ALCATEL SUBMARINE NETWORK

Havhingsten

Appendix E2 - Marine Archaeology Foreshore Survey

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Cotswold Archaeology marine

Havhingsten submarine cable system

Preliminary draft results of foreshore and intertidal archaeological survey data

for

Fugro Germany Marine GmbH

CA Project: 770835

CA Report: 770835.1

April 2019

Andover Cirencester Exeter Milton Keynes

Havhingsten submarine cable system
Preliminary draft results of foreshore and intertidal archaeological survey data

CA project: 770835
CA report: 770835.1

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SUMMARY

Project name: Havhingsten submarine cable system

Cotswold Archaeology was commissioned by Fugro Germany Marine GmbH to undertake:

- non-intrusive archaeological assessments at six proposed landfall locations at:
    - Loughshinny, Co Dublin, Ireland;
    - Port Erin, Isle of Man;
    - Port Grenaugh, Isle of Man;
    - Lytham St Anne's, west coast of England;
    - Seaton Sluice, east coast of England; and
    - Whitley Bay, east coast of England.
- an archaeological assessment of marine geophysical survey data along the potential cable route across the Irish Sea, and in English territorial waters (out to 12 nautical miles (nm)) in the North Sea.

for a proposed fibre optic cable (Havhingsten submarine cable system) between Ireland and Denmark.

In total, the proposed cable route will run for approximately 607.7km. The cable route is proposed to run beneath the Irish Sea, with landfall locations on the east coast of Ireland, on the south-east and south-west coasts of the Isle of Man, and on the west coast of England. The proposed cable route continues under the North Sea, with landfall at two potential locations on the north-east coast of England. Details of the cable route above mean high water springs (MHWS) are beyond the remit of this report.

This is a preliminary draft report as it currently includes only the initial results from the foreshore and intertidal geophysical, hand-held metal detector and walkover surveys.

The archaeological assessment of near shore and offshore geophysical survey data for the entire route is in final preparation and will be incorporated with the foreshore survey results once complete. The assessment of marine data will include the identification of archaeological remains, including an assessment of archaeological potential, in proximity to the proposed cable route

The landfall surveys were conducted in March 2019 over the foreshore and inter-tidal zones at Loughshinny, Co Dublin, Ireland, Port Erin and Port Grenaugh on the Isle of Man, Lytham St Anne's, on the west coast, and Seaton Sluice and Whitley Bay on the east coast of England. These surveys comprised walk-over, hand-held metal detector and terrestrial geophysical (electrical conductivity) surveys. All find spot locations were recorded using the geodetic datum World Geodetic System (WGS) 1984 using a hand-held Global Positioning System (GPS) devices, while features of archaeological potential were recorded with digital photography.

These surveys have successfully evaluated the six potential landfall locations and have identified no anomalies of clear archaeological potential. At Port Grenaugh, however, where a possible fish trap or barrier against small vessels is recorded (Cotswold Archaeology 2019), linear anomalies detected perpendicular to the tide, may be anthropogenic in origin, perhaps resulting from buried walls or the accumulation of deposits against them. These anomalies are assessed as of low to moderate archaeological potential. No other anomalies of archaeological potential have been identified at any of the potential landfall locations. Elsewhere, four linear anomalies identified at Port Erin, and a fifth at Lytham St Anne's, indicate buried service pipes / cables. On the basis of the walkover geophysical, and metal detecting surveys, therefore, these landfall locations are assessed as of low archaeological potential, which corroborates the results of the marine archaeology desk-based assessment (Cotswold Archaeology 2019).

CONTENTS

LIST OF ILLUSTRATIONS

1. INTRODUCTION

Outline

1.1. Cotswold Archaeology (CA) was commissioned by Fugro Marine Germany GmbH, at the end of November 2018, to undertake marine archaeological assessments for the proposed Havhingsten submarine cable system. These assessments included foreshore and intertidal surveys at six potential landfall locations, and the archaeological assessment of marine geophysical survey data collected along the proposed cable route corridor across the Irish Sea, and from the east coast of England to territorial limits (12nm) across the North Sea.

1.2. This interim report presents the preliminary draft results of foreshore and intertidal archaeological survey data only; the final report will incorporate the results of the assessment of the marine geophysical survey data which is currently being finalised. The final report will include an assessment of marine and coastal cultural assets potentially affected by this project, up to the mean high water springs (MHWS).

1.3. The Havhingsten submarine cable system (henceforth 'the project') is proposed to run beneath the Irish Sea with potential landfall locations at Loughshinny in Ireland, at Port Erin and Port Grenaugh on the Isle of Man and at Lytham St Anne's on the west coast of England. The cable will also run under the North Sea with two potential landfall locations at Seaton Sluice and at Whitley Bay on the north-east coast of England.

Project background

1.4. The proposed cable route runs for approximately 607.7km; 57.3km through Irish waters, 59.4km through Isle of Man waters and 491km through English waters (see figures 1 & 2). This preliminary draft presents the initial results from the six potential landfall locations; the final report will asses each of the routes following the relevant national frameworks and guidance of each respective nation through whose waters the cable may be laid.

1.5. These assessments have been undertaken by Cotswold Archaeology in collaboration with our colleagues at Headland Archaeology, who undertook the collection and analysis of foreshore and intertidal geophysical survey data, at the six potential landfall locations.

