2021 Heritage Common - GPR

Introduction

A Ground Penetrating RADAR (GPR) survey was requested from the Rottnest Island Authority (RIA) of the area known as Heritage Common, adjacent to the Quad on Rottnest Island. The survey area (outlined in blue in *figure 1)* consists of a rectangular area of approximate dimensions 150m by 50m. The purpose of the survey is to check the sub-surface for any anomalies that cannot be explained by existing infrastructure. Such anomalies could potentially be associated with burials.

The data was collected on 27th to 29 April 2021. This report presents the methodology and results from the RADAR survey. A similar survey was performed in 2019 on Rottnest for RIA using the same equipment and methodology. This work is described in the report titled "Report of a Ground Penetrating RADAR (GPR) survey of the proposed Rottnest Lodge Redevelopment Area, Wadjemup, Western Australia". A more detailed description of RADAR theory and RADAR responses from anomalies on Rottnest can be found in this report.

Figure 1 Survey area Indicated by Blue Rectangle

Site Description

The site is placed on the Eastern side of the Quad. Early infrastructure present includes the prisoner walk, Lomas Cottage and associated garden.

Modern infrastructure present includes drainage pipes, electrical wires, roads, paths and retaining walls. RADAR is sensitive to all these. In addition, tree roots are present which also show a RADAR response.

Method

The RADAR used was a MALA Easy Locator with Widerange antennae. Lines of data were recorded in a roughly East - West direction. A data point was taken every 10cm along the lines and the spacing between lines was 0.5m. When encountering a level change (e.g. prisoner walk retaining wall), the RADAR was lifted up or down to ensure continuity of the line.

Control of the line spacing was achieved using 3 crossline tape measures placed at the start, middle and end of the lines. Pin markers were placed every 0.5m along the crossline tapes and the RADAR was walked towards the corresponding pin flag. Pin flags were removed as they were encountered. The internal GPS of the RADAR was used to locate anomalies along each line of data.

Results

Approximately 15 line kilometres of RADAR data was collected. Each line of data was processed in ObjectMapper, the companion software for MALA RADAR data. Each line of data was displayed in the software and anomalous features marked, giving position and depth of the feature.

The anomalies can then be sorted out by depth and displayed on Google Earth for analysis.

Anomalies 0 to 0.7m deep

These anomalies are typically associated with the edges of paths, tree roots or occasionally as part of a larger anomaly such as deep drainage. *Figure 2* shows the shallow anomalies. There is a strong correlation with the edges of paths or roads and tree roots. The anomalies to the top of the image are part of the RADAR response to the large drainage feature in that area.

