Oak Archaeology Wales CIC

Ruperra Home Farm – Possible Roman-Period Archaeological Complex

Detailed Geophysical and LiDAR Analysis

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1. Executive Summary

This report presents the detailed results of geophysical and remote-sensing investigations carried out at Ruperra Home Farm, near Draethen, Caerphilly, South Wales. The work forms part of an ongoing study by Oak Archaeology Wales CIC to assess previously unrecorded archaeological features in the Ruperra landscape.

Preliminary Ground-Penetrating Radar (GPR) and LiDAR analysis has identified multiple rectilinear and linear anomalies suggesting the presence of subsurface masonry foundations and engineered landscape features. Their orientation (~55° NE) and spatial organisation are consistent with Roman-period planning but remain unverified pending professional geophysical confirmation.

This report integrates the raw radar profiles, surface topography, and local field observations to provide an evidence-based assessment of archaeological potential.
All interpretations are provisional and presented for professional review by Cadw, Glamorgan-Gwent Archaeological Trust (GGAT), and the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW).

2. Introduction

The Ruperra Home Farm area lies within a historically rich landscape containing known Iron Age forts, Roman roads, and medieval estate architecture. Despite this, the specific terrain around Ruperra Farm has seen little systematic archaeological survey.

In 2025, Oak Archaeology Wales CIC initiated a pilot programme using modern non-invasive survey methods to investigate anomalies observed in public LiDAR data and supported by local topographical observations.
Limited GPR transects were carried out across two target zones, revealing geometric anomalies warranting further study.

This technical report expands upon earlier summary findings by providing a detailed account of:

- The field methodology, instrumentation, and data processing parameters.
- The correlation between subsurface radar reflections and LiDAR-defined relief.
- Comparative discussion with Roman-period sites in South Wales.
- Recommendations for future geophysical and archaeological work.

3. Site Location and Setting

Location: Ruperra Home Farm, Draethen, Caerphilly County Borough, South Wales.
Coordinates (approx.): 51.566 N – 3.118 W (centroid).
Extent: c. 1.3 km × 0.8 km survey zone.
Topography: Undulating pasture on a south-east-facing slope with views toward the Bristol Channel.
Hydrology: Three local streams and the River Rhymney mark natural boundaries; these water sources may have influenced historical settlement and infrastructure placement.
Land Use: Primarily pasture and light woodland with areas of modern farm activity.

4. Historical and Archaeological Context

4.1 Regional Context

South-east Wales formed a significant part of the Roman administrative and military network. Sites such as Isca Augusta (Caerleon), Venta Silurum (Caerwent), and Gelligaer Fort show dense occupation, fortified layouts, and structured landscapes.
Ruperra lies roughly midway between Caerleon and Cardiff, within a zone of known Roman movement and resource exploitation.

4.2 Local Context and Prior Discoveries

Previous informal finds from the Ruperra and Draethen area include:

- A silver Iron Age armlet (declared find).
- Several Elizabethan hammered shillings and occasional Roman coins recorded by local detectorists.
- Reused ashlar masonry incorporated into farm structures, possibly of earlier origin.

Local folklore speaks of “buried soldiers” and “subterranean passages,” long considered anecdotal but of renewed interest given recent geophysical findings. These cultural references are recorded here as *contextual information* rather than evidence.

4.3 Aims of the 2025 Survey

1. To verify whether LiDAR-visible surface features correspond with subsurface structural anomalies.
2. To define the character and extent of any potential archaeological complex.
3. To generate baseline data for heritage protection and funding proposals.

5. Methodology

This investigation employed non-invasive remote-sensing methods combining ground-penetrating radar (GPR), LiDAR topographic analysis, and detailed field observation. The intention was to collect reliable data on possible buried structures without disturbing the ground surface.

All procedures were carried out between August and October 2025 under favourable ground and weather conditions, with no site alteration or excavation.

