ARCHAEOLOGICAL SERVICES IN RELATION TO THE PROTECTION OF WRECKS ACT (1973)

WRECKS OFF THE COAST OF WALES

MARINE GEOPHYSICAL SURVEYS AND INTERPRETATION

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The fieldwork was carried out by Cristina Serra with assistance from David Howell, Patrick Dresch, vessel master Steve Lewis and boat crew Phil Hambidge, Paul Bell and Howard Davies. The data were processed and this report was compiled by Cristina Serra with the assistance of Ben Urmston. The illustrations were prepared by Kitty Brandon and the project was managed by Steve Webster and Paul Baggaley.

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1. PROJECT BACKGROUND

1.1. INTRODUCTION

1.1.1. Wessex Archaeology (WA) was commissioned by English Heritage (EH) on behalf of Cadw to acquire new marine geophysical data over 19 recorded wreck locations off the coast of Wales that had been associated with Welsh slate and coal mining industries that were subject to desk-based investigation in 2009 (Wessex Archaeology 2009a and 2009b).

1.1.2. The marine geophysical surveys targeted a total of nine suspected wreck locations in Milford Haven area, off the coast of South Wales, seven of which represent the locations for the remains of 19th century vessels associated with the coal mining industry (Wessex Archaeology 2009a). Additional survey data were acquired over two 20th century sites within the Milford Haven, the *Thor* and the remains of a Sunderland flying boat. The acquisition of these data aimed to assist RCAHMW maritime team and the Sunderland Trust with on-going archaeological research and fund-raising.

1.1.3. The marine geophysical surveys also targeted a total of ten suspected and known wreck site locations off the coast of Lleyn peninsula in North Wales. These included eight unconfirmed positions of 19th century vessels associated with the slate mining industry (Wessex Archaeology 2009b) and two designated sites the *Diamond* and Tal-Y-Bont. The marine hazard of St Patrick's Causeway was also subject to an area survey with the aim of discovering new wreck sites.

1.2. AIMS AND OBJECTIVES

Project Aim

1.2.1. The project aim was to provide Cadw with high resolution geophysical data and archaeological interpretations of the wreck sites in order to allow further, decision-orientated investigation of specific sites. This is particularly relevant when considering the cost and time implications of diver-lead investigations.

Project Objectives

1.2.2. The objectives of this study are as follows:

- to acquire and interpret high-resolution geophysical data to establish the presence/absence of non-designated wreck sites associated with Welsh coal and slate mining industries;
- to acquire and interpret high-resolution geophysical data over two designated sites in order to monitor their physical condition and provide updated site plans;
- to acquire and interpret high-resolution geophysical data over areas of suspected archaeological interest in order to discover previously unknown wreck sites;

1.4. TARGETED KNOWN AND SUSPECTED WRECK SITES

1.4.1. Based on the archaeological assessments undertaken by WA in 2009, the geophysical surveys were designed to be logistically effective whilst targeting those wrecks of higher archaeological interest. The known wrecks and recorded losses targeted during this project are referred to by the unique WA identifying number and, if known, by vessel name as used in the desk-based assessments (Wessex Archaeology 2009a and 2009b).

1.4.2. In preparation for the surveys WA compiled a list of sites to be surveyed. The targeted sites were distributed in five different areas, two in south Wales and three in north Wales.

Wrecks off South Wales

1.4.3. The wreck sites selected in south Wales were located just outside Milford Haven. As illustrated in **Figure 1** and listed below:

- WA2019 *Faith* PRN 102466
- WA2043 / 1567 SS *Philotis* PRN 102469
- WA2023 SS *St Jacques* position 1 PRN 102467
- WA2052 *Antonio*
- WA2027 SS *St Jacques* position 2
- WA2022 Possibly the *Gisella*
- SS *St Jacques* position 3
- WA1491 *Musgrave*
- WA2049 SS *Clapham* position 1 PRN 102468
- WA2050 SS *Clapham* position 2

1.4.4. Additional wreck site locations situated within Milford Haven itself were suggested by the *RCAHMW*. These were:

- *Thor* 1940 Coal carrier PRN 102470
- *Van der Weyden* 1922 Trawler
- *Matronna* 1941 Cargo
- HMS *Leda* (find) 1808 5th rate
- HMS *Caroline* (aft) 1941 Mine sweeper
- *Behar 1* 1940 Cargo
- HMSM *E39* 1922 Submarine
- HMS *Caroline* 1941 Mine sweeper
- HMS *Eveline* 1942 Patrol boat
- HMS *MGB 12* 1941 Gunboat
- *PLM 21* 1944 Collier
- HMS *Pilot Boat No 10* 1941 Pilot vessel
- Unknown Aircraft Recorded loss
- HMS *Minicoy* 1941 Patrol boat
- Landing Craft, 1951
- Unknown Aircraft Recorded loss
- *Dakotian* 1940 Cargo
- HMS *Barking* 1964 Boom defence vessel

1.5.4. The Causeway itself is described as mostly undivided and upper till Cardigan Bay formation facies (BGS-GSI 1990). The solid geology of the area is formed by Palaeogene-Oligocene deposits of Grey silt and clay with thin lignitic bands and fine-grained sandstones (IGSGSI 1982). These sandstones are yellow and silty in the upper part, whilst in the lower part they are red, silty and conglomeratic.

1.5.5. The seafloor sediments of the causeway are described as pre-Quaternary rock outcrops with high, variable acoustic reflectivity and hummocky, bold, topography. A 3km wide area along the causeway contains seabed sediments consisting of gravels, sandy gravels and gravelly sands of medium grain size. Beyond this area the sediments are generally sand, as is the case for the Tal-Y-Bont site.