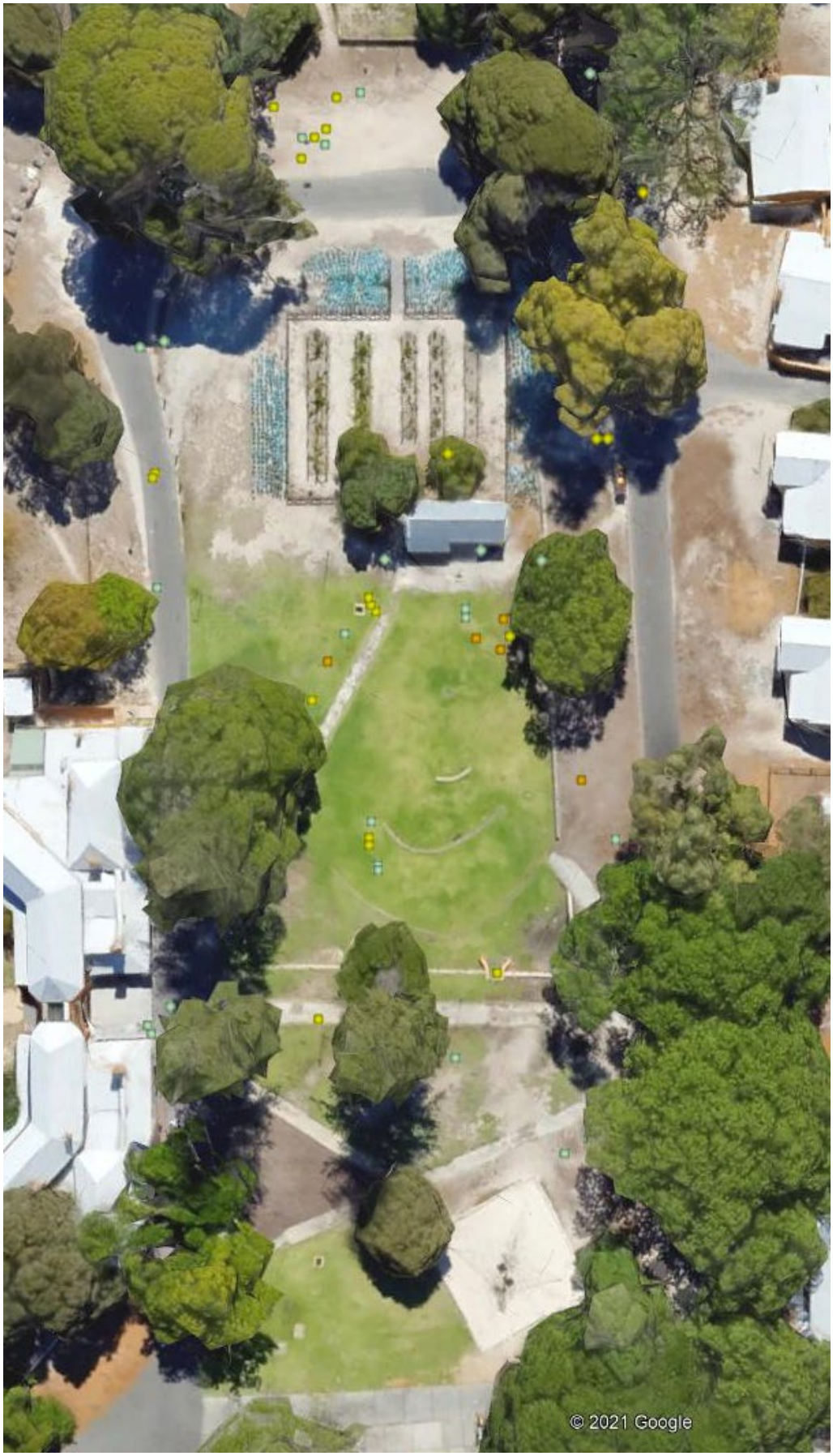

Figure 2 Location of Shallow Anomalies 0 – 0.7m Deep

Anomalies 0.7m to 1.3m

The majority of RADAR responses are in the 0.7m to 1.3m depth band. To interpret his band of depths, it is assumed that anomalies near trees, paths and retaining walls are caused by these same objects. As the RADAR pulse radiates in all directions, proximity to a retaining wall for example is plotted with depth on the radiogram. However the reality is that the RADAR energy is allowed to travel laterally and reflect from these objects. This gives the appearance of a deep anomaly in the data, where in fact it came from a near surface object. An example of this can be seen in the centre of figure 3 and the anomalies plotted around the semi circular retaining walls.

Linear features are present in the data and are interpreted by finding linear trends in the data. Notes taken during surveying about the locations of drain covers, utility covers etc aid the interpretation. The linear features are a combination of electrical and drainage lines.

The areas circled in red are interpreted as drainage related. The anomalies are consistent with soakwells, given the broad area of these anomalies, coupled with proximity to surface grates.

The large number of anomalies in the cottage garden and surrounding the cottage are thought to be due to existing infrastructure. A retaining wall and large trees account for the anomalies to the East of the cottage. The cottage garden shows multiple random scattered anomalies that are consistent with limestone rubble. Posts and fences associated with the garden would also contribute to these anomalies.

A group of anomalies circled in blue are not readily explained by infrastructure. They are positioned away from linear features and are away from the influence of tree roots. It is possible they are part of a soakwell system. *Figure 4* shows some data from this area. A large broad anomaly at the 4m mark is at 1.5m depth. Above the anomaly can be seen a break in the layering indicated a trench or large hole was dug. The size of the anomaly indicates a large structure such as soakwell. Smaller anomalies at 5.6m and 6.7m are consistent with pipes.