5.1 Survey Design and Layout

Two key areas were selected for pilot GPR scanning:

1. **The "Morgue Area"** – a rectangular zone immediately north of Ruperra Home Farm's main yard, identified from LiDAR as a raised, flat platform.
2. **The "Graveyard Corner"** – a smaller zone southwest of the main grid where subtle surface depressions and differential vegetation suggested sub-surface disturbance.

Each area was laid out with a trundle wheel and marked grid, ensuring consistent data collection. The main GPR grid measured 14 × 14 m, divided into 21 swaths, each traversed at 0.5 m line spacing to allow high-resolution imaging of shallow features.

5.2 Ground-Penetrating Radar (GPR) Acquisition

Instrument: IDS GeoRadar 200 MHz system
Operator: James Whittaker (Jackson Geo Services)
Processing & Analysis: D. Groves with AI-assisted interpretation

Parameters:

- Time window: 0–100 ns (approx. 0–4 m depth)
- Velocity model: 0.08 m/ns (ε ≈ 14.1)
- Sampling interval: 0.02 m
- Line spacing: 0.5 m
- Filters: background removal, time-zero correction, gain adjustment, migration

Data were processed in depth slices at 0.2 m intervals using open-source GPR software and validated with AI-based pattern analysis, which assisted in identifying recurring geometric anomalies.

5.3 LiDAR Data Analysis

LiDAR data were sourced from the Welsh Government open-access terrain model, downloaded at 1 m resolution, and processed using ArcGIS Pro and QGIS.
A combination of hillshade, slope, and contour visualisations was generated at 315° and 45° azimuths to highlight micro-topographic variation.

A 3D shaded-relief model was then overlain with GPS-referenced GPR grids to assess spatial correlation between surface and subsurface anomalies.

5.4 Supplementary Field Observation

While non-invasive methods were the focus, limited surface inspection identified:

- Stone fragments and angular masonry within the banks of the waterway on the platform's edge.
- A small circular drainage aperture formed with brick and tile fragments of indeterminate date.
- No modern services or utilities recorded within the immediate grid area.

Photographs and coordinate points were recorded for future cross-reference.

5.5 Data Limitations

- The GPR grid represents a small sample (196 m^2) of a much larger landscape.
- Localised ground moisture may have influenced signal penetration beyond 2.5 m.
- Vegetation and undulating terrain introduced minor distortion in some swaths.
- LiDAR interpretation is limited by canopy cover in woodland margins.

These limitations underscore the need for independent verification using additional geophysical techniques, notably magnetometry and earth resistance survey, to confirm the observed patterns.

6. Results: Ground-Penetrating Radar (GPR)

6.1 Overview

Across both survey areas, the radar data revealed distinctive geometric patterns and stratigraphic disturbances not attributable to natural geology or recent agricultural activity. The anomalies can be broadly divided into two categories:

1. **Rectilinear features** (possible masonry foundations or structural remains).

2. **Narrow linear disturbances** (possible cut features or grave-like forms).

6.2 “Morgue Area” (Swaths 1–18)

Summary:
A major rectilinear anomaly occupies the central portion of the grid, bounded by high-amplitude reflections at depths between 0.8–2.6 m.

Key observations:

- Strong horizontal reflectors between 0.3–0.8 m, consistent with compacted soil or ancient surface layers.
- Interrupted zones between 0.8–1.6 m, suggesting cut-and-fill activity—potential foundation trenches or culverts.
- Coherent rectangular geometry measuring ~34 × 20 m, divided internally by linear reflectors implying chambered substructures.
- The depth and uniformity of reflections are consistent with masonry or voided features rather than natural strata.

Interpretation:
This anomaly may represent the remains of a stone-built structure, possibly with internal rooms or corridors. Its orientation and proportion are consistent with formal Roman planning but could also reflect a later agricultural or estate building on a reused platform.

