



## Humber Gateway Offshore Wind Farm

Archaeological Review of Groundtruthing Survey  
for Seabed Features (Turbine Locations)



**HUMBER GATEWAY OFFSHORE WIND FARM**  
**ARCHAEOLOGICAL REVIEW OF GROUNDTRUTHING SURVEY FOR SEABED**  
**FEATURES (TURBINE LOCATIONS)**

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# HUMBER GATEWAY OFFSHORE WIND FARM

## ARCHAEOLOGICAL REVIEW OF GROUNDTRUTHING SURVEY FOR SEABED FEATURES (TURBINE LOCATIONS)

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### Summary

Wessex Archaeology was commissioned by E.ON Climate and Renewables on behalf of Humber Gateway Offshore Wind to undertake an archaeological review of the groundtruthing survey of anomalies (seabed features) at the turbine base locations subject to, and in advance of, geotechnical borehole survey.

Diving survey data consisting of still and video images, diver trackplots and reported data acquired during UXO diving investigation of geophysical anomalies surrounding 10 proposed borehole locations (for turbines) were investigated and the reported results interpreted by Wessex Archaeology.

A total of 15 sites of potential archaeological interest were reviewed. Details of all sites are contained within this document (see **Appendix I**). Six discoveries of archaeological interest were made along with two that remain of potential interest. Of the discoveries of archaeological interest, four were left *in situ* and avoided during geotechnical investigation phases, one was moved away from any proposed development impact, and one was recovered to the surface for archaeological interpretation.

Full details of the discoveries have been included in this report.

# **HUMBER GATEWAY OFFSHORE WIND FARM**

## **ARCHAEOLOGICAL REVIEW OF GROUNDTRUTHING SURVEY FOR SEABED FEATURES (TURBINE LOCATIONS)**

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### **Acknowledgements**

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The diving survey data were acquired by Red7Marine and 6 Alpha Associates.

The data was archaeologically assessed and the report compiled by Toby Gane. Illustrations were prepared by Kitty Brandon. The project was managed for Wessex Archaeology by Toby Gane.

### **Data Licences**

A summary of archaeological site data in the Humber Gateway Study area was obtained from the National Monument Record (NMR) - now the National Record for the Historic Environment (NRHE). Copyright restrictions apply to any data that may be obtained by the NMR.

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# HUMBER GATEWAY OFFSHORE WIND FARM

## ARCHAEOLOGICAL REVIEW OF GROUNDTRUTHING SURVEY (TURBINE LOCATIONS)

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# HUMBER GATEWAY OFFSHORE WIND FARM

## ARCHAEOLOGICAL REVIEW OF GROUNDTRUTHING SURVEY FOR SEABED FEATURES (TURBINE LOCATIONS)

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### 1. INTRODUCTION

- 1.1.1 Proposals for the development of the Humber Gateway Offshore Wind Farm (OWF) for renewable energy will be accompanied by archaeological assessment. Wessex Archaeology (WA) has been appointed by E.ON Climate & Renewables (E.ON) to assist in the archaeological assessment of the Humber Gateway OWF.
- 1.1.2 As part of this assessment, WA has been commissioned to undertake a review of the findings of diver survey for pre-geotechnical purposes at proposed borehole locations for each of the planned 10 turbine base locations at which potential archaeological anomalies were present, as shown in **Figure 1**. The anomalies were investigated as part of UXO diving investigations and reports of cultural heritage and archaeological material encountered were made to WA. Those borehole locations investigated are also shown in **Figure 1**.
- 1.1.3 Subsequent to these investigations geotechnical data was acquired to support the detailed design of the proposed OWF and to assess the turbine locations with regard to proposed engineering and construction details.
- 1.1.4 Following assessment of the data derived by the diving investigation, WA then gave advice to E.ON on appropriate follow-up actions.

### 2. AIM AND OBJECTIVES

- 2.1.1 The aim of the investigation was to carry out the archaeological interpretation of the anomalies investigated by diving and the data collected from the borehole locations, as indicated on **Figure 1**. The objectives were as follows:
- To assess the data and information provided by the Client and acquired by the diving Contractor during the diver survey in order to identify, within the specified borehole locations, any material of archaeological interest lying within the vicinity of the borehole locations.
  - To identify the presence/absence, extent, condition, nature and character of any archaeological material found to be present at borehole locations targeted for investigation.
  - To identify items that may cause disruption to the Site Investigations and provide information on the historic context of those items.

### 3. DATA REVIEW METHODOLOGY

#### 3.1 DIVER SURVEY

- 3.1.1 The diver survey was undertaken by Red7Marine and 6 Alpha Associates during September to November 2011. The survey data covers all 10 proposed turbine locations at which potentially archaeological or UXO anomalies were detected.

Those borehole locations that were investigated for potential archaeology are shown in **Figure 1**.

- 3.1.2 Where available, digital video and still photography, diver track-plots and dive reports were all assessed for potential archaeology. The available data for all dives was made available to Wessex Archaeology.

### 3.2 DATA SOURCES

- 3.2.1 Data was supplied by E.ON and its Contractors. Table 1 details the main data sources supplied to WA:

Contractor	Title	Date	Notes
Osiris	Geophysical Survey	May/Jun 2011	Mag & sidescan data-sets used
Red7Marine	Diver UMA Site Completion Report; BH02	25 Aug 2011	
Red7Marine	Diver UMA Site Completion Report; BH07	22 Aug 2011	
6 Alpha Associates	Diving Results; BH07	24 Aug 2011	
Red7Marine	Diver UMA Site Completion Report; BH09	21 Aug 2011	
Red7Marine	Diver UMA Site Completion Report; BH12	20 Aug 2011	
Red7Marine	Diver UMA Site Completion Report; BH25	26 Aug 2011	
6 Alpha Associates	Diving Results; BH25	03 Sep 2011	
6 Alpha Associates	Diving Results; BH38	04 Sep 2011	
Red7Marine	Diver UMA Site Completion Report; BH48	03 Oct 2011	
6 Alpha Associates	Diving Results; BH48	14 Oct 2011	
6 Alpha Associates	Diving Results; BH56	16 Oct 2011	
6 Alpha Associates	Diving Results; BH58	07 Nov 2011	
Red7Marine	Diver UMA Site Completion Report; BH71	18 Nov 2011	
6 Alpha Associates	Diving Results; BH72	11 Nov 2011	
Red7Marine	Diver UMA Site Completion Report; BH75	16 Oct 2011	

**Table 1:** Data sources used to inform the report.

### 3.3 APPROACH

- 3.3.1 Coordinates of target anomalies were cross-checked with Osiris Survey data, GeoSea work plan and Diver USBL Track Plot and the UXO Geotechnical Investigation Position sign-off Certificate (the latter prepared for GeoSea).
- 3.3.2 Red7Marine conducted diving inspections on all targets between 20<sup>th</sup> September and 18<sup>th</sup> November 2011.
- 3.3.3 All divers employed an Aquascan DX200 handheld magnetometer. The activities were supervised by an E.ON representative on-board the dive support vessel *Gray Mammoth*. Office based Quality Assurance was provided by E.ON and 6 Alpha.
- 3.3.4 The magnetometer was checked for function (on the vessel and on an 8T shackle, on the shot line, after descent) before and after the dive. During the operation, the divers ensured that any magnetometer signals interpreted by the DX200 were not due to noise generated by DSV *Gray Mammoth*. Wherever it was safe and



practicable to do so, boulders or rocks with a magnetic signature were moved and the area was re-scanned to evidence it was free from a magnetic signature.

- 3.3.5 Where potentially archaeological material was encountered, the find was immediately reported by E.ON to Wessex Archaeology. Advice was given to E.ON, based on the information provided, on the actions necessary in the circumstances of the discovery.