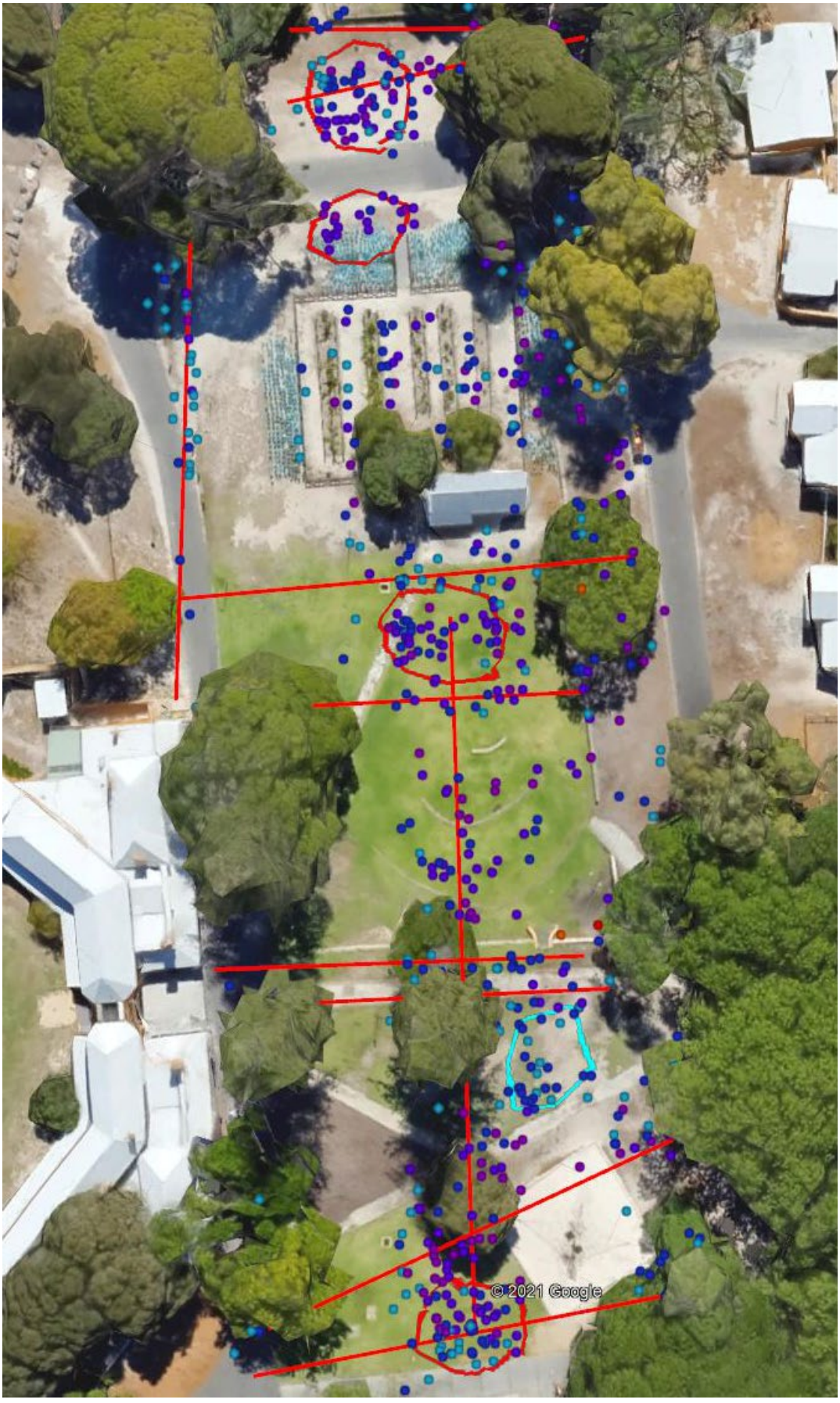

Figure 3 Location of Anomalies 70cm to 1.3m

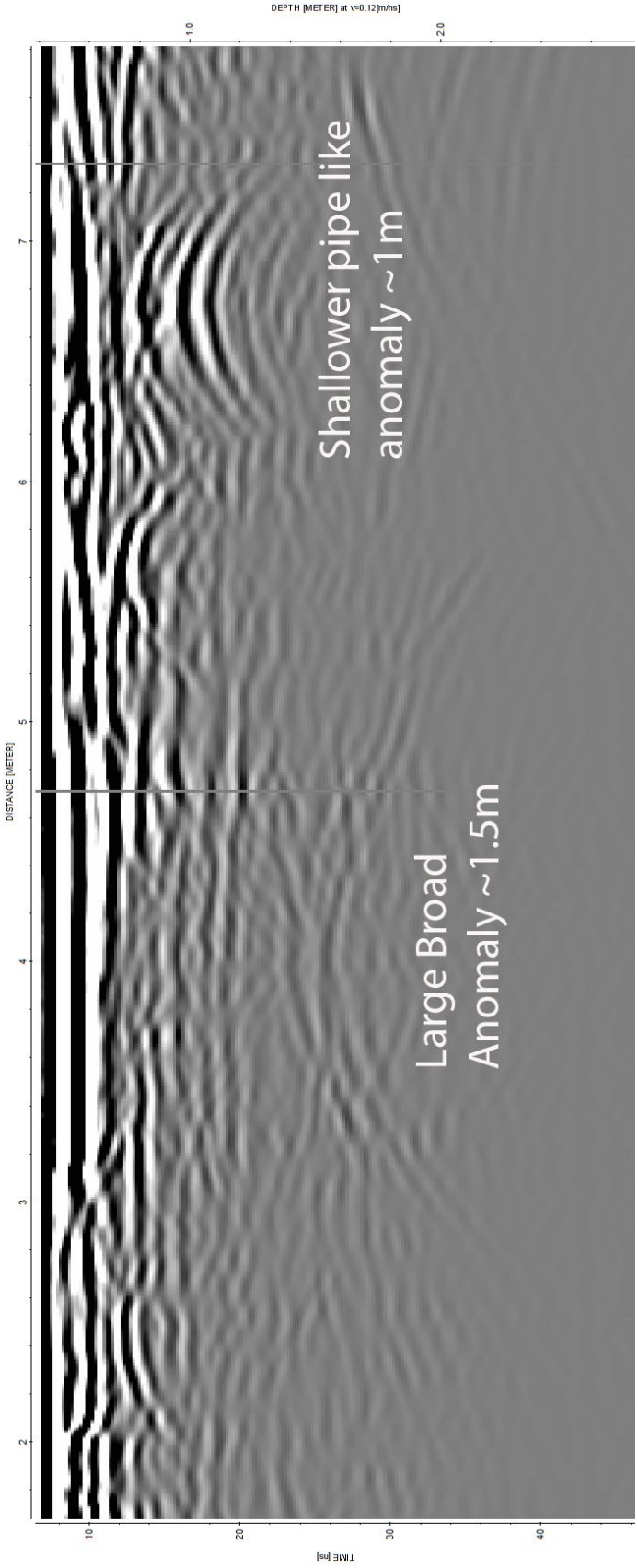

Figure 4 Line of Data Within Blue Circle

Anomalies 1.4m to 1.8m

A small group of anomalies were detected beyond 1.3m as shown in *figure 5.* Most of these anomalies occur in or very close to interpreted structures. Anomalies to the East alongside the road are associated with the structure of the road and possibly the tree roots in this area.

Interpretation

The survey area was dominated with surface and subsurface cultural objects that respond to the RADAR signal. 9 linear features and 5 roughly circular features were imaged within the survey area. These are shown on *figure 6*. The linear features are interpreted as subsurface drainage pipes and electrical wires. The red circular areas are interpreted as being associated with drainage and are most likely soakwells. The blue circular area is interpreted as drainage related due to the types of anomalies present.

No burial sites were imaged in the survey area. It must be remembered that due to the large amount of cultural material present, such a conclusion is never a certainty.

A more accurate interpretation would be aided by any “as constructed plans” to further refine the conclusions.

