"Dangerous" waste survey

By Goran Bekic

Introduction

In the last few decades the ecological awareness has risen to a whole new level. Today investments and actions are made to improve the waste management which were previously unthinkable. One of the major steps in the waste management process is locating and estimating the amount and condition of the waste in the disposal areas. GPR surveys are irreplaceable and very important part of these efforts. When combined with the global positioning they result in a rich GIS data maps. The maps reveal to us where in the world (GPS), at what depths (GPR) and in what condition (GPR) one can find illegal, forgotten or badly managed waste disposal areas. From this data a highly precise plan of action can be created to clear the disposal area or implement new sanitation measures.

Survey example

As an example of the dangerous waste survey site, we created a test ground by burying two metal drums. The dimensions of the drums are 53 cm in diameter and 94 cm long which is very near to the classic 60 liter barrel dimensions.

The GPR operator conducting the test was unaware of the exact position and depths of the targets. He was instructed to survey the area in search for "the barrels with dangerous waste".

Creating "the dangerous waste barrels" survey site

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Equipment for the job

Antenna name	Recommended settings			Size of target (m)	Recommended area of application
	HP(MHz)	LP(MHz)	Range (ns)		
GCB500	250	1000	10-50	0.1	Shallow to medium depths layer and utility survey

The GCB-500 is a full shielded ground coupled antenna with an excellent resolution in shallow depths. It is extremely lightweight compared to the same frequency range antennas available from other manufacturers. The suggested areas of application for this antenna are shallow to medium depths layer and utility survey.

Conducting the survey

The survey was taken in the grass covered backyard in search for a few buried barrels. The area is approx 200 m^2 and L shaped. The only other known information was that the target barrels are not deeper than 3 meters.

In order to narrow down the scope ,the area was first divided into two smaller surveying rectangles (elements of the “L”). In each surveying rectangle we created 4 dummy profiles. Dummy profiles eliminated the first rectangle entirely and guided us to one small area of interest in the second rectangle, with two possible targets. Eleven evenly spaced and parallel profiles were collected over this small area to create a 3D grid survey.

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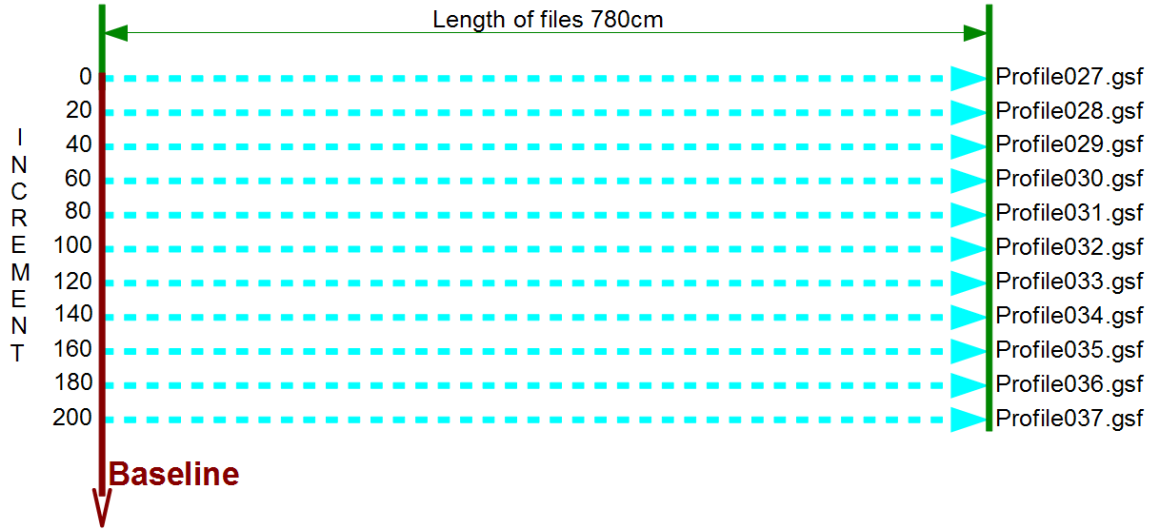
Collecting the grid data