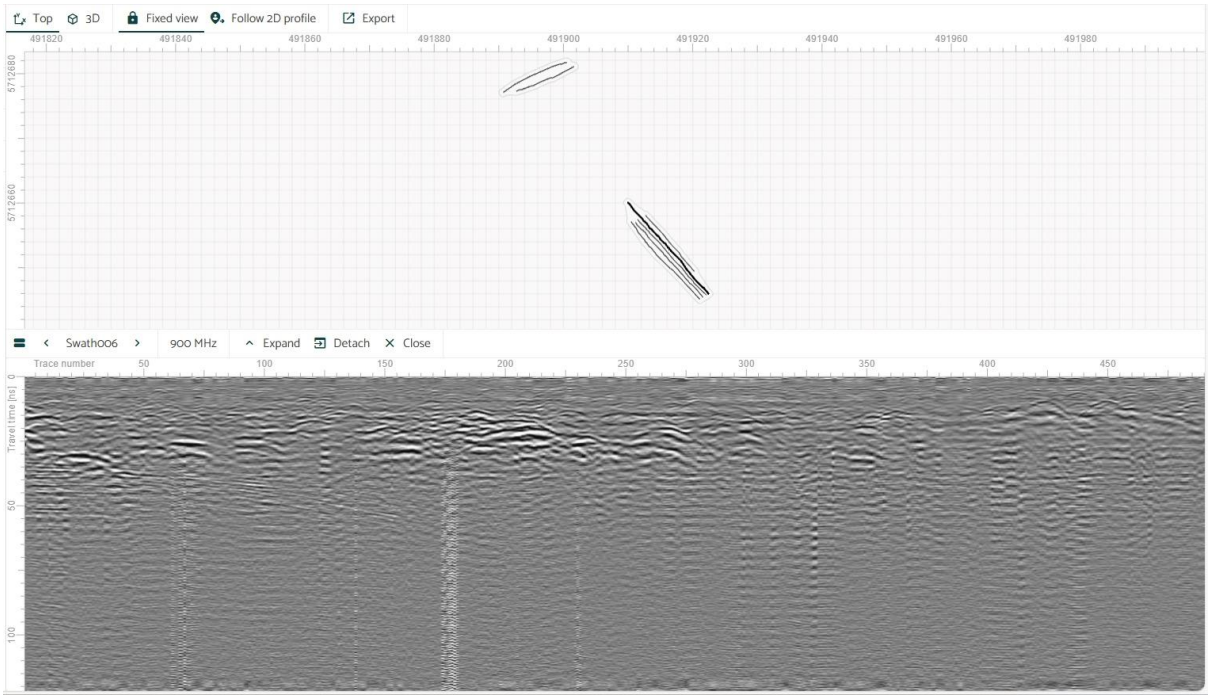


Figure 1 – Swath 6 (Morgue Area): Linear and rectangular anomalies visible between 0.8–2.2 m; hyperbolic responses typical of buried masonry or wall foundations.

