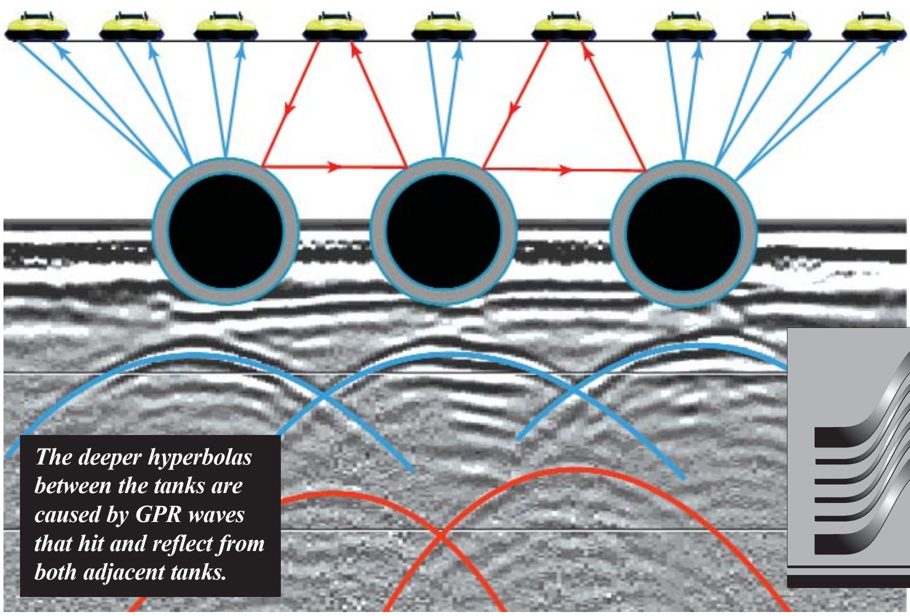
Ask-the-Expert

(continued from page 3)

caused by GPR waves that reflect from one tank to another before reflecting back to the Noggin receiver. These deeper responses are multipath artefacts and are not from real objects.

Similar effects can be seen from closely-spaced pipes in soil or from rebar in concrete.

If anyone has a good example that shows this, please send it to us so we can feature it in a future edition. ■



The deeper hyperbolas between the tanks are caused by GPR waves that hit and reflect from both adjacent tanks.

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