### 3.4 INFORMATION AND DATA PROCESSING

- 3.4.1 Still and video images acquired by the diving contractor were interpreted by WA for potential cultural heritage and archaeological material. Diver reports and trackplots were also assessed and the results were compared with the geophysical interpretation of the borehole locations (Wessex Archaeology 2011).
- 3.4.2 The data provided by the diving investigations were also compared with the recent and historic geophysical assessments undertaken in the development area by Wessex Archaeology (2005; 2009). Any material could then be potentially linked to known or potential wrecks in the vicinity of the discovery, where they existed.

## 4. RESULTS

- 4.1.1 For the purposes of archaeological groundtruthing, a total of seven sidescan sonar anomalies, plus 11 magnetometer anomalies (four of which corresponded with each other) were individually identified and investigated by divers at 11 turbine locations. This was done on the basis of information from E.ON stating that only anomalies at the drilling rig locations that were likely to be impacted were to be investigated.
- 4.1.2 Material of archaeological potential found within the borehole location boxes were characterised by WA as follows:

Archaeological Discrimination	Number of Sites	Interpretation
A	6	Material of archaeological interest
P	2	Material of possible archaeological interest
U	2	Modern or non-archaeological material
N	5	Natural Material
<b>Total</b>	<b>15</b>	

**Table 2:** Discrimination for assessment of targets within borehole locations.

- 4.1.3 Furthermore, these discoveries can be classified by type, which can further aid in assigning archaeological potential and importance:

Classification	Discoveries
Wreck sites or wreck debris fields	4
Isolated maritime finds	1
General debris	1
<b>Total</b>	<b>6</b>

**Table 3:** Classification of possible archaeological sites (discrimination class A) within the borehole location boxes by anomaly type.

- 4.1.4 The individual discoveries identified in the course of the diver survey are listed in detail in a gazetteer in **Appendix I** and their locations are shown in **Figure 1**. Additionally, a data sheet has been included in **Appendix II** for each borehole location box within which archaeological sites were interpreted. These contain

details of each site investigated by diver plus an image of the diver trackplot and images, where these were made available by the diving contractor.

- 4.1.5 Of the 26 sites within the borehole location boxes, 15 were investigated by divers for UXO and/or archaeological material. Where suspected archaeological material was encountered it has been interpreted in **Section 5**.

## 5. DISCUSSION

- 5.1.1 The diving investigation of anomalies led to the discovery of five items that are considered to be of an archaeological nature. Those items are discussed in more detail below.
- 5.1.2 During investigation of a non-archaeological target at Borehole 38, part of “an old anchor” was described by the UXO diver (see **Appendix I**). However, on subsequent dives the anchor could not be relocated, and no useful description or record was taken of the find, and so it has been discounted from this assessment.

### 5.2 POSSIBLE MINE BASE (WA7026)

- 5.2.1 This object was discovered following diver survey of a magnetic anomaly (with a magnetic amplitude measuring 79nT) on 26<sup>th</sup> September 2011 at Borehole 48.
- 5.2.2 The object described by the divers was constructed of iron or steel, measured approximately 0.7 x 0.7 x 0.2m and although most of the object was buried, the diver was able to establish approximate size using a handheld magnetometer. The object had chain link attached to it and was described as ‘heavily corroded’.
- 5.2.3 The corroded and concreted nature of the discovery indicates that it has been on the seabed for a considerable time. The size and general description of this find is consistent with the base of mines that were laid in the North Sea during hostilities with Germany between 1914 and 1918 (WWI). Most mines used wire to tether the mine to the base when deployed, but some systems used chain links (or a combination of the two) - as is possible in this case. The explosive warhead, which would have been set at a level to impact with passing ships’ hulls, has been cut away - probably during clearance operations during, or shortly after the war - leaving the mine base on the seabed.
- 5.2.4 During the WWI the British laid 116,000 mines in the North Sea and English Channel. In addition, the Americans laid 56,000 mines and the Germans 25,000 mines in over 1,000 minefields in British waters. In total, mines in the North Sea and English Channel are thought to have caused the loss of 150 German ships including 35 U-boats, 46 Royal Navy warships, 269 merchant ships and 63 fishing vessels. It is thought in excess of 1 million tons of Allied shipping was lost as a result of the minefields in this period (Steffen 2005: 802), not to mention the appalling loss of life that this would have caused.
- 5.2.5 Given the scale of the use of mines in the course of WWI in the North Sea, it is not surprising to have found a mine base in the development area. It is considered to be an isolated find, and this discovery is only tentatively identified as a mine base. As a relic of WWI it is of some historic interest, although it is considered to be of low archaeological significance.

### 5.3 SMALL ANCHOR (WA7041)

- 5.3.1 This object was discovered following diver survey of a magnetic anomaly (with a magnetic amplitude measuring 58nT) on 18<sup>th</sup> November 2011 at Borehole 71.
- 5.3.2 The object is described as a small anchor 0.6 x 0.1 x 0.1m with 'spade flukes' and is probably of the admiralty or fisherman's pattern. It appears to be heavily corroded from the images provided.
- 5.3.3 The size of this anchor would indicate a small vessel, and is probably 19<sup>th</sup> century in date, although it is difficult to come to any firm conclusions with the information available. It is possible it is from one of the ancillary boats of a larger vessel.
- 5.3.4 Borehole 71 is in close proximity to two archaeological exclusion zones (AEZs) identified during archaeological assessment of the geophysical survey data in 2005 and 2009. These are AEZs for **7001** (to the east of borehole 71, c. 100m radius from centre of target) and **7004/7062** (to the south-west of borehole 71, c. 100m radius from centre of target) (Wessex Archaeology 2005). The borehole is approximately 200m from both AEZs. The first of these anomalies (**7001**) is a seafloor disturbance near the presumed wreck site of the *Marshall*, a 307-ton German steamship (sunk in 1853). The second AEZ (**7004/7062**) is for another area of seafloor disturbance and the reported position of the sinking of the *Marshall* (*Ibid.*: 16-24).
- 5.3.5 This object probably represents part of a debris scatter associated with one of the anomalies within the AEZs, which may be connected with the *Marshall*. It is considered to be of low archaeological significance.

### 5.4 WINDLASS MECHANISM (WA7042)

- 5.4.1 This object was discovered following diver survey of a magnetic anomaly (with a magnetic amplitude measuring 133nT) on 1<sup>st</sup> November 2011 at Borehole 72.
- 5.4.2 The item consists of composite iron and wood, with a toothed iron ring and wooden 'barrel' coming off the ring. It is heavily corroded and concreted.
- 5.4.3 The object was initially identified as a 'possible torpedo tail section' by the EOD diver. However, on recovery it was clear that it was not explosive ordnance related, and was sent to WA for archaeological assessment. The object is assessed to be part of a 'pump-break' windlass mechanism (the pawl rim and one barrel) of early 19<sup>th</sup> century date. Windlasses were horizontal winding mechanism for heavy lifting tasks, such as weighing anchor and would have been a standard item on most sailing vessels (Stone 1993: 41-43).
- 5.4.4 The nearest AEZ (c. 100m radius from centre of target) is for **7064**, which is the reported wreck site of the *Saltoun*, a 719-ton British steamship sunk in 1927. The windlass is, however, unlikely to be from this vessel (as this would have carried a steam driven windlass) and there are a range of small anomalies - indicative of debris - in the vicinity of borehole 72 that may indicate a well broken up and scattered wreck that has not been coherent enough to be identified in the assessment of geophysics data. Detail of the Position of the anomaly can be seen in **Figure 2**.
- 5.4.5 The reported anomalies from the 2005 Geophysical Assessment (Wessex Archaeology 2005) in the general vicinity include 4104, 4248 and 4262 and any one of these could be the source of the windlass.