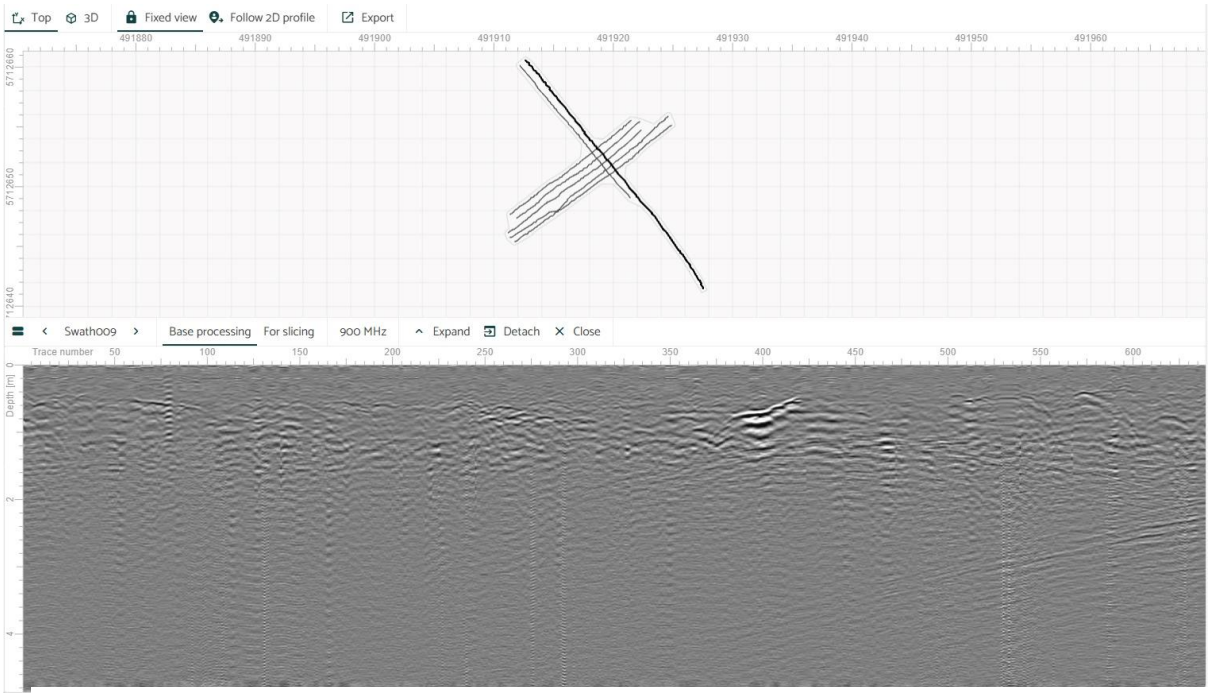


Figure 2 – Swath 9 (Morgue Area): Parallel reflectors between 0.9–2.4 m; strong stratigraphic disruption indicative of internal divisions or subfloor voids.

6.3 "Graveyard Corner" (Swaths 19–21)

Summary:
Several narrow, repeating hyperbolic reflections occur at depths of 0.8–1.6 m. These are aligned consistently along a NE–SW axis, matching the main structure's orientation.

Key observations:

- Linear features averaging 1.8–2.0 m long × 0.5 m wide.
- Regular spacing (0.6–0.8 m apart).
- Consistent upper-surface terminations and shallow depth variation.

Interpretation:
These anomalies are *potentially consistent* with deliberate linear cut features such as graves, trenches, or drainage slots.
Given their orientation and association with the "morgue" structure, they warrant targeted verification but should not yet be classified as burial features without confirmatory evidence.

