Interpretation of Raptor data, part 1

In the previous note we briefly covered data collection and the most common processing steps. We concluded that if the raw data is of good quality, especially when it comes to positioning, the following processing can be swiftly done with modern software. That brings us to the most time-consuming step in managing 3D GPR data – interpretation. This stage is a real bottleneck and where good software can make a significant difference. In this note, we look at the simplest, but a reliable, way of interpreting Raptor data.

Top-views are probably the most common when it comes to interpreting 3D GPR data. However, they are not that useful for the precise picking of target depths. Instead, their strength lies in giving the user an overview and the perception of the target layouts. Having 3D data at hand provides us with the ability to view any 2D cut in that data volume. If those cuts are made properly, then picking a target in the 2D view, combined with views and picks in the top-view, makes the process more accurate.
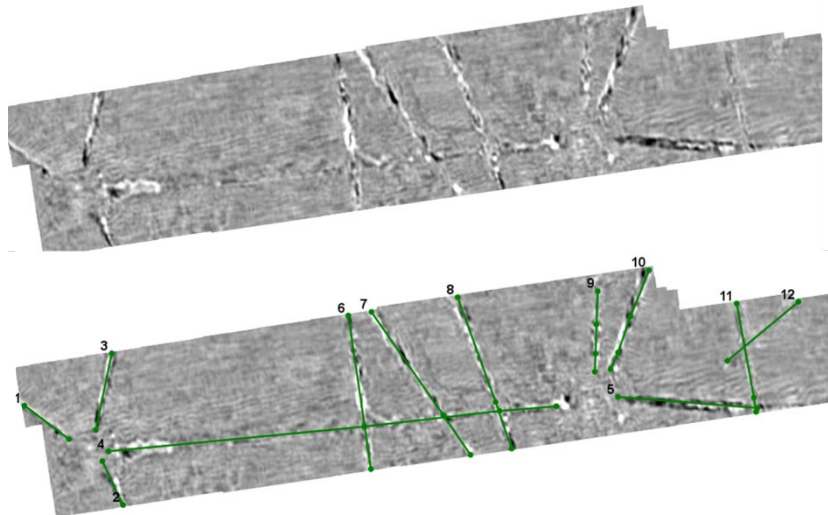

Figure 1, Clean top-view at depth slice showing most targets and laid out cut-lines(green), bottom

Figure 1 shows a top view where many targets are visible at the same depth slice. The cut-lines suitable for target picking are shown below. Laying out these cut-lines is intuitive, and the ability to scroll up and down in the time-slices makes it straightforward to place them correctly, centred on the targets. Once in place, it is possible to pick a straight utility line in a 2D view in a matter of seconds. Curved and dipping targets will be a little more time consuming to pull out.

During this process, the software must support an effective workflow, because, in a complex project, the screen can quickly become cluttered and confusing to understand. Things which may not seem significant, when working a small project, now reveal their importance. For example, having clear positioning indicators, minimizing keyboard inputs, auto-naming, auto-colouring, short-cuts, the ability to switch between different processing instances and views easily, a simple tool for measuring distances, and a straightforward means to turn such tools on and off, are but a few to mention.

In Figure 2, the picking of a dipping target is shown. The horizontal line in the 2D view keeps the user aware of where the depth slice is located in the top view, with the cursor positions shown in both aspects. Needless to say,
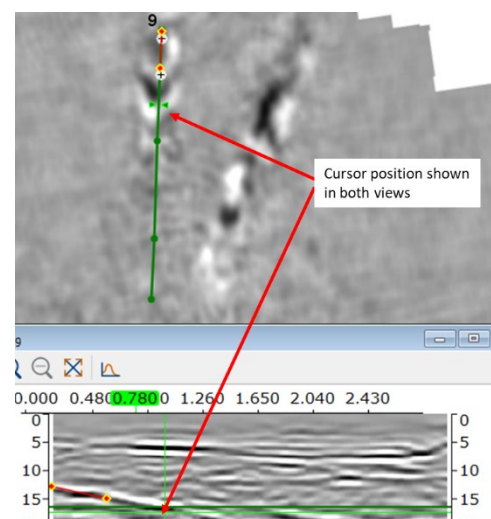

Figure 2, picking of a dipping target. A cursor shows the actual position of the cursor along the cut line and a horizontal line in the 2D-view show the actual depth slice.

modern software must allow interpretation in all the available views, without restrictions.

In Figure 3, a slightly more complex situation is shown. Here we are marking a target which crosses under another line. In cases like this, and even more complex ones, the software must give the user practical tools for navigating through the data to manage the views and interpretation features.