- 5.4.6 There are a number of recorded casualties of 19<sup>th</sup> century date, all of whom struck on the New Sand Hole sandbank to the south of the study area, but which may have come adrift and sunk in the development area (Wessex Archaeology 2005: 46).
- 5.4.7 The windlass is considered to be of historic and heritage interest. Due to the rarity of examples of this age is also considered to be of archaeological significance, although without the context of a known or located wreck this is somewhat limited (medium significance).

## 5.5 LARGE ANCHOR AND CHAIN (WA7101)

- 5.5.1 These objects (including associated items **WA7102, 7103**) were discovered following diver survey of sidescan and magnetic anomalies (with a large magnetic amplitude measuring 3222nT) on 16<sup>th</sup> October 2011 at Borehole 75.
- 5.5.2 The main object is described by the diver's report as a large anchor 2.6 x 0.2 x 0.2m of 'admiralty pattern AC14' with square section shank. This is a confusing description, and the diver presumably meant either an Admiralty *Cast* AC14 (a 20<sup>th</sup> century anchor introduced in 1943) or an Admiralty *Pattern* anchor (which would be of likely 19<sup>th</sup> century date). The images are not sufficient to form a firm opinion of the type of anchor, but the shaft does not appear robust enough for an AC14, and the level of corrosion product would indicate a lengthy spell on the seabed. It is therefore considered more likely to be an Admiralty Pattern anchor, which would also fit better with the wreck of the *Nora*, and its associated debris field, in the vicinity of Borehole 75.
- 5.5.3 The anchor appears to be heavily corroded from the images provided and has clearly been on seabed for some time. The additional anomalies (**WA7102, 7103**) proved to be anchor chain and other debris apparently associated with **WA7101**. The diver was unable to give further details that might indicate the age of the anchor and so the suggestions given here are made with a degree of uncertainty.
- 5.5.4 These finds appear in an area of further small anomalies indicative of wreck debris. Detail of the position of the anomaly can be seen in **Figure 2**. Borehole 75 is very close to an AEZ (c. 200m+ radius from centre of target) for anomaly **7000** (Wessex Archaeology 2005; 2009), the suspected wreck of the *Nora*, a 722-ton Danish cargo steamship sunk in 1916 by the German submarine *UC-10*.
- 5.5.5 The anchor type (presumably admiralty or similar pattern) is not usually associated with the main anchors for steamships of the early 20<sup>th</sup> century such as the *Nora*, who would have used stockless anchors as their main bowers. However, it is entirely feasible that this item is a spare bower anchor or stream anchor with a folding stock that would have been commonly carried and held on the deck of a ship like the *Nora* (Waine 2003: 27 and 135).
- 5.5.6 The object was repositioned, following prior consultation with the Retained Archaeologist (WA), due to engineering constraints, to a drop location to the west of borehole 75 (318425.18E, 5949059.34N).
- 5.5.7 The object is considered to be of historic and heritage interest, but is not considered to be archaeologically sensitive, with a low level of archaeological significance.

## 5.6 REMAINING ANOMALIES WITH ARCHAEOLOGICAL POTENTIAL (WA7104, 7105)

- 5.6.1 Two remaining magnetic anomalies at Borehole 75 (**WA7104, 7105**) were located by diver survey, but the source of the anomalies could not be found. It is likely that

the causative objects were buried in the seabed, and were therefore not accessible to the investigating UXO diver.

- 5.6.2 These anomalies are likely to represent further debris associated with the outward edge of the debris field of the *Nora* and outlying of its specified exclusion zone (**7000**) (Wessex Archaeology 2005; 2009).

## 6. RECOMMENDATIONS

- 6.1.1 Although none of the anomalies identified and investigated have been classified as indicating a wreck location in the immediate vicinity of a borehole, two of the anomalies (**WA7101** and **7042**) are considered to be representative of the outer scatter of debris from a wreck site. It is therefore probable that the remaining geophysical targets associated with these represent isolated maritime finds or general debris.
- 6.1.2 One of the wreck related finds is the discovery at anomaly **WA7042** at borehole 72, which has been interpreted as a possible early 19<sup>th</sup> century pump-brake windlass. This item is probably associated with the wreck material and AEZ at **7064** (Wessex Archaeology 2005) located approximately 600m to the south-west of the borehole, or alternatively, one of the many geophysical anomalies close to borehole 72 that were discounted in subsequent geophysics assessments (*ibid.*).
- 6.1.3 The other wreck related find is the large anchor at anomaly **WA7101** close to borehole 75. This item matches with the outer scatter of the suspected wreck of the *Nora* (**7000**) and the corresponding AEZ (Wessex Archaeology 2005; 2009). Due to the engineering constraint that was represented by this find, it was relocated to a nearby location on the seabed, outside of the impact zone to a drop location to the west of borehole 75 (318425.18E, 5949059.34N).
- 6.1.4 All of the discoveries of archaeological significance have been geographically recorded and left *in situ*, with the exception of the windlass (**WA7042**), which was recovered to WA for archaeological interpretation and recording.
- 6.1.5 The anchor (**WA7101**) that was relocated away from borehole 75 has been reported under The Crown Estate Protocol for Archaeological Discoveries (The Crown Estate 2010) as it was lifted, but not recovered for archaeological assessment.
- 6.1.6 Where objects are left *in situ*, it is recommended that they are avoided during future development and construction activities. For this purpose, a buffer of 50m should be applied to project charts and navigation software to help facilitate the avoidance of impacts on these receptors during installation. This should also apply to the two anomalies that remain of potential archaeological interest (**WA7104, 7105**).
- 6.1.7 The possible archaeological sites outside the area of immediate impact posed by Site Investigations, but still within borehole location boxes, are less likely to be impacted by the actions of drilling. However, they should nonetheless be taken into account and circumvented during planning and installation phases of the turbine bases or cables to avoid impacts to these features.

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**APPENDIX I: GAZETTEER OF INVESTIGATED ARCHAEOLOGICAL ANOMALIES IN BOREHOLE LOCATIONS**

WA ID	Bore-hole	Geophysics Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Geophysics Description	Investigation Description	Arch. Assessment
7000	2	Dark reflector	321158	5944562	3.1	1.7	0.9		Rounded object with shadow that extends beyond range in one line so height may be underestimated.	Large boulder. 1.6m high x 3m long x 2.7m wide. No magnetic signature.	N
7002	7	Debris	320131	5944135	2.8	1.3	0.5		Angular object with hard reflector on the near side.	Boulder at centre of Archaeology target (7002) measured 500mm high by 400mm by 1000mm photo taken. No magnetic response indicated.	N
7003	8	Dark reflector	320582	5944679	1.8	0.6	0.2		Elongated object, although this may be overemphasised by slightly distorted data here.	Impacts on target avoided. No investigation carried out.	-
7004	8	Dark reflector	320602	5944612	2.0	1.2	0.4		Rounded object with a hard near edge.	Impacts on target avoided. No investigation carried out.	-
7005	9	Dark reflector	321011	5945121	2.6	1.0	0.4		Approximately circular object with shadow that extends beyond data range, so height is underestimated. Surrounded by many other similar but much smaller objects.	Boulder located in centre of target 200mm by 300mm by 900mm.	N
7006	12	Magnetic	322327	5946615				153	Medium magnetic anomaly, possible piece of ferrous debris.	Small piece of scrap metal approximately 8 inch diameter. Scrap was encrusted buried down 100mm. Diver excavated down 100mm and found target. Area rescanned.	U
7014	22	Debris	322674	5947722	2.3	0.1	0.2	701	Small linear object in the sidescan sonar data. Large magnetic anomaly identified on more than one survey line. Located 13m northwest of sidescan anomaly, along track.	Impacts on target avoided. No investigation carried out.	-