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- Ireland CSC
- Isle of Man CSC
- England (Irish Sea) CSC

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PROJECT TITLE

Havhingsten submarine cable

FIGURE TITLE

Irish Sea CSCs

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FIGURE TITLE

North Sea CSC

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1.6. The purpose of these archaeological assessments is to identify known and potential sites and features of archaeological interest at the six potential landfall locations that might be impacted by the project. The impact on those sites of the project will then be limited through the adoption of appropriate mitigation measures. Archaeological potential is evaluated through the assessment of the nature and density of known sites in the vicinity of the proposed development.

2. METHOD

2.1. All surveys were positioned using the geodetic datum WGS 1984, with projection in the appropriate Universal Transverse Mercator Zone.

Foreshore survey

2.2. The surveys were conducted during the most favourable Spring tides and extended to the low water mark in an effort to achieve full overlap coverage with the offshore marine surveys.

2.3. The landfall surveys, conducted on the foreshore and in the intertidal zone, comprised walkover, hand-held metal detector, and geophysical (electro-magnetic conductivity) surveys. The aim of the surveys was to assess and map the extent of any archaeological remains along, and in proximity to, the proposed cable route.

Metal detector and walkover surveys

2.4. Hand-held metal detector and walkover surveys were conducted following 5m wide traverses to match those used for the geophysical survey. The metal detector was set to detect all metal, but the sensitivity was adjusted to compensate for the high salt content of the beach sand. All identified features and detected finds spots were recorded photographically with a brief description, if deemed necessary. Locations were recorded using a hand-held Garmin GPS and plotted into an AutoCAD base plan. As this survey was non-intrusive, no finds spots were excavated. A Minelab X-Terra 705 metal detector was used to conduct the surveys (Fig 3).

2.5. The numeric values displayed on the detector were also recorded as they can potentially assist in the identification of the type of metal detected, with higher values more likely to be indicative of non-ferrous metals (Minelab 2017:11).

Figure 3 Metal detecting on Port Erin beach

Geophysics

2.6. Geophysical survey was undertaken by a geophysicist from Headland Archaeology using a Geophex GEM-2 multi-frequency broadband electromagnetic (EM) instrument (Fig 4) to perform a terrain electrical conductivity survey. The instrument is a non-intrusive frequency-domain electrical conductivity measuring device that records the spatial variations of apparent ground conductivity of the earth in units of milliSiemens / metre (mS/m). The 'siemen' is the international unit of measurement for volume electrical conductance and is the equivalent to an ampere/volt. Differences in deposits, principally variations in thickness between deposits with different conductivities, can produce spatial variations in conductivity readings.

2.7. The system provides two measurements:

- Quadrature (apparent conductivity); and
- In-phase data (metallic response).

2.8. The GEM-2 can acquire data over multiple frequencies, which is equivalent to measuring the earth response from multiple depths (depending upon the earth medium targeted). Five frequencies were utilised and subsequently analysed on

each of the landfall locations (475 Hertz (Hz), 1525Hz, 5325Hz, 18325Hz and 63025Hz).

Figure 4 GEM2 in operation at Port Erin

2.9. A survey grid was set out at the required locations and subdivided into 5m transects, using a GPS system utilising WGS84 30N Universal Transverse Mercator (UTM) with an accuracy of 0.5m or greater.

2.10. The primary focus of the survey was to identify buried metal objects on the beach that might relate to heritage assets. In addition, some success was obtained in mapping variations in silting patterns in the foreshore area. Variations in response might occur where timber structures have influenced the deposition of sediments and could therefore be used to identify the presence of wooden material which could be indicative of wreck material or other wooden structures buried in the sand.

2.11. In addition, as ground conductivity is influenced by soil moisture content, an electromagnetic conductivity survey could be used to differentiate between areas of solid substrata and sand. This could help to define the former physical topography of the survey area by identifying former channels or basins in the sub-strata. Identification of these features would help to define areas of archaeological potential within the survey area.

2.12. The data was digitally recorded and periodically downloaded to a field computer for quality assurance and preliminary interpretation.

2.13. At the conclusion of the survey, the Geophex GEM-2 data was interpreted and mapped using Terrasurveyor V3.0.32.4 software (DWConsulting), a surface mapping software that allows topographic data to be contoured and presented in a manner that enables the interpretation of sub-surface features.

2.14. The illustrations of the foreshore and intertidal geophysical survey data in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different frequencies. All graphics are displayed using the 5325Hz frequency which has been presented to most suitably display and interpret the data from each site based on the experience and knowledge of the assessors.

2.15. The geophysical survey and report were completed in accordance with relevant best practice guidance documents (see Bonsall *et al*. 2014; David *et al*. 2008; Gaffney *et al*. 2002; Schmidt *et al*. 2015).