A user might want to add manholes or other infrastructure visible in the data, assuming they did not bring them into the project as surface features during data collection. This ability can add value for the final touch up, likely done in a CAD environment; it may also be a useful QA/QC of the results. A final interpretation may look like the upper part of Figure 4, where for clarity, we also show a dxf-export with a bounding box.

Takeaway

The combination of 3D GPR array data and modern software removes many of the

Figure 3,, picking a target along the horizontal cut-line in top view while crossing under a target coming in from 90 degrees.

ambiguities often faced by users of simpler 2D systems. The dense data makes it possible to view the subsurface from any direction and thereby secure a reliable interpretation. Nevertheless, in larger projects, it is probably the most time-consuming part of the whole mapping process, which makes the user-friendliness and workflow support of a modern software critical.

We have shown here the most straightforward approach and left out more advanced tools and methods, which we will cover in the next part of this note.
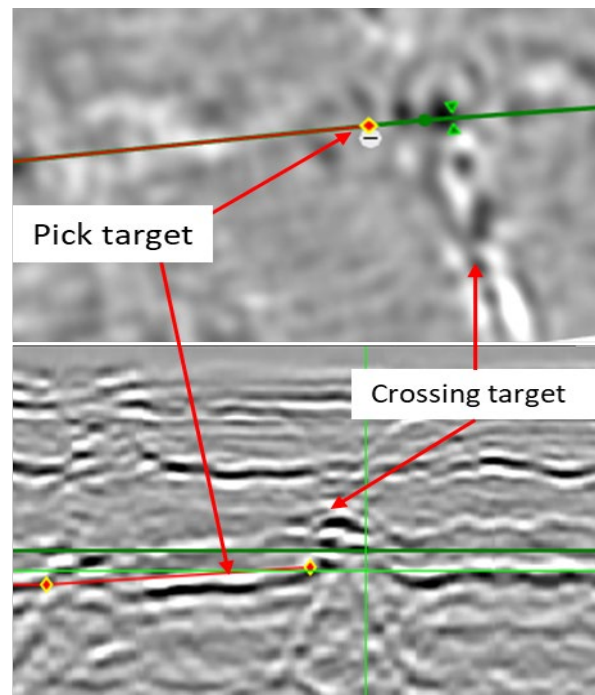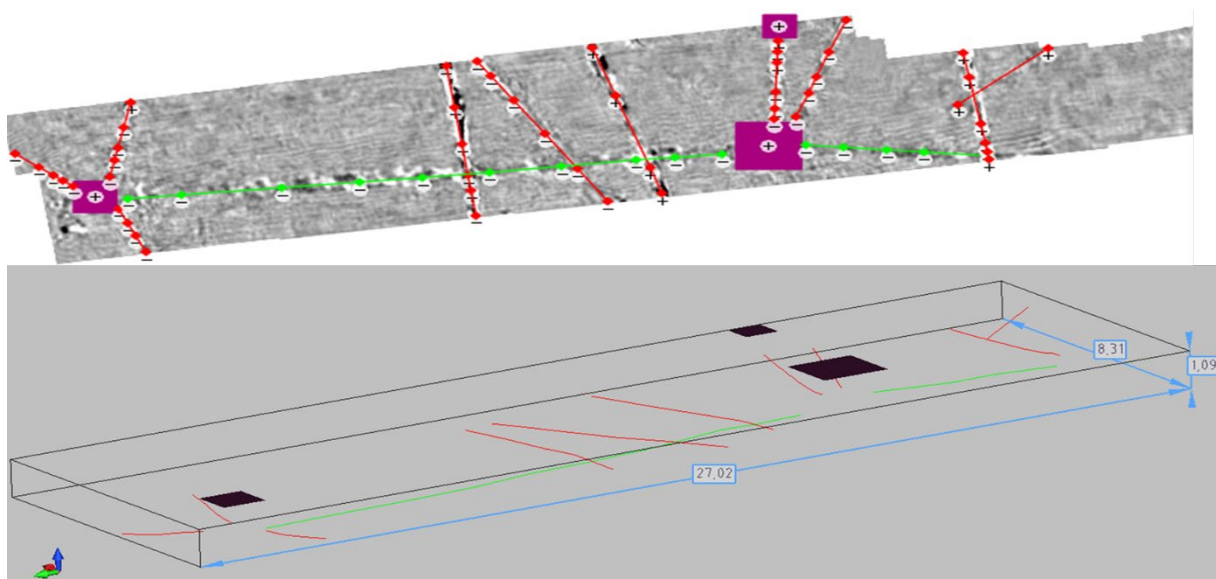

Figure 4, Final interpretation as it might look in the radar software, top. Exports to a dxf-viewer, bottom.