WA ID	Bore-hole	Geophysics Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Geophysics Description	Investigation Description	Arch. Assessment
7016	25	Magnetic	319394	5944857				129	Medium magnetic anomaly, identified on two survey lines.	Metal debris – (Angle iron) – 1.7 x 0.2 x 0.2m (strong magnetic signature).	U
7021	35	Magnetic	319248	5945406				119	Medium magnetic anomaly, identified on two survey lines.	Impacts on target avoided (DP Vessel used). No investigation carried out.	-
	38	UXO target	320597	5946950					UXO sonar anomalies	Initially a non-archaeological target, but part of an “old anchor” was discovered by the diver. It could not be relocated on subsequent dives and so has been discounted from this assessment.	A
7026	48	Magnetic	320471	5947510				79	Small, distinct magnetic anomaly.	Object measuring L700 x W700 x H200mm. Object had what appeared to be steel chain links as well as an eyebolt and shackle attached to it, was heavily corroded and approximately 20% covered in marine growth. The object had a metallic signature and had a number of edges and features. It was buried in the seabed and only the above dimensions were visible. Possible WWI naval mine base unit.	A
7027	49	Dark reflector	320900	5948023	1.8	0.4	0.4		Elongate hard reflector with height.	Impacts on target avoided (DP Vessel used). No investigation carried out.	-
7030	51	Magnetic	321817	5949003				675	Large magnetic anomaly identified on more than one survey line.	Impacts on target avoided (DP Vessel used). No investigation carried out.	-



WA ID	Bore-hole	Geophysics Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Geophysics Description	Investigation Description	Arch. Assessment
7032	54	Debris	318999	5946630	12.6	2.8	1.6		Rounded object (3.3x2.8x1.6m) with shadow that extends beyond range so height is underestimated. Appears to be surrounded by a scour. A linear object (12.6x0.2x0.0m) lies adjacent to it.	Impacts on target avoided (DP Vessel used). No investigation carried out.	-
7034	54	Magnetic	318994	5946674				651	Large magnetic anomaly identified over a very wide area, covers the entire BH54 survey area. Presumed location of the Humber Gateway met mast, though this is not noted in the survey logs.	Impacts on target avoided (DP Vessel used). No investigation carried out.	-
7035	56	Dark reflector	319874	5947667	2.6	1.0	0.5	7	Rounded object with height. A very small magnetic anomaly is located 17m to the southeast, along track.	Large rock located 2m NE of the centre of the target size, 1500mm long x 1200mm wide x 800mm high.	N
7037	60	Dark reflector	321693	5949589	1.3	1.1	0.6	33	Irregularly shaped object consisting principally of an angular hard reflector. Small magnetic anomaly located 8m to the northeast.	Impacts on target avoided (annex 1 reef habitat, no works carried out). No investigation carried out.	-
7038	62	Magnetic	318899	5947271				50	Isolated small magnetic anomaly.	Impacts on target avoided (DP Vessel used). No investigation carried out.	-
7041	71	Magnetic	320073	5949323				58	Small magnetic anomaly identified on two survey lines, possible ferrous debris.	Small anchor 600mm by 100mm by 100mm with spade flukes, no chain attached.	A
7042	72	Magnetic	318631	5948463				133	Medium isolated anomaly that has not been identified on adjacent lines. Possibly debris or noise.	EOD diver confirmed that the target was a "possible torpedo tail section", but that it was Free From Explosives (FFE) and was not connected to anything under, or in front of the anomaly. Following recovery, archaeological	A

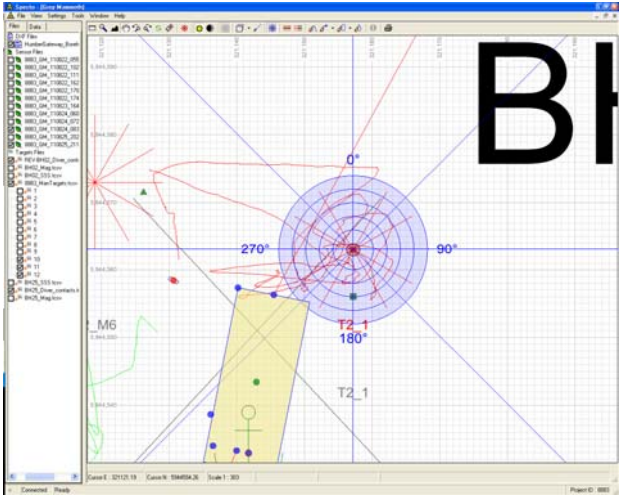
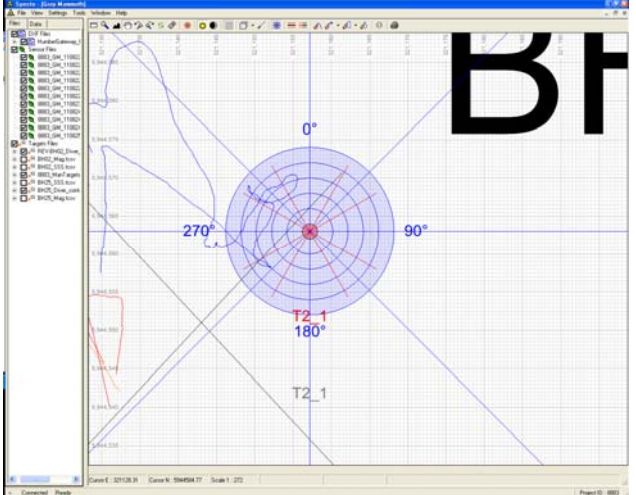


WA ID	Bore-hole	Geophysics Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Geophysics Description	Investigation Description	Arch. Assessment
										assessment identified it as part of a windlass mechanism.	
7044	76	Magnetic	323369	5947027				91	Small, irregular shaped anomaly. Located in an area of noise, so could be ferrous debris or noise. Possibly identified on more than one survey line.	Impacts on target avoided. No investigation carried out.	-
7101	75	Debris	318505	5949007	19.0	0.1	0.1	3222	Curvilinear object, which may be fishing gear, rope or chain. Associated with a very large, irregularly shaped magnetic anomaly.	Large Anchor with chain L2630mm x W200mm x H100mm, 1m east of target area. Subsequently moved to 318425.18E, 5949059.34N.	A
7102	75	Debris	318514	5949015	6.0	0.2	0.1	3222	Curvilinear object. Possibly fishing gear, rope or chain. This site lies near 7101 and is associated with the same very large, irregularly shaped magnetic anomaly.	As per 7101 (related)	A
7103	75	Debris	318518	5949079	7.8	5.7	0.1	2491	Convolutated curvilinear object. Length and width are those of area covered by the feature. The feature itself has a width of 0.3m max. Associated with a very large magnetic anomaly and likely to be ferrous debris.	As per 7101 (related)	A
7104	75	Magnetic	318425	5949088				60	Small anomaly, possibly related to other anomalies around BH75. Possible debris.	Diver search, no anomalies found (target possibly buried).	P
7105	75	Magnetic	318480	5949047				150	Medium anomaly, possibly related to other anomalies around BH75. May be debris.	Diver search, no anomalies found (target possibly buried).	P