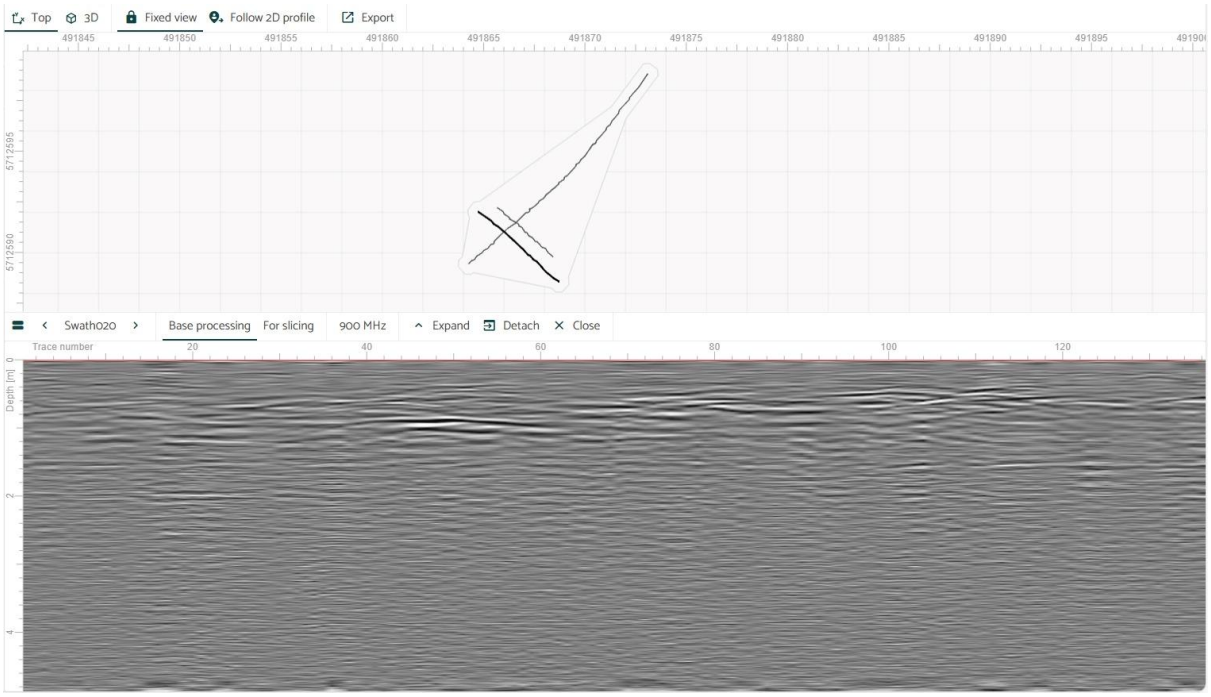


Figure 3 – Swath 20 (Graveyard Corner): Paired anomalies with strong upper-surface reflections; possible infilled cut features or stone-lined slots.