Offshore survey

2.16. Being finalised…

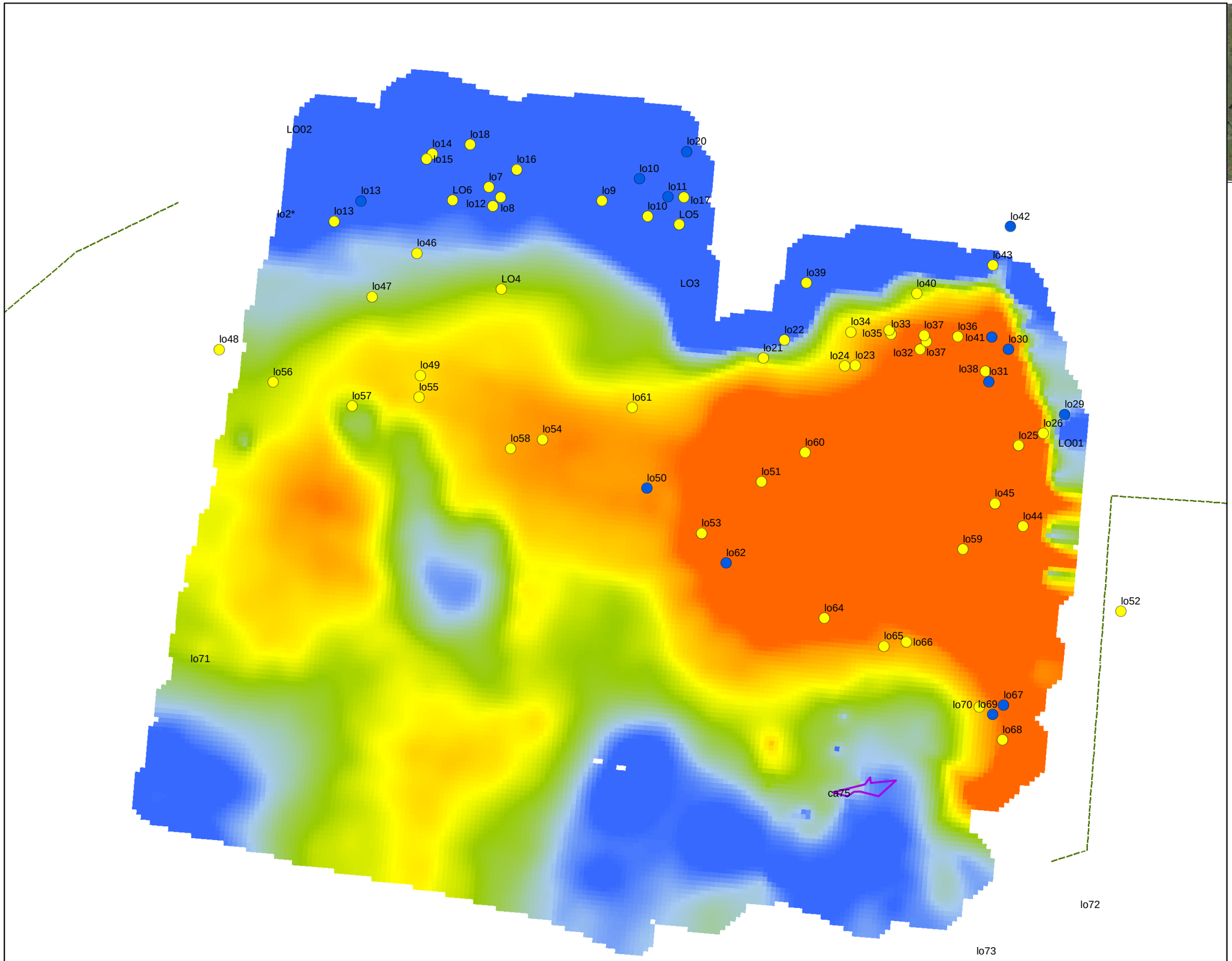
3. RESULTS

Foreshore survey

Loughshinny

3.1. Nothing of particular archaeological interest was identified in the DBA at Loughshinny (Cotswold Archaeology 2019). Rather than emanating from a marine context, archaeological discoveries in the vicinity appear to have eroded from the promontory fort.

3.2. Complimentary in-phase (magnetic susceptibility) and quadrature (conductivity) geophysical datasets collected at Loughshinny recorded clear contrasts between high conductivity / high magnetic susceptibility in the harbour area adjacent to the wharf in the east and lower values generally in the west of the survey area (Fig. 5). This variation is probably caused by the accumulation of marine deposits behind the harbour wall where the silts are sheltered from the Irish Sea. Clearly



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PROJECT TITLE

Havhingsten submarine cable

FIGURE TITLE

Loughshinny Beach landfall close-up

DRAWN BY	RLF	PROJECT NO	770800	FIGURE NO.
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interpretable metallic responses have been identified in the in-phase dataset (Fig. 6) as discrete anomalies with extreme values, mostly occurring towards the high-water mark at the head of the beach and within the harbour area in the east. This observation is reflected in the results from the metal-detection survey. The concentration of metal detection locations higher up the beach, to the north-west (Fig. 6), probably represents casual losses indicative of the area of the beach that is most likely favoured by bathers and walkers.

Port Erin

3.3. All sites recorded in the DBA on the Isle of Man appear to be above MHWS or without the CSC (Cotswold Archaeology 2019). This was confirmed by the archaeological walkover which identified nothing of archaeological potential within the study area.