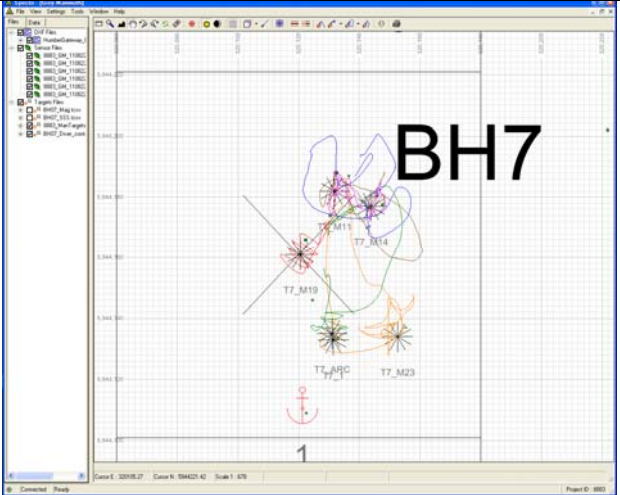

**Notes:**

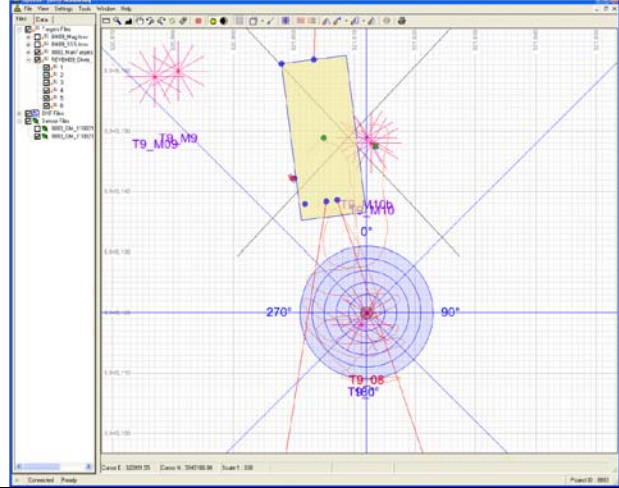
All coordinates are UTM Zone 31N.

- A** Material of archaeological Interest
- P** Material of possible archaeological interest
- U** Modern or non-archaeological material
- N** Natural Material

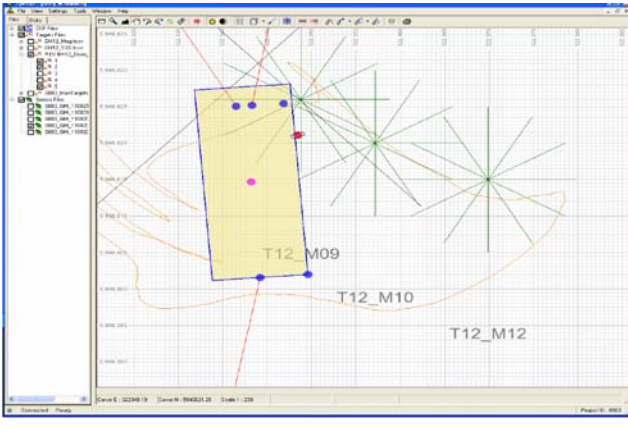
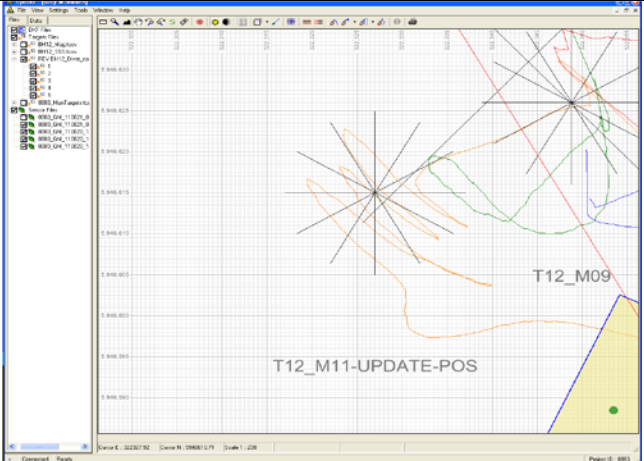
**APPENDIX II: DATA SHEETS FOR ALL SITES OF ARCHAEOLOGICAL POTENTIAL INVESTIGATED DURING DIVING OPERATIONS**

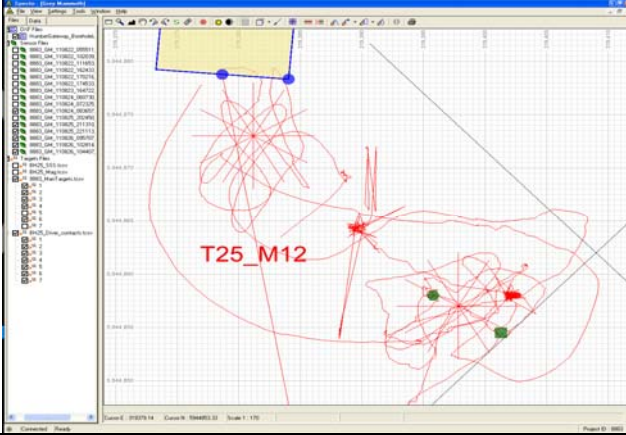

BOREHOLE 2 – 321143 E 5944551 N ARCHAEOLOGICAL ASSESSMENT			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	25 Aug 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
			
<b>WA Site ID</b>	7000	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	321157 E 5944562 N	<b>Geophysical Details</b>	3.1m x 1.7m x 0.9m
<b>Geophysics Description</b>	Dark reflector. Rounded object with shadow that extends beyond range in one line so height may be underestimated.	<b>Diver Description</b>	Large boulder. 1.6m high x 3m long x 2.7m wide. No magnetic signature.
		<b>Archaeological Assessment</b>	Natural
<b>Images</b>			
			
Images showing large boulder at target location.			

<b>BOREHOLE 7 – 320120 E 5944161 N ARCHAEOLOGICAL ASSESSMENT</b>			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	22 August 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
			
<b>WA Site ID</b>	7002	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	320131 E 5944135 N	<b>Geophysical Details</b>	2.8m x 1.3m x 0.5m
<b>Geophysics Description</b>	Debris. Angular object with hard reflector on the near side.	<b>Diver Description</b>	Boulder at centre of Archaeology target (7002) measured 500mm high by 400mm by 1000mm photo taken. No magnetic response indicated.
		<b>Archaeological Assessment</b>	Natural
<b>Images</b>			
			
Images showing large bolder at target location.			

<b>BOREHOLE 9 – 321009 E 5945149 N ARCHAEOLOGICAL ASSESSMENT</b>			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	21 August 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
			
<b>WA Site ID</b>	7005	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	321011 E 5945121 N	<b>Geophysical Details</b>	2.6m x 1m x 0.4m
<b>Geophysics Description</b>	Dark reflector. Approximately circular object with shadow that extends beyond range, so height is underestimated. Surrounded by many other similar but much smaller objects.	<b>Diver Description</b>	boulder located in centre of target - 200mm by 300mm by 900mm.
		<b>Archaeological Assessment</b>	Natural
<b>Images</b>			
None available			



<b>BOREHOLE 12 – 322344 E 5946631 N ARCHAEOLOGICAL ASSESSMENT</b>			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	20 August 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
			
<b>WA Site ID</b>	7006	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	322327 E 5946615 N	<b>Geophysical Details</b>	153 nT
<b>Geophysics Description</b>	Magnetic. Medium magnetic anomaly, possible piece of ferrous debris.	<b>Diver Description</b>	Small piece of scrap metal approximately 8 inch diameter. Scrap was encrusted buried down 100mm. Diver excavated down 100mm and found target. Area rescanned.
		<b>Archaeological Assessment</b>	Non-archaeological
<b>Images</b>			
None Available			