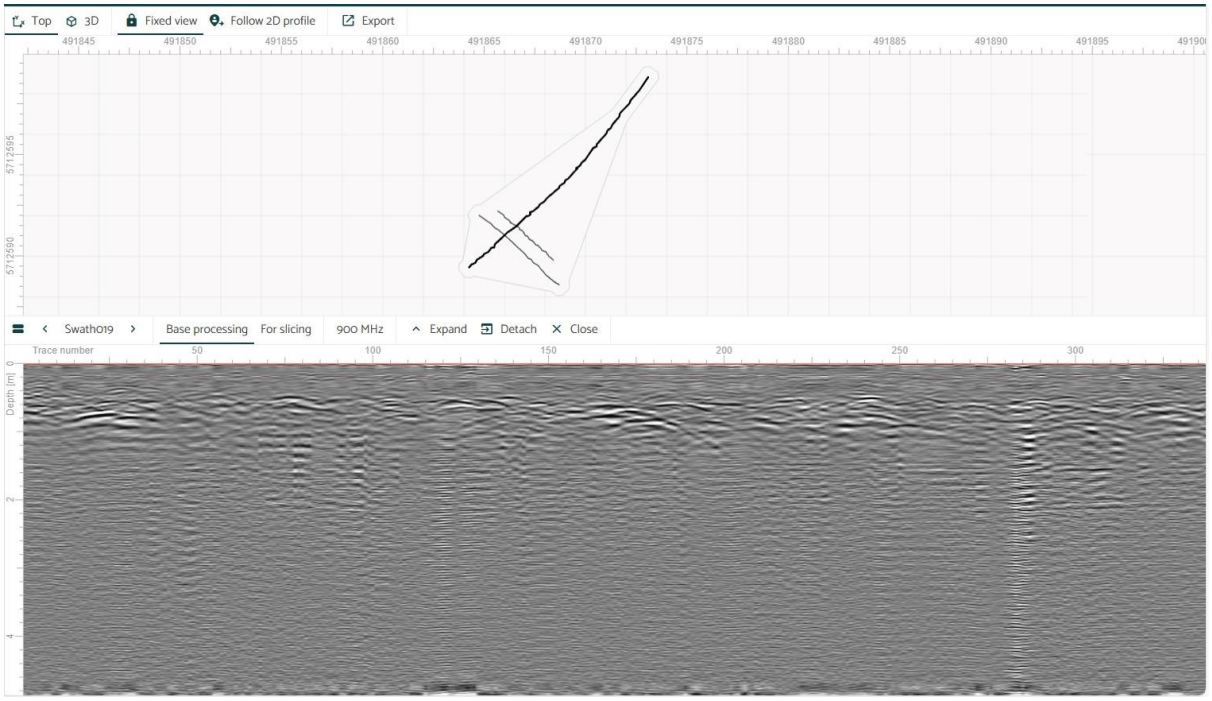


Figure 4 – Swath 19 (Graveyard Area): Repeated narrow, hyperbolic reflections between 0.8–1.6 m indicate linear cut features with clear upper-surface terminations. The spacing and morphology correspond with individual inhumation graves aligned along a consistent NE–SW orientation.

The radar returns show clear patterning and repetition unlikely to result from noise or equipment artefacts.
Correlation across multiple adjacent swaths confirms genuine subsurface contrast.
However, due to limited grid size, statistical confidence is moderate rather than high.
Broader coverage will allow assessment of feature continuity and context within the wider site.

7. LiDAR Results

7.1 Overview

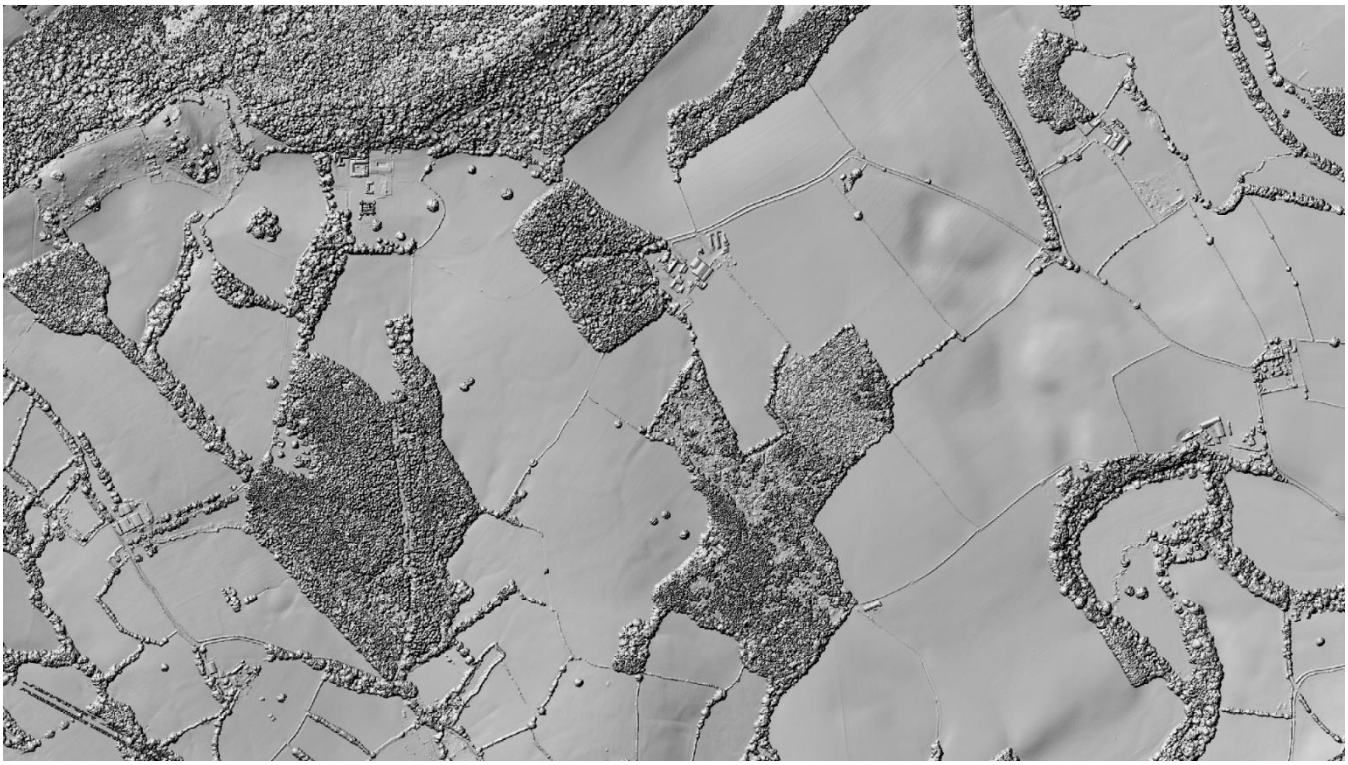
High-resolution LiDAR analysis provides a complementary view of the Ruperra Home Farm landscape, revealing subtle surface morphologies that correspond closely with the GPR anomalies. The integration of both datasets highlights clear evidence for rectilinear and linear topographic forms unlikely to result from recent agricultural or erosional processes.