3.4. Four linear anomalies are clearly visible in the Port Erin geophysical datasets, radiating from a concrete ramp that provides access to the beach in the east of the survey area (Fig. 7). These anomalies represent buried services which were not located by the metal detector, probably because they were too deeply buried. The broad area of low conductivity / low magnetic susceptibility in the east of the dataset corresponds to the outflow from a minor watercourse and is probably due to variation in the depth and composition of the beach deposits in this area. The concentration of non-ferrous metal detections at the upper (western) end of the beach could again represent isolated finds on the more frequently used section of the beach although the linear nature of the finds, parallel to the waterline, might suggest detritus washed ashore.

Port Grenaugh

3.5. One of the sites mentioned in the DBA (Cotswold Archaeology 2019), *Cronk ny Merriu*, a presumed Iron Age defended promontory, which was later built over by a Viking longhouse, was visited during the walkover (Fig 8) and was confirmed to be well away from the study area. The possible remains of a fish trap, or a rudimentary barrier against small vessels was also inspected at low tide but the surviving remains (Fig 9) are difficult to interpret with any certainty.

3.6. At Port Grenaugh the geophysical survey has identified at least four parallel linear anomalies, aligned north-east / south-west, perpendicular to the tide (Fig. 10). The

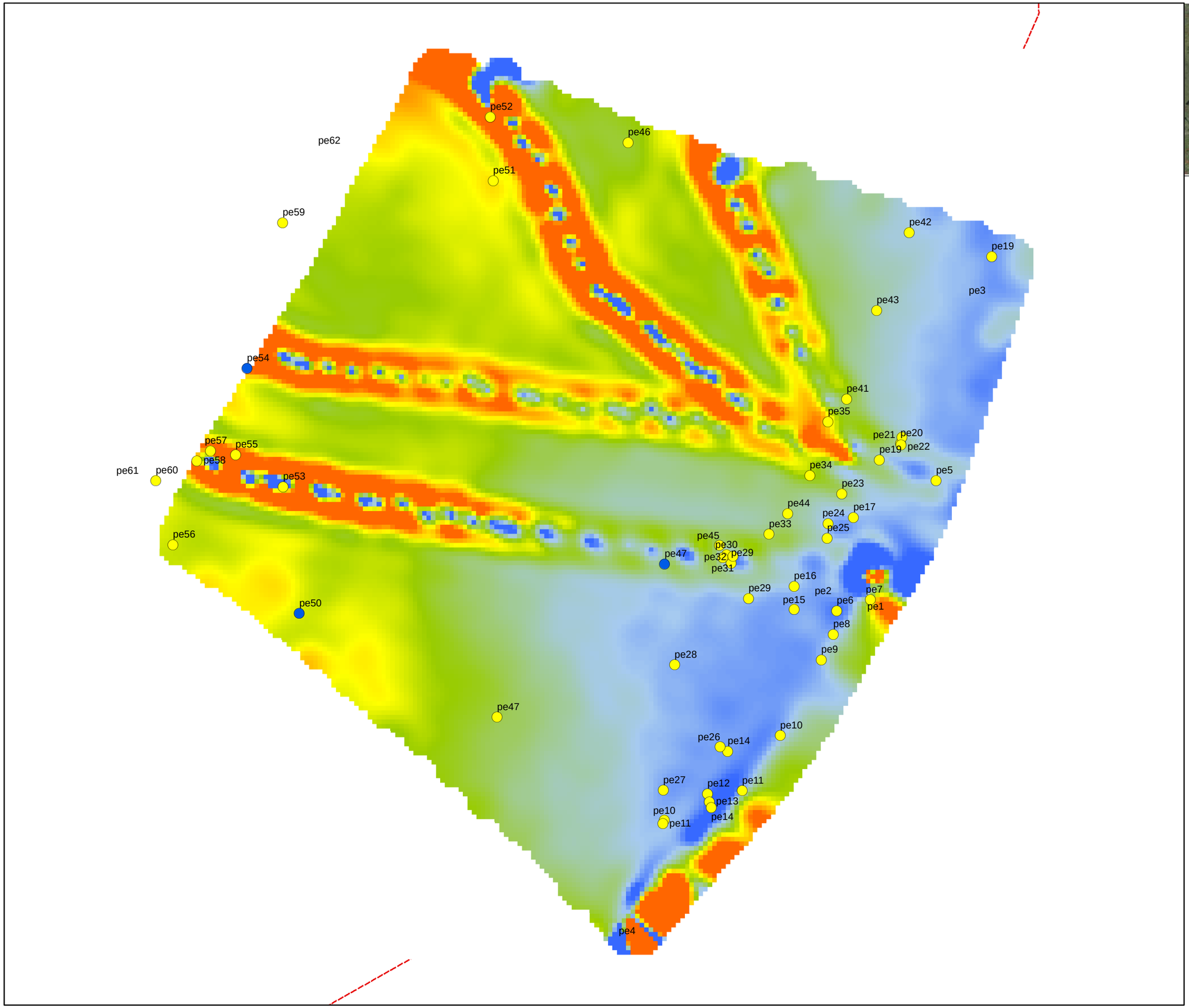

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FIGURE TITLE

Loughshinny Beach landfall close-up

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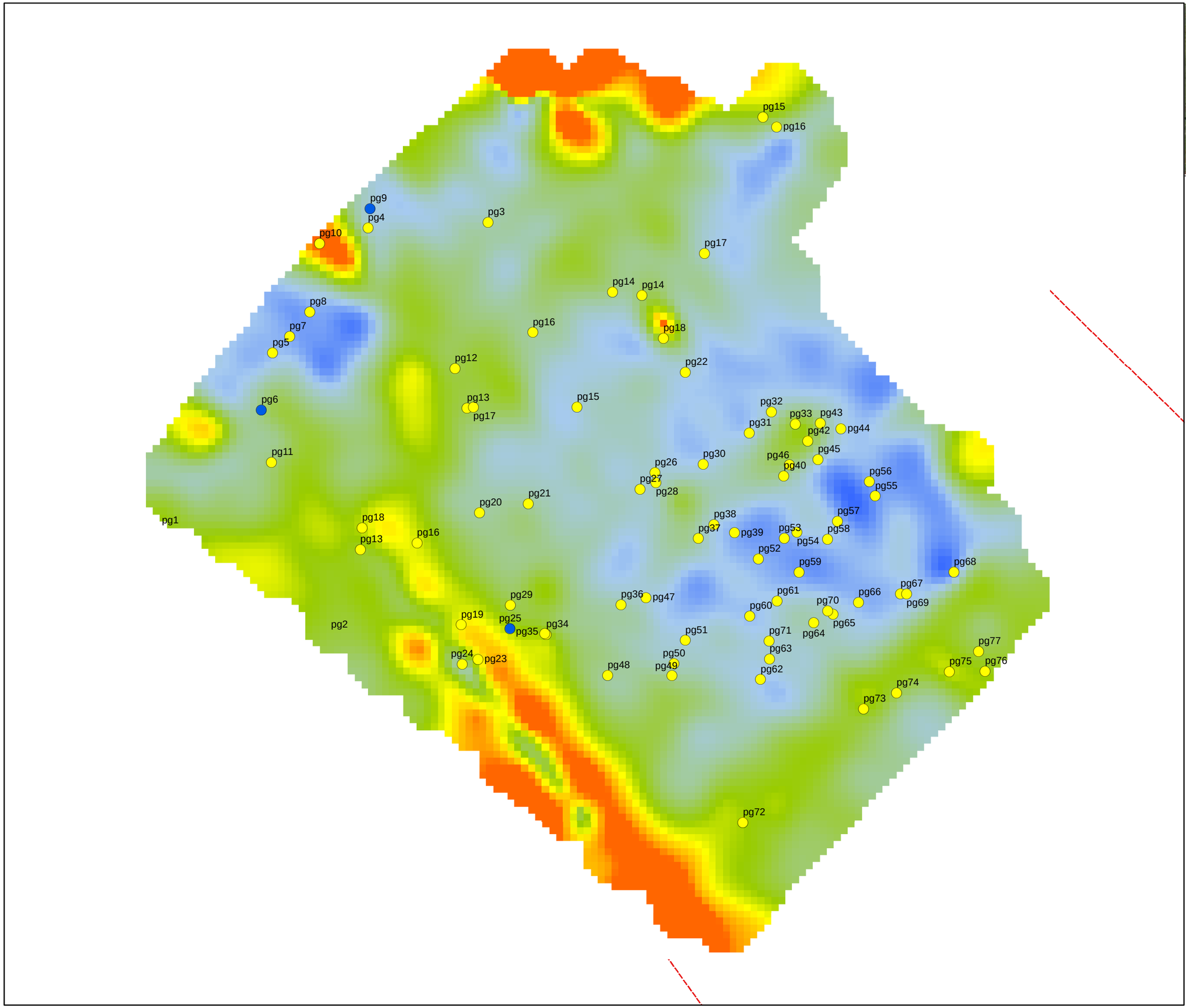
Figure 8 *Cronk ny Merriu*, a presumed Iron Age defended promontory (background facing landward), later built over by a Viking longhouse (foreground)

Figure 9 Boulders located in the lower intertidal zone at Port Grenaugh interpreted as a possible fishtrap or barrier to small vessels



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Loughshinny Beach landfall close-up