Grid schematic

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When doing a survey on a large area, one way of reducing time and effort for the survey is to collect a "dummy profile". The dummy profile is not used for final conclusions or interpretation – it might even be left out of the report entirely. You collect the dummy profile in a free path scheme – zigzagging, crossing back over your track at different angles and changing course freely. While you are collecting the profile, pay attention to your screen. Whenever you see an anomaly (hyperbola, sudden clutter, extreme attenuation/reflection) make a mark on the ground. Now you can allow yourself to make small grids or profiles over these marks in order to collect just the relevant data. One might think of this procedure as narrowing the scope of survey to places of interest.

When doing the 3D survey - pay special attention to your baseline and parallel direction of your profiles. Disregarding the baseline and curving the profiles will result in a useless attempt to integrate the data into a 3 dimensional representation.

Baseline (red) and direction (blue)

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After declaring the baseline, ALL profiles of the grid must start at the same baseline!

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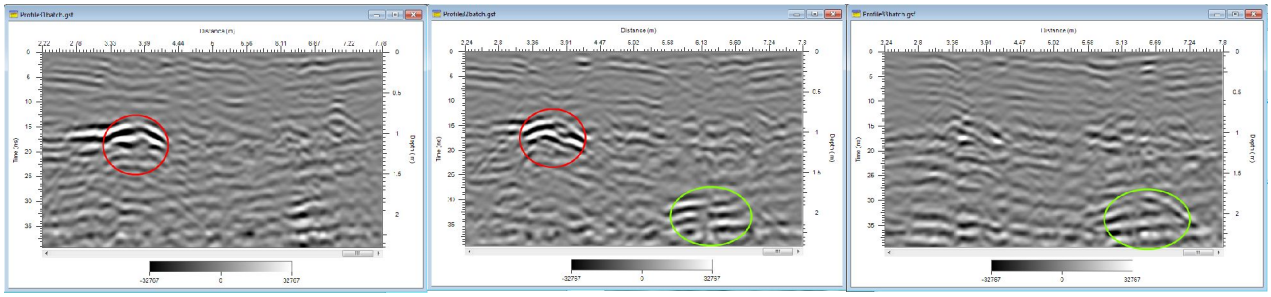
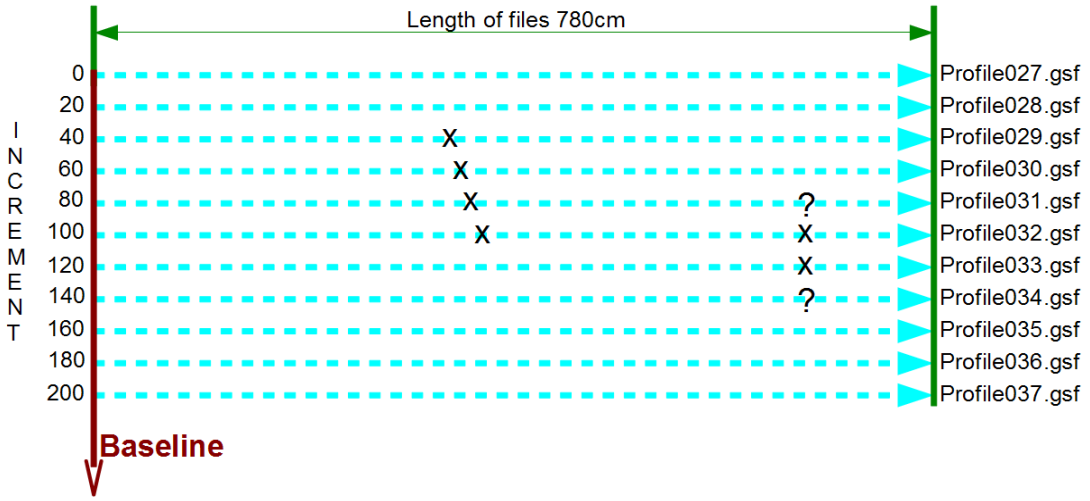
Processing and Conclusions

In order to create a 3D project file the individual files of the grid survey were processed. During the basic processing we observed consecutive files and we were able to create a manual interpretation report by marking our findings on to the grid schematic.



