CASE STUDY

PROJECT DUMFRIES AND GALLOWAY – STRUCTURE SURVEY

CLIENT CONFIDENTIAL

PROJECT DESCRIPTION

GPR Survey to investigate internal structure of masonry arch bridge to assess its suitability to carry the vehicles required to access a potential wind farm site.

SERVICES PROVIDED

GPR is a non-destructive geophysical method that uses radar pulses to image the subsurface. GPR equipment consists of an antenna connected to a controller. The controller displays real time data collection allowing for infield quality control and site specific optimisation of data acquisition. The antenna contains a transmitter and a receiver; it is mounted on a sled or trolley and towed over the surface of the road. The transmitter emits electromagnetic energy into the ground in the form of high-frequency radio-waves. When the wave encounters a buried object or boundary between materials, part of the wave will penetrate the medium and part will be reflected back to the surface, where the receiver then records the reflected signal. To focus on different depths within the subsurface multiple antennae emitting different frequencies can be used.

Figure 1: GPR trolley used to push antenna over road surface

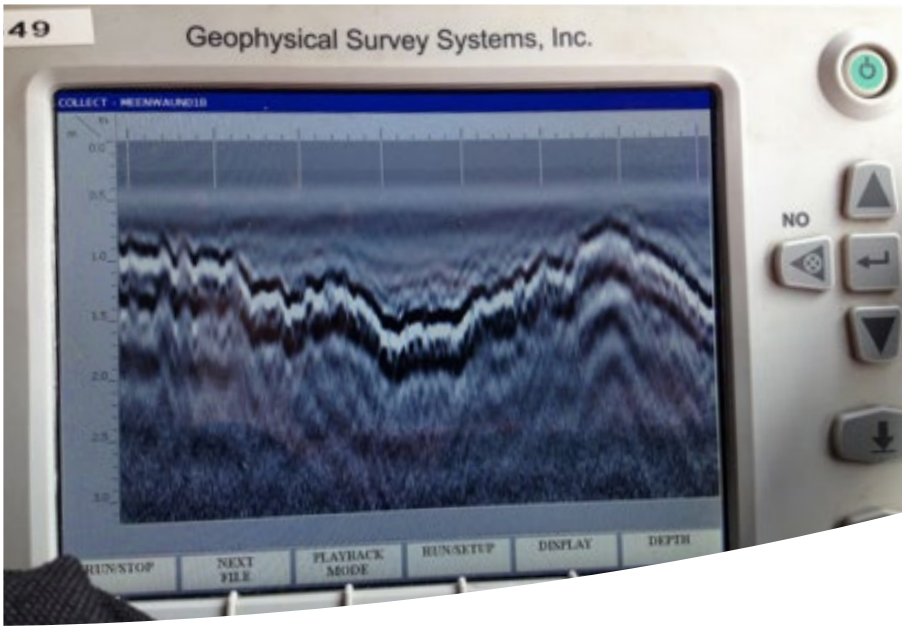

Figure 2: GSSI controller 3000 display screen during data acquisition

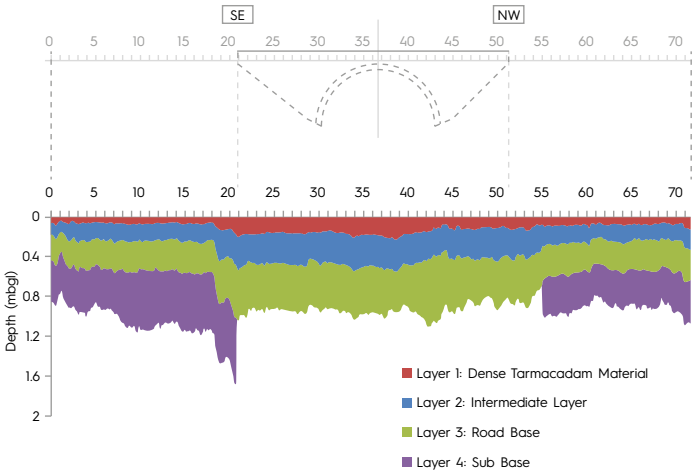

Figure 3: Road pavement thickness

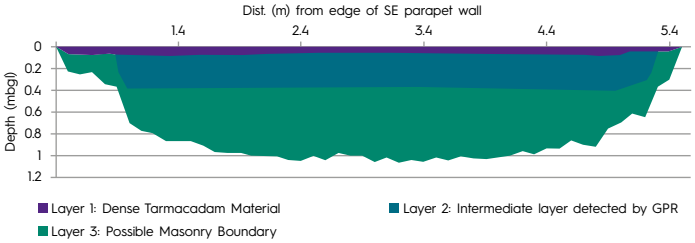

Figure 4: Cross sectional model of upper layers of the bridge

SURVEY RESULTS

- A scan of the road pavement thickness indicated a notable increase in pavement thickness over the bridge, shown in figure 2
- Transverse lines across the bridge shown in figure 3 enabled a cross sectional model of the bridge to be produced, as shown in figure 4
- Two small sections of the bridge-to-ground contact were mapped, the resulting shape of this boundary suggests the interface between bridge infill and natural ground slopes with the shape of the existing bedrock towards the river bed as opposed to a large cut out foundation
- Various anomalies in the bridge make up were identified, the cause of each anomaly could not be explained using the GPR alone but these highlight important target areas for further investigation during the site investigation (SI) phase
- The GPR survey confirmed speculation that no metal reinforcement was present in the masonry bridge
- The survey also located a buried 200mm metal drainage pipeline at the South East end of the bridge

Prior to the GPR survey nothing was known about the internal structure of the masonry. The GPR investigation provided useful information about the bridge structure and helped confirm several aspects of the expected design and type of foundations. The survey also highlighted several key anomalies to be explored during the next stage of investigation. This information is vital for designing a successful site investigation, targeting the most important areas of the bridge for investigation and getting the most value for money from the future intrusive works.

In this case the GPR survey provided sufficient information along with an expert assessment of the bridge for the council to determine the bridge was safe for turbine delivery.

ADDED VALUE

The GPR survey took half a day of fieldwork compared to alternative investigation techniques such as drilling and in-situ testing which would have involved several days of fieldwork, use of heavy plant and road closures and therefore be of far greater expense to the client.

FOR MORE INFORMATION CONTACT:

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