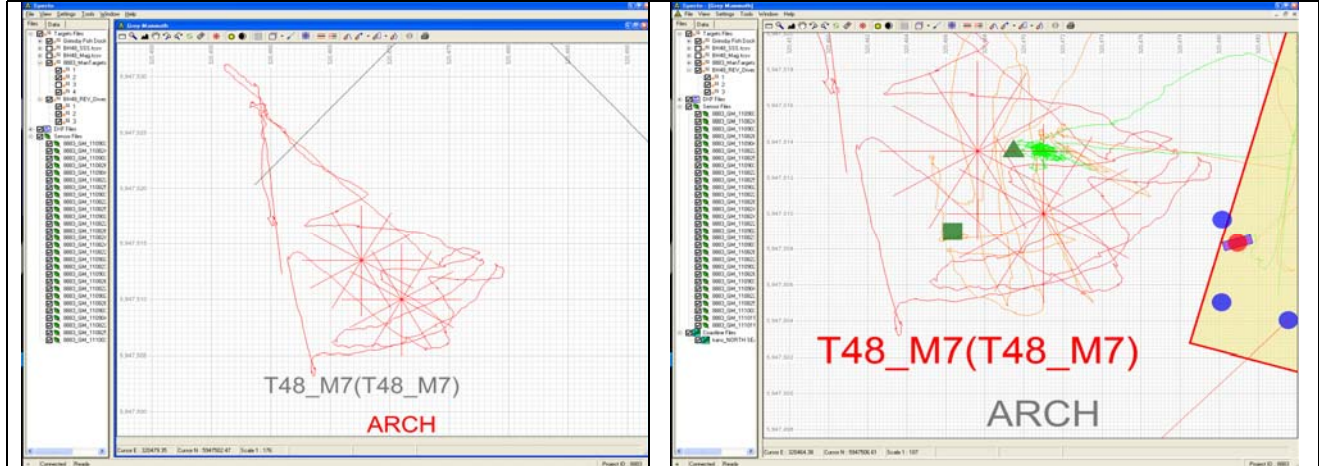
<b>BOREHOLE 25 – 319409 E 5944862 N ARCHAEOLOGICAL ASSESSMENT</b>			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	26 August 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
			
<b>WA Site ID</b>	7016	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	319394 E 5944857 N	<b>Geophysical Details</b>	129 nT
<b>Geophysics Description</b>	Magnetic. Medium magnetic anomaly identified on two survey lines.	<b>Diver Description</b>	Metal debris (angle iron) 1.7 x 0.2 x 0.2m (strong magnetic signature)
		<b>Archaeological Assessment</b>	Non-archaeological
<b>Images</b>			
			
Image showing debris at target location.			



**BOREHOLE 48 – 320477 E 5947540 N  
ARCHAEOLOGICAL ASSESSMENT**

<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	26 September 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd

**Diver Trackplot(s)**



<b>WA Site ID</b>	7026	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	320471 E 5947510 N	<b>Geophysical Details</b>	79 nT
<b>Geophysics Description</b>	Magnetic. Small, distinct magnetic anomaly.	<b>Diver Description</b>	Object measuring L700 x W700 x H200mm. Object had what appeared to be steel chain links as well as an eyebolt and shackle attached to it, was heavily corroded and approximately 20% covered in marine growth. The object had a metallic signature and had a number of edges and features. It was buried in the seabed and only the above dimensions were visible.
		<b>Archaeological Assessment</b>	Archaeological. Possible anti-shiping mine base (WW1 period).

**Images**



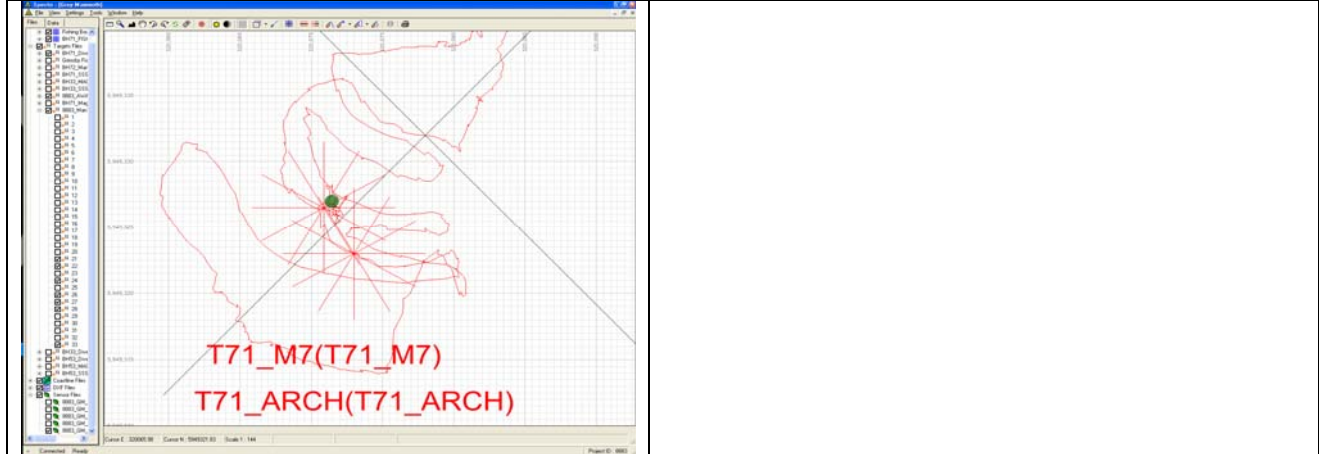
Images showing possible mine base at target location.

<b>BOREHOLE 56 – 319900 E 5947643 N ARCHAEOLOGICAL ASSESSMENT</b>			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	14/15 October 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
None available			
<b>WA Site ID</b>	7035	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	319874 E 5947667 N	<b>Geophysical Details</b>	2.6m x 1m x 0.5m / 7 nT
<b>Geophysics Description</b>	Dark reflector. Rounded object with height. A very small magnetic anomaly is located 17m to the southeast, along track.	<b>Diver Description</b>	Large rock located 2m NE of the centre of the target size, 1500mm long x 1200mm wide x 800mm high.
		<b>Archaeological Assessment</b>	Natural
<b>Images</b>			
None available			

**BOREHOLE 71 – 320078 E 5949332 N**  
**ARCHAEOLOGICAL ASSESSMENT**

<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	18 November 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd

**Diver Trackplot(s)**



<b>WA Site ID</b>	7041	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	320073 E 5949323 N	<b>Geophysical Details</b>	58 nT
<b>Geophysics Description</b>	Magnetic. Small magnetic anomaly identified on two survey lines, possible ferrous debris.	<b>Diver Description</b>	Small anchor 600mm by 100mm by 100mm with spade flukes, no chain attached.
		<b>Archaeological Assessment</b>	Archaeological. Possible 19 <sup>th</sup> century anchor. Admiralty/fisherman's pattern.

**Images**



Images showing anchor at target location.



<b>BOREHOLE 72 – 318611 E 5948447 N ARCHAEOLOGICAL ASSESSMENT</b>			
<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	01 November 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd
<b>Diver Trackplot(s)</b>			
None available			
<b>WA Site ID</b>	7042	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	318631 E 5948463 N	<b>Geophysical Details</b>	133 nT
<b>Geophysics Description</b>	Magnetic. Medium isolated anomaly that has not been identified on adjacent lines. Possibly debris or noise.	<b>Diver Description</b>	EOD diver confirmed that the target was a “possible torpedo tail section”, but that it was Free From Explosives (FFE) and was not connected to anything under, or in front of the anomaly. Following recovery, archaeological assessment identified it as part of a windlass mechanism.
		<b>Archaeological Assessment</b>	Archaeological. Part of early 19 <sup>th</sup> century windlass mechanism (ratchet pawl and barrel).