Figure 5 Anomalies 1.4m to 1.8m

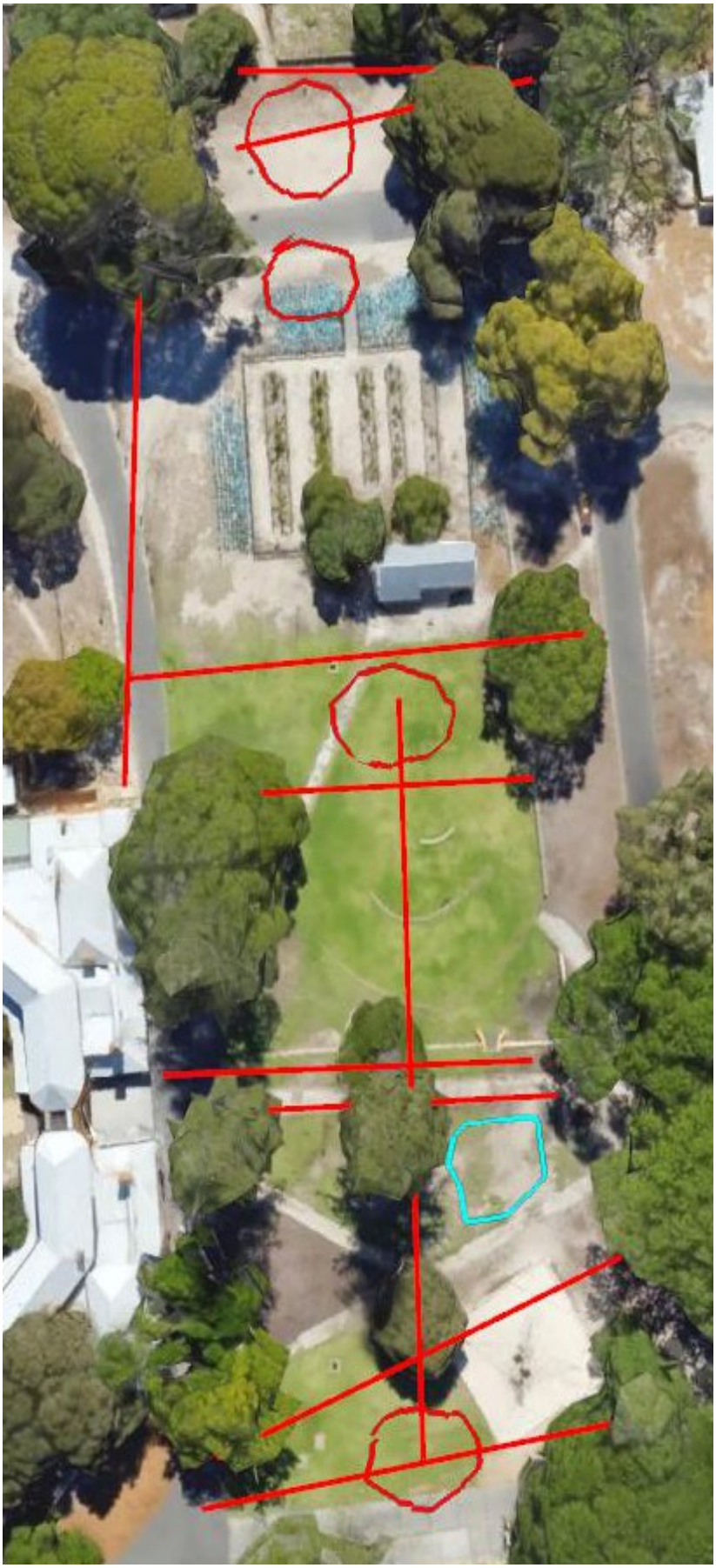

Figure 6 Final Interpretation map of Survey Area

Summary and Conclusions

A GPR survey of the Heritage Common area was undertaken. The survey method was effective in imaging subsurface infrastructure and any associated ground disturbance. The use of a shielded RADAR antennae was successful in rejecting responses from surface interference.

The site is dominated with surface and subsurface cultural objects such as paths, roads, pipes electrical cables, drainage soakwells, retaining walls, cottage foundations, and fences. Careful examination of RADAR responses near surface infrastructure, such as retaining walls, is necessary to reject some anomalies. A map of interpreted anomalies shows primarily linear features interpreted as pipes and electrical cables and large circular areas interpreted as drainage related. To further refine the interpretation, a map of theoretical locations of underground surveys would be needed.

No burial sites were imaged in the survey area. Due to the amount of cultural material buried on the site, this conclusion is never a certainty.