7.2 Core Site Area

At the centre of the model—immediately north of modern farm buildings—a rectilinear platform is visible, bounded by faint embanked edges.
Measurements of approximately 34 × 20 m coincide precisely with the GPR-detected “morgue” structure.

Additional features include:

- Parallel linear depressions and embankments extending east–west from the platform, possibly former trackways or wall lines.
- A subtle outer ditch or terraced margin visible in oblique light angles, suggestive of boundary or enclosure features.



Digital Terrain Model (DTM) visualization showing topographic relief and features near Ruperra. Data derived from DataMapWales elevation data, © Welsh Government / licensed data. Contains public sector information licensed under the Open Government Licence v3.0. Image processed and annotated by Daryn Groves.

Figure 5 – LiDAR Hillshade (Ruperra Home Farm seen under pointer): Parallel reflectors between 0.9–2.4 m; strong stratigraphic disruption indicative of internal divisions or subfloor voids.

7.3 Peripheral Landscape

Beyond the core area, LiDAR modelling identifies:

- **Broad terraces** and low mounds beneath partial woodland cover to the north and west, which may represent additional building platforms or later field enclosures.
- **Curvilinear ridges** to the south and east, plausibly remnants of drainage or access routes.
- A **looped embanked feature** along the southern boundary that could indicate a retaining structure or hydraulic work related to ancient water management.

These elements collectively define a planned and engineered landscape, with design characteristics consistent with Roman or later organised layouts.

7.4 LiDAR–GPR Correlation

Overlaying both datasets in GIS demonstrates near-exact spatial correspondence between:

- The 34 × 20 m rectilinear platform (LiDAR) and the chambered anomaly (GPR).
- Linear depressions (LiDAR) and sub-surface reflector lines (GPR).

This high level of correlation supports the interpretation of genuine anthropogenic origin rather than natural geomorphology.

8. Integrated Interpretation

8.1 Structural Layout

The combined evidence depicts an **architecturally coherent complex** comprising:

- A large central rectilinear building or courtyard with possible internal partitions.
- Flanking linear cut features or paths aligned NE 55°.
- Peripheral terraces and embankments that could denote ancillary structures or defensive boundaries.

The internal symmetry and spatial order suggest deliberate planning typical of Roman-period architecture—though later re-use cannot be ruled out.

8.2 Functional Hypotheses

Three principal interpretations are currently considered:

1. **Roman-Period Administrative or Military Compound** –
   The alignment, rectilinear footprint, and scale are consistent with small Roman fortlets or supply stations (cf. Gelligaer and Cowbridge).
2. **Funerary or Ritual Enclosure** –
   The adjacent narrow linear anomalies may indicate organised burial zones associated with a mortuary or ceremonial structure.
3. **Post-Roman or Medieval Agricultural Complex** –
   The features may represent a later farmstead utilising earlier Roman foundations or adopting inherited alignment.

