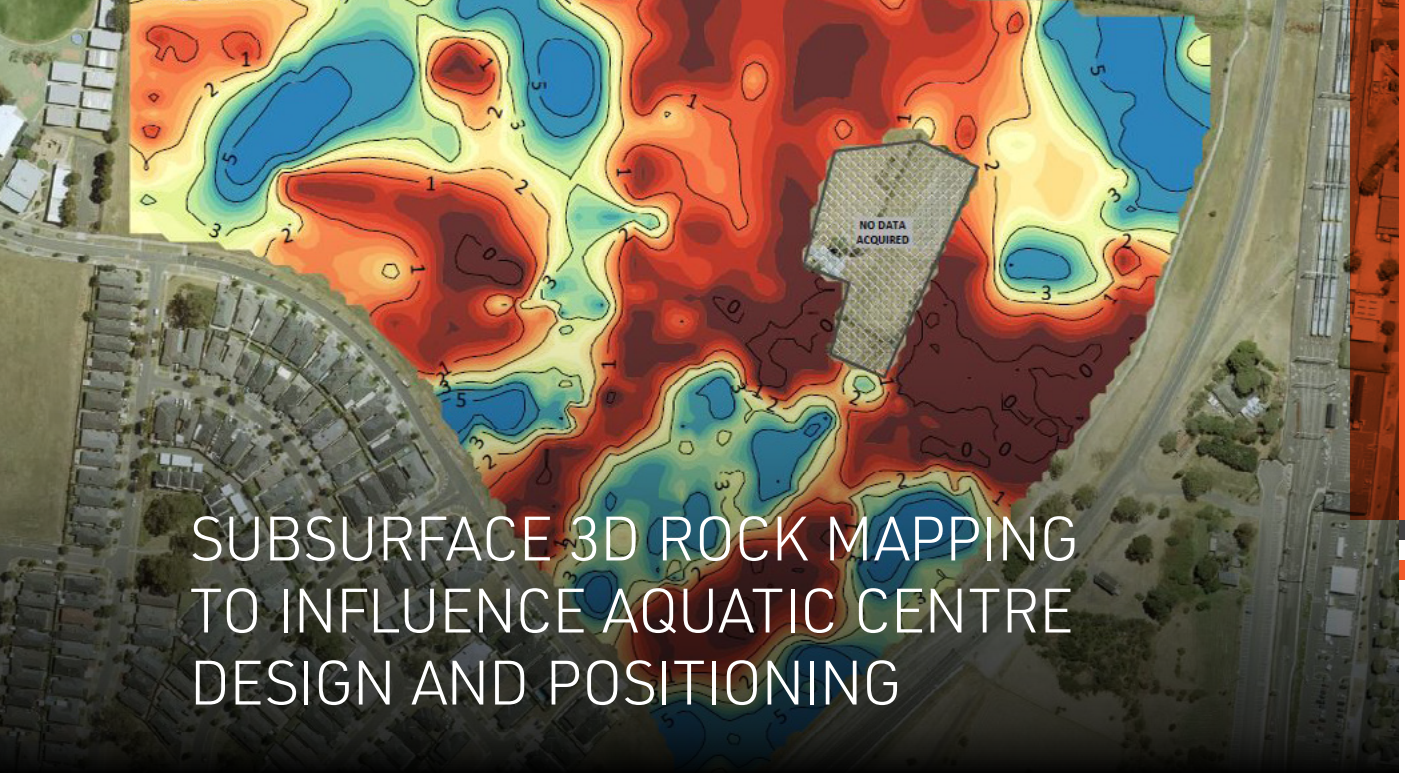
CASE STUDY



SUBSURFACE 3D ROCK MAPPING TO INFLUENCE AQUATIC CENTRE DESIGN AND POSITIONING

PROJECT: Mernda sports facility, geophysical investigation - Mernda, Victoria **CLIENT**: Stantec

PROJECT BACKGROUND

Mernda is located in the City of Whittlesea, approximately 30km north of Melbourne, Victoria. To accommodate the various health and wellbeing needs of its diverse community, a regional sports and aquatic facility is planned for Mernda on a 24ha site.

The proposed site, however, is known to have shallow basalt rock with numerous outcrops visible at the surface. Basalt rock is an extrusive volcanic rock which can be several times stronger than concrete, creating difficulties in construction projects. The presence of basalt rock within the site area had the potential to considerably influence the design and construction methods of the project.

The facility will incorporate an Olympic-sized swimming pool which requires significant excavation. To minimise the project costs and construction timeline, mapping the near surface bedrock in detail is paramount to the conceptual design of the facility, in particular positioning the aquatic centre to be in sync with the subsurface geology across the site.

As such, an informed understanding of the subsurface conditions of the area was critical to the design phase of the project.

The project engineers, Stantec, commissioned geotechnical investigations and then MNG to conduct further geophysical 3D rock mapping using seismic techniques to map rock depth more accurately and completely. The results would provide clarity and assist in the development of the engineering designs for the project site.

CHALLENGES

The presence of basalt rock within the site area had the potential to considerably influence the design and construction methods of the project. An informed understanding of the subsurface conditions of the area was critical to the design phase of the project.

To minimise the project costs and construction timeline, mapping the near surface bedrock would be paramount to the overall development.

The geotechnical boreholes only present information at the borehole location. Without geophysical information to interpolate subsurface conditions between the boreholes, they provide limited information of the site in order to optimise the final position of the pool knowledge of the location and depth of bedrock across the site.

AN INFORMED UNDERSTANDING OF THE SUBSURFACE CONDITIONS OF THE AREA WAS CRITICAL TO THE DESIGN PHASE OF THE PROJECT.

SOLUTIONS

MNG's SubSpatial team conducted a geophysical investigation to accurately map the level of basalt bedrock throughout the proposed site. These results formed part of the broader geotechnical scope of the site classification package.

A Multi-channel Analysis of Surface Waves (MASW) geophysical survey was conducted along a series of transects across the project site, bridging the gap between boreholes, generating 2D geological cross-sections that, when combined, form a comprehensive 3D subsurface model of the bedrock.

A multi-channel seismograph records the seismic wave signals along a geophone array, which is then used to evaluate the relative shear strength of subsurface materials and depth to the bedrock below the surface. GPS measurement along the transects are used for position and elevation and to create a 3D plan.

This data can be presented in a variety of ways, starting with 2D cross-sections which provide a clear visual representation of geology encountered along a proposed alignment. 3D contour plots that highlight bedrock location in either elevation or depth below ground level. More sophisticated products include, volumetric calculations using 3D AutoCAD TIN files integrated with topography TIN models.

OUTCOMES

Stantec used the results from the geophysical investigation to inform their design of the proposed sports and aquatic facility. The availability of rich and accurate 3D models of subsurface rock proves transformative in fostering better informed decision making, particularly in the realm of engineering design. The acquisition of such bedrock survey data emerges as a powerful tool in reducing site uncertainty, unforeseen earthwork costs and financial risk. An area large enough to accommodate the Olympic-sized swimming pool has been identified with an average depth to bedrock greater than 3.5m. Stantec engineers were empowered to make informed decisions on cut and fill design and the sequencing of bulk earthworks.

Rich and accurate subsurface bedrock modelling demonstrates significant cost savings and program efficiencies for the City of Whittlesea and Stantec engineers. This was achieved by enabling the identification of the best design location for the swimming pool that minimised excavation and construction impacts of near surface rock.

TALK TO US

MNG provide innovative and personalised solutions for all projects. Talk with us today to find out more. Email info@mngsurvey.com.au or visit mngsurvey.com.au