Consecutive files in manual interpretation



Manual interpretation process and results

Although it is not a true replacement for the 3D cube representation, a manual interpretation and marking the finds over a gridded paper can create a fair conclusion output. Keep in mind that this method demands a lot of time and effort. Also the result lacks the ease of depth and size of the targets reading.

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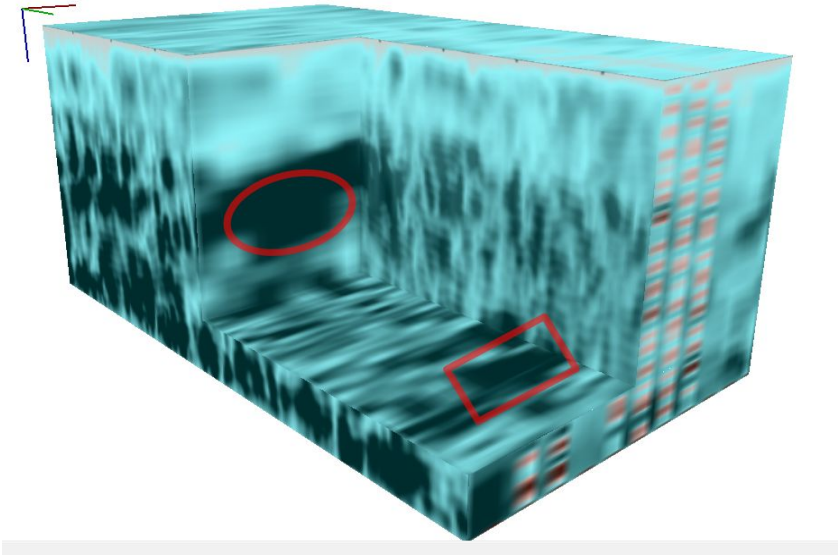
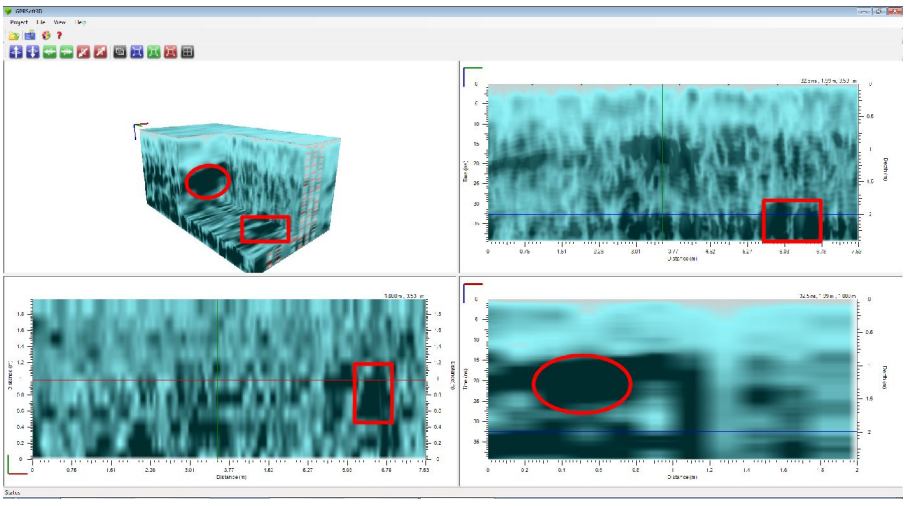
After doing the basic processing steps we created a 3D project file. Creating 3D projects is sometimes tedious work, but the results can be very rewarding. When opened in the 3D module, here is how our survey results look like:



Two barrel objects in a 3D cube view



Two barrel objects in a 3D multi-view

From the 3D project file the depth values and overall position can be read directly and most of the objects will be easy to spot and trace through the 3D cube.

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