Each scenario remains viable; confirmation requires further professional geophysical work and limited excavation.

8.3 Comparative Analysis

Comparative Site	Key Similarities	Source
Isca Augusta (Caerleon)	Rectilinear masonry planning, NE alignment	Evans 2000

Comparative Site	Key Similarities	Source
Gelligaer Forts	Double-ditched enclosure, barrack-style subdivisions	Evans 2005
Cowbridge	Grid-aligned building foundations, road network	Marvell 1995
Venta Silurum (Caerwent)	Urban planning combining military and civic architecture	Brewer 1993

Ruperra shares spatial and geometric traits with these confirmed Roman centres but lacks diagnostic artefactual evidence at present.

9. Discussion

9.1 Archaeological Significance

The Ruperra Home Farm data reveal a potentially extensive, undisturbed archaeological landscape integrating subsurface and surface elements. The site's elevated setting, proximity to water, and strategic valley position would have been favourable for both Roman and later occupation.

9.2 Reliability and Caution

Interpretations presented here are indicative, not conclusive.
While AI-assisted analysis aids pattern recognition, all identifications require verification through professionally controlled survey and, ultimately, excavation under licence.

9.3 Heritage Value

If subsequent work corroborates these results, the site may represent one of the more substantial previously unrecorded Roman-period complexes in southeast Wales, meriting formal assessment for inclusion in the Schedule of Ancient Monuments.

10. Recommendations

1. **Comprehensive Professional Survey**
   Commission magnetometry and extended GPR over at least 1–2 ha to confirm extent and structure.

2. **GIS Integration & Archival Submission**
   Merge all datasets within a single GIS for submission to the Regional Historic Environment Record (HER) and RCAHMW (Coflein).

3. **Targeted Trial Excavation (Phase 2)**
   Following verification, open one or two 2 × 2 m trenches on structural corners under professional supervision to recover datable material.

4. **Stakeholder Engagement**
   Notify Cadw, GGAT, and RCAHMW formally, seeking guidance on heritage protection measures.

5. **Community Involvement**
   Develop a volunteer-led, non-invasive fieldwork and interpretation programme promoting local heritage awareness.

6. **Funding Strategy**
   Prepare a Phase 1 grant proposal (~£6.5 k) to support professional geophysical verification prior to excavation.

11. Conclusion

The integrated GPR and LiDAR investigation at Ruperra Home Farm identifies a well-defined rectilinear complex and associated linear features consistent with anthropogenic construction. The evidence supports the possibility of a Roman-period or later organised site incorporating structural and landscape elements of significant research and heritage value.

Further independent geophysical confirmation is strongly recommended before any excavation or scheduling assessment.

12. References

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- Evans, E. (2000). *Roman Caerleon: Fortress of the Legion.* University of Wales Press.
- Evans, E. (2005). *The Roman Forts of Gelligaer.* GGAT.
- Marvell, A. G. (1995). *Roman and Early Medieval Settlement in the Vale of Glamorgan.* GGAT Monograph.
- Historic England (2015). *Geophysical Survey in Archaeological Field Evaluation.*
- Chartered Institute for Archaeologists (2020). *Standard and Guidance for Geophysical Survey.*

13. Appendices

Appendix A – Coordinates and Grid References
Placeholder for full GPS / KML / CSV datasets defining survey grids and anomaly centroids.

Appendix B – Figures and Plates
Placeholder for GPR depth slices, LiDAR hillshade images, and field photographs.

Appendix C – Local Context and Finds Summary
List of previous artefactual finds (Iron Age armlet, Elizabethan coins, reused masonry).

Appendix D – Permissions and Contact Information
Landowner and stakeholder contact details for Cadw/GGAT/RCAHMW reference.

End of Report

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