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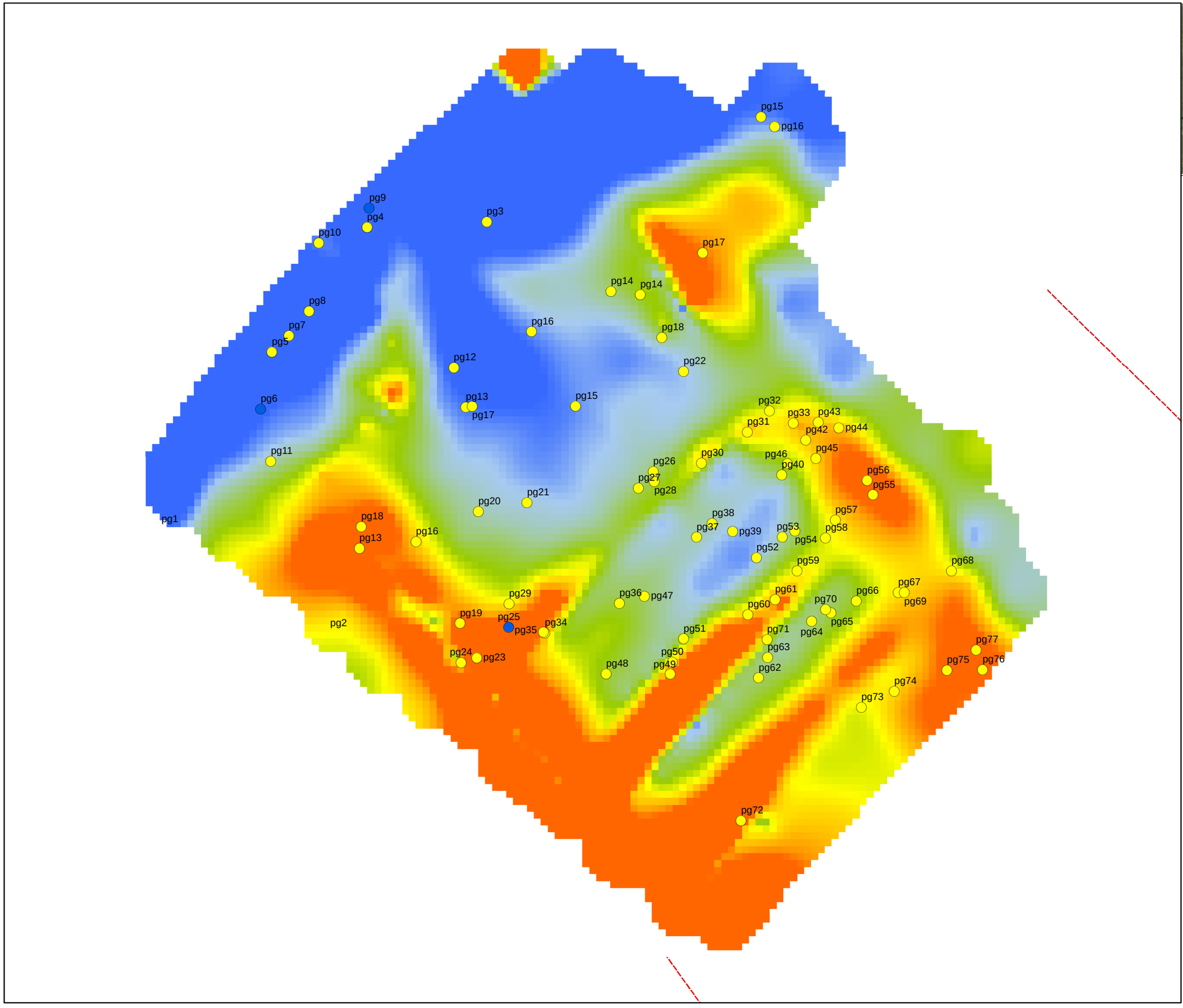

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PROJECT TITLE

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FIGURE TITLE

Loughshinny Beach landfall close-up

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alignment of the anomalies corresponds to the surrounding inter-bedded siltstone / mudstone / sandstone bedrock. The anomalies probably represent an accumulation of deposits within fissures in the bedrock or by the bands of Caledonian Supersuite (metamorphic rock) which are also recorded on this alignment. Potential alignments in the metal detection survey seem to reflect those found in the geophysical survey data. This could represent items trapped in the fissures or could represent built structures. A possible fish trap or barrier against small vessels is recorded in the bay and therefore an anthropogenic origin cannot be discounted. It is possible that the anomalies represent buried walls, or the accumulation of deposits against them.

Lytham St Anne's

3.7. None of the three sites (**CA6-8**) identified in the DBA (Cotswold Archaeology 2019) in the vicinity of the proposed landfall location at Lytham St Anne's was immediately apparent during the walkover survey which suggests either that they are well beyond the study area or that little remains.

3.8. An east / west linear anomaly has been clearly identified in the in-phase (magnetic susceptibility) geophysical dataset (Fig. 12). The anomaly represents a buried service pipe. Towards the eastern end of the anomaly it deviates southwards, maintaining a constant distance from the sea defences which delimit the north-west corner of the survey area. Buried sea defences have also been clearly detected within this dataset as high magnetic susceptibility linear anomalies adjacent to the north-western survey limit.

3.9. Broad and amorphous areas of electrical conductivity and magnetic susceptibility variation across the dataset are probably a result of natural silting patterns.

3.10. There is no obvious patterning in the metal detection survey; the bulk of the locations again appear to represent casual losses in the upper (eastern) section of the beach which is more frequently used by walkers and bathers.

Seaton Sluice

3.11. None of the four sites recorded in the DBA (Cotswold Archaeology 2019) in the north-east (**CA57-60**) were identified during the walkover surveys which suggests either that remains are beyond the study area, they no longer exist, or they have been buried, removed, or built over.