**Images**

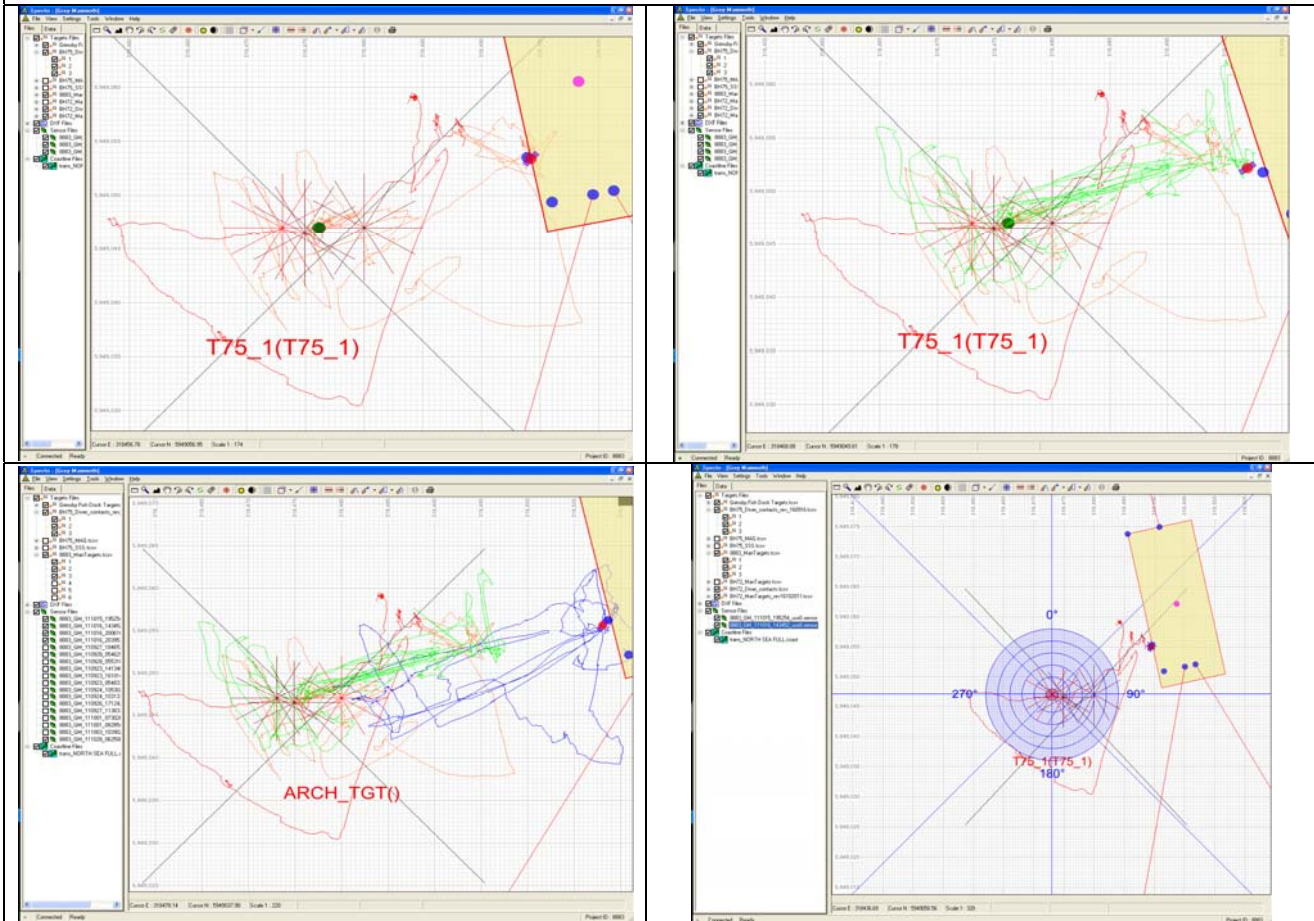


Images showing artefact at target location and following recovery.

**BOREHOLE 75 – 318477 E 5949045 N  
ARCHAEOLOGICAL ASSESSMENT**

<b>Assessor</b>	WA (ref. 60289.05)	<b>Survey Date</b>	16 October 2011
<b>Assessment Date</b>	November 2011	<b>Survey Company</b>	Red 7 Marine Ltd

**Diver Trackplot(s)**



<b>WA Site ID</b>	7101	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	318505 E 5949007 N	<b>Geophysical Details</b>	19m x 0.1m x 0.1m
<b>Geophysics Description</b>	Debris. Curvilinear object, which may be fishing gear, rope or chain. Associated with a very large, irregularly shaped magnetic anomaly.	<b>Diver Description</b>	Large Anchor with chain L2630mm x W200mm x H100mm, 1m east of target area.
		<b>Archaeological Assessment</b>	Archaeological. Admiralty pattern, square shaft. Outlying debris associated with known wreck and exclusion zone (7200) 100m to the north.

**Images**





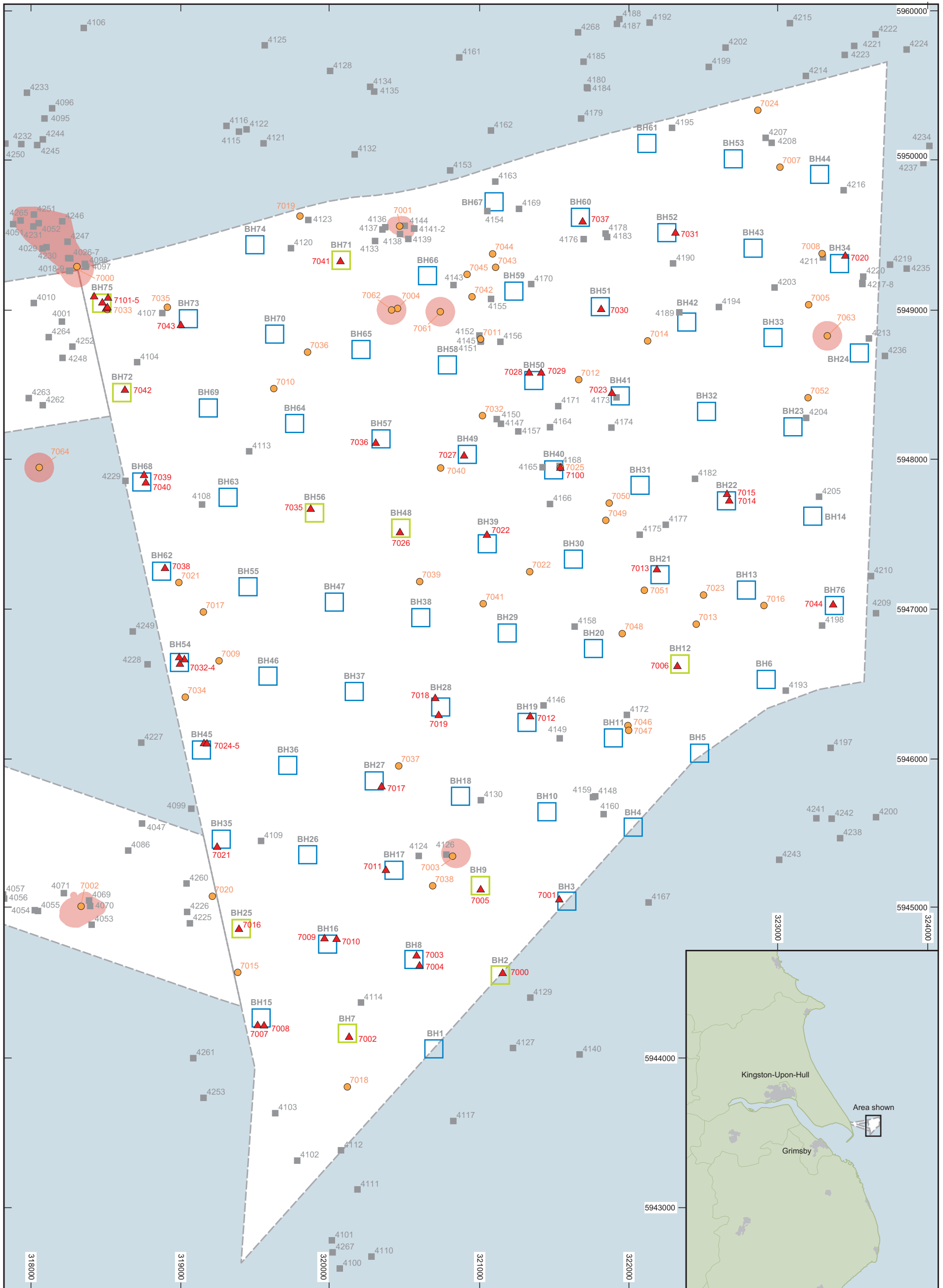
Images showing anchor at target location.

<b>WA Site ID</b>	7102	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	318514 E 5945015 N	<b>Geophysical Details</b>	6m x 0.2m x 0.1m
<b>Geophysics Description</b>	Debris. Curvilinear object. Possibly fishing gear, rope or chain. This site lies near 7101 and is associated with the same very large, irregularly shaped magnetic anomaly.	<b>Diver Description</b>	Related to 7101
		<b>Archaeological Assessment</b>	Archaeological. Anchor chain and associated debris.
<b>Images</b>			
None available			

<b>WA Site ID</b>	7103	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	318518 E 5949079 N	<b>Geophysical Details</b>	7.8m x 5.7m x 0.1m
<b>Geophysics Description</b>	Debris. Convoluted curvilinear object. Length and width are those of area covered by the feature. The feature itself has a width of 0.3m max. Associated with a very large magnetic anomaly and likely to be ferrous debris.	<b>Diver Description</b>	Related to 7101
		<b>Archaeological Assessment</b>	Archaeological. Anchor chain and associated debris.
<b>Images</b>			
None available.			

<b>WA Site ID</b>	7104	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	318425 E 5949088 N	<b>Geophysical Details</b>	60 nT
<b>Geophysics Description</b>	Magnetic. Small anomaly, possibly related to other anomalies around BH75. Possible debris.	<b>Diver Description</b>	Diver search, no anomalies found (target possibly buried).
		<b>Archaeological Assessment</b>	Possible Archaeological Interest.
<b>Images</b>			
None available.			

<b>WA Site ID</b>	7105	<b>Geophysics Discrimination</b>	A2
<b>Site Position</b>	318480 E 5949047 N	<b>Geophysical Details</b>	150 nT
<b>Geophysics Description</b>	Magnetic. Medium anomaly, possibly related to other anomalies around BH75. May be debris.	<b>Diver Description</b>	Diver search, no anomalies found (target possibly buried).
		<b>Archaeological Assessment</b>	Possible Archaeological Interest.
<b>Images</b>			
None available.			



0 1 km

Scheme Area  
 Borehole location  
 Borehole location and diving survey  
 2005 Geophysical Anomalies  
 2009 Geophysical Anomalies  
 2011 Geophysical Anomalies  
 Exclusion Zones

Drawing projection: UTM WGS84 z31N.

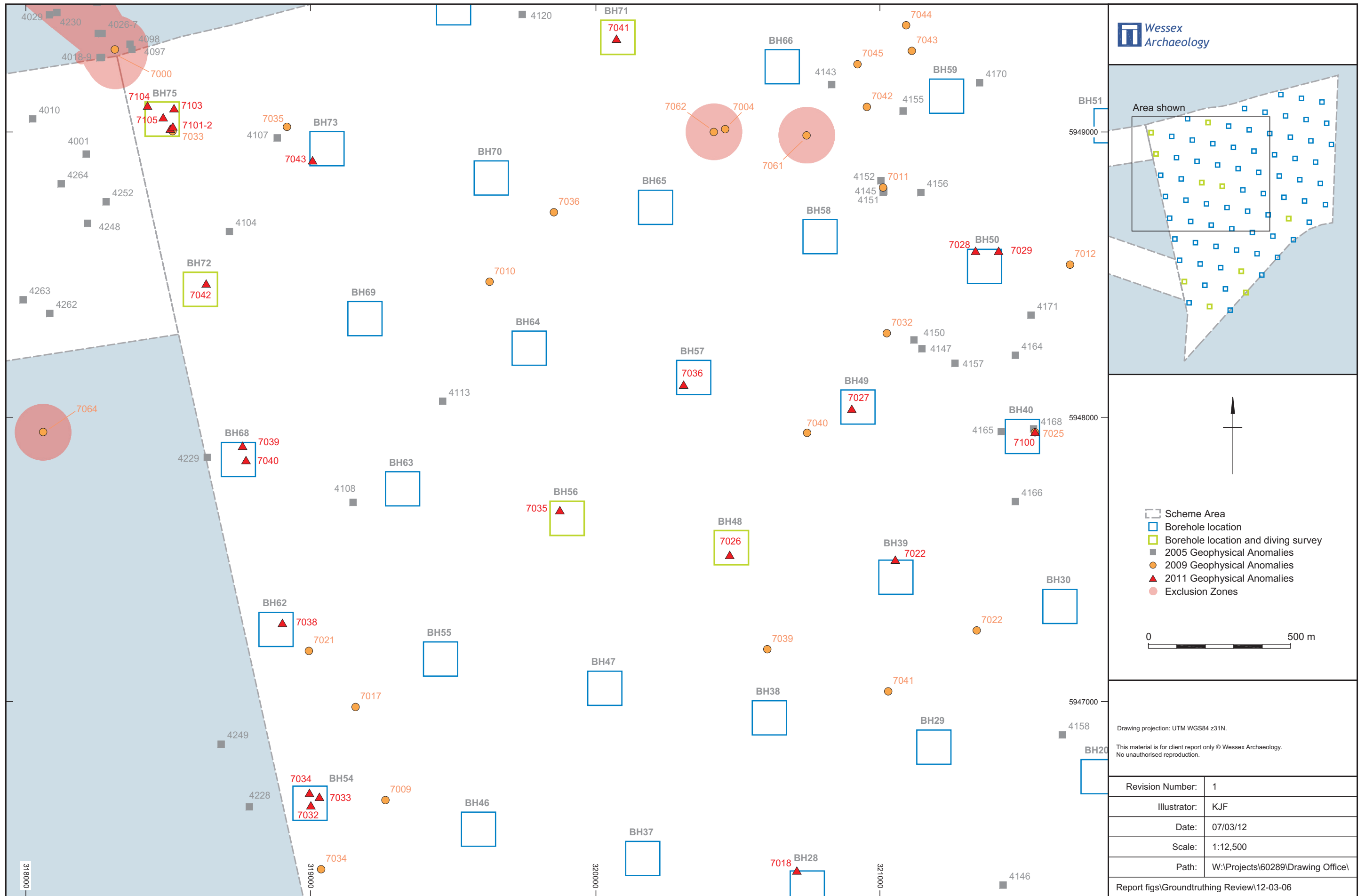
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Date: 06/03/12	Revision Number: 1	
Scale: 1:25,000 @A3	Illustrator: KJF	
Path: W:\Projects\60289\Drawing Office\Report figs\Groundtruthing Review\12-03-06		

Survey location plan showing proposed borehole locations and sites of potential archaeological interest

Figure 1





Survey location plan showing proposed borehole locations and sites of potential archaeological interest (detail of NW sector)

Figure 2



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