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Loughshinny Beach landfall close-up

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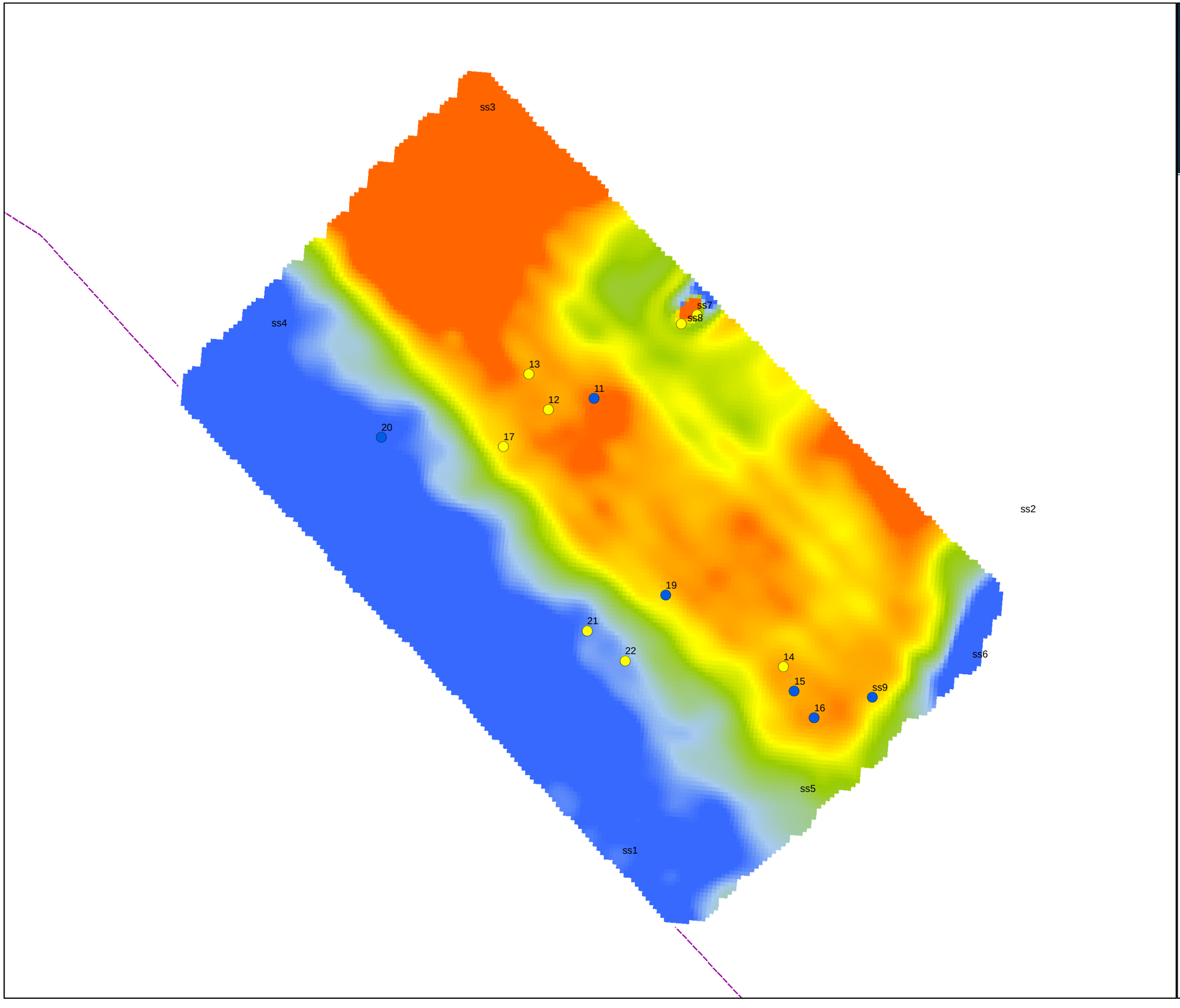

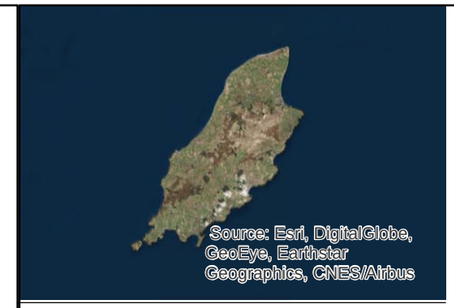

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FIGURE TITLE

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3.12. The geophysical data at Seaton Sluice is characterised by a broad band of low conductivity / low magnetic susceptibility along the south-western side of the dataset. This anomaly corresponds with the elevated section of the beach. The north-eastern half of the dataset contains broad and amorphous areas of variation which again are probably a result of natural silting patterns (Fig. 13).

Whitley Bay

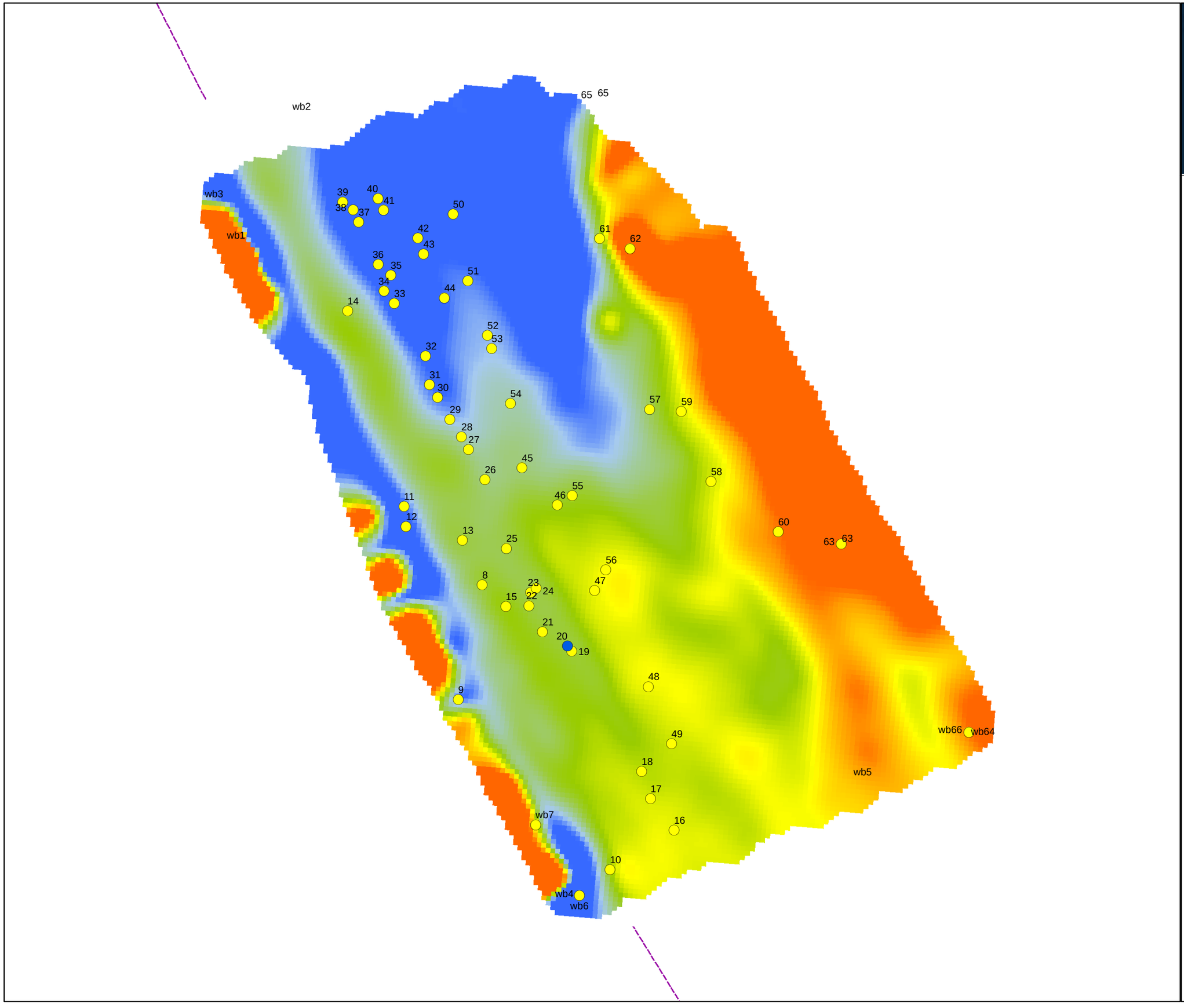
Extreme values along the south-western edge of the geophysical survey area are caused by the presence of concrete sea defences. The broad and amorphous area of low conductivity in the north of the quadrature plot corresponds to an area of outcropping bedrock. Elsewhere the variations recorded are probably again the result of natural silting patterns. Highly magnetic discrete anomalies along the low water mark (the north-eastern edge of the dataset) represent buried metal objects (Fig 14). These were not detected by the metal-detecting survey, possibly as they were buried too deeply. The lines of non-ferrous metal detections parallel to the waterline may represent detritus from the construction of the concrete sea defences detected in the geophysical data further offshore.

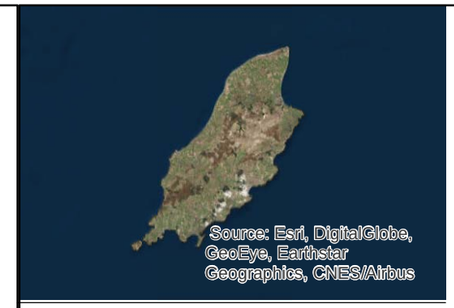
Offshore survey

3.13. Being finalised…

4. DISCUSSION

4.1. These surveys have successfully evaluated the six potential landfall locations and have identified no anomalies of clear archaeological potential. At Port Grenaugh, however, where a possible fish trap or barrier against small vessels is recorded (Cotswold Archaeology 2019), linear anomalies detected perpendicular to the tide, may be anthropogenic in origin, perhaps resulting from buried walls or the accumulation of deposits against them. These anomalies are assessed as of low to moderate archaeological potential. No other anomalies of archaeological potential have been identified at any of the potential landfall locations. Elsewhere, four linear anomalies identified at Port Erin, and a fifth at Lytham St Anne's, indicate buried service pipes / cables. On the basis of the walkover geophysical, and metal detecting surveys, therefore, these landfall locations are assessed as of low archaeological potential, which corroborates the results of the marine archaeology desk-based assessment (Cotswold Archaeology 2019).





N

Legend

- Ferrous
- Non-ferrous
- Survey_line
- Survey_Ply
- UK east merge

Coordinate System: WGS 1984 UTM Zone 31N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: 3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

0 0.0225Kilometers

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PROJECT TITLE

Havhingsten submarine cable

FIGURE TITLE

Draft 1

DRAWN BY	**RK**	*PROJECT NO*	**xx**	*FIGURE NO.*	
CHECKED BY	**xx**	*DATE*	**xx**		**1**
APPROVED BY	**xx**	*SCALE@A3*	**1:750**		

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Online Resources

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