1.5.6. The seabed sediments in the north Wales region lie within a mobile depositional environment. The deposits are affected by strong currents and tidal action that forces sands and mud to be swept into sandwave fields or mud accumulations. This leaves areas of the seabed with lag deposits ranging in texture from gravelly sands to boulders. These deposits are formed from the residue of the substrate after the tidal currents have removed the finer grained material. The clasts thus form a surface layer which protects the substrate from further erosion.

1.5.7. The coarse lag deposits are broad areas of the seabed covered by a smooth or gently undulating surface of gravelly sand or sandy gravel. These are normally less than 0.25m thick and may be underlain by bedrock or quaternary sediments.

North of Lleyn peninsula – Porth Dinllaen

1.5.8. The seabed deposits to the north of the Lleyn peninsula are generally gravelly sands. In some areas, such as **GSA XVI**, there may be only a thin veneer of local or intermittent mobile and lag sediments covering surfacing bedrock.

1.5.9. The solid geology of the area is undivided lower palaeozoic to pre-Cambrian (IGSGSI 1982). Further inland, at Porth Dinllaen itself, the solid geology is formed of extrusive igneous rocks derived from basic lava of lower Palaeozoic to pre-Cambrian origin.

Bardsey Island

1.5.10. In the area to the south-west of Bardsey Island, including **GSA XI** and **GSA XV**, the quaternary geology is on or near the surface of the seafloor (GDS-GSI 1990). The quaternary geology is Pleistocene Cardigan Bay formation of Upper till facies, including the area of **GSA XIV**. To the north-west of this, near **GSA XIII**, is a boundary between exposed, near surface bedrock and the Pleistocene Cardigan Bay formation of Upper till facies.

1.5.11. The solid geology of the area is Acoustic basement, undivided lower Palaeozoic to pre-Cambrian (IGSGSI 1982).

1.5.12. To the north of Bardsey Island is a small area of sandwaves, and moving from Pen-y-Cil headland eastwards the seabed sediment is made up of sandy gravel. While this sandy gravel is less mobile than sandy sediments, it may be up to 0.2m thick in places (Tappin *et al.* 1994: 90) and may form sufficient sediment cover to preserve

2.1.4. The GSA covering St. Patrick's Causeway is an irregular polygon situated along the causeway and measuring approximately 18km x 1.7km. The GSA also covers the designated site of the *Diamond*. The resulting survey covered a total of 30.6km^2.

2.1.5. The GSAs in South Wales are defined by the following coordinates:

Geophysical Survey Areas in South Wales	Node A	Node B	Node C	Node D	Node E
GSA I: Possible *Faith*	349816E 5727486N	349816E 5727686N	350016E 5727686N	350016E 5727486N	-
GSA II: Possible *St. Jacques position 1*	349991E 5726138N	349991E 5726338N	350191E 5726338N	350191E 5726138N	-
GSA III: Possible *St. Jacques position 2*	344130E 5720702N	344130E 5720902N	344330E 5720902N	344330E 5720702N	-
GSA IV: Possible *St. Jacques position 3*	353695E 5722824N	353695E 5723024N	353895E 5723024N	353895E 5722824N	-
GSA V: Possible *Clapham position 1*	345626E 5720681N	345626E 5720881N	345826E 5720881N	345826E 5720681N	-
GSA VI: Possible *Clapham position 2*	347535E 5721203N	347535E 5721403N	347735E 5721403N	347735E 5721203N	-
GSA VII: *Philotis*	350791E 5720492N	350791E 5720692N	350991E 5720692N	350991E 5720492N	-
GSA VIII: *Thor*	344130E 5720702N	344130E 5720702N	344130E 5720702N	344130E 5720702N	-
GSA IX: *Sunderland*	364907E 5729876N	365027E 5729873N	365177E 5729814N	365149E 5729751N	364855E 5729794N

Table 2: Coordinates defining geophysical survey areas in South Wales

2.1.6. The GSAs in North Wales are defined by the following coordinates:

Survey Area	Node A	Node B	Node C	Node D	Node E	Node F	Node G
GSA X: *Peter Varkevissar* position 1 **(WA1002)** *Peter Varkevissar* position 2 **(WA1011)**	385726E 5850504N	385246E 5850978N	385429E 5851158N	385886E 5850651N	385726E 5850504N		
GSA XI: *Elizabeth & Jane* **(WA2036)**	379315E 5845920N	379293E 5846054N	379858E 5846595N	380044E 5846289N	379643E 5845952N	379315E 5845920N	
GSA XII: *Miss Madock* position 1 **(WA2085)** *Miss Madock* position 2 **(WA1014)**	395723E 5866997N	395723E 5867992N	396081E 5867989N	396081E 5866997N	395723E 5866997N		

2.2.5. Water depths for the survey areas around St. David's Head range from 3m to 50m. The sidescan sonar was deployed using a soft tow cable anchored to the side of the survey vessel, with a maximum of 85m of cable deployable. The magnetic gradiometer was deployed from the opposite side of the survey using soft tow cables with a maximum of 85m of cable deployable.

2.2.6. Water depths for the survey areas in North Wales around Cardigan Bay ranged from 3m to 30m. Both the sidescan sonar and magnetic gradiometer were deployed using similar methods to those used in South Wales. An electric winch was available for the North Wales survey to aid in the recovery of the sensors.

Horizontal Positioning

2.2.7. Positions were provided using Lecia 500 Trimble RTK beacon receiving corrections via satellite or a Trimble DGPS, which received differential corrections via land stations to provide a position to within 0.6m. Positions were recorded using World Geodetic System 1984 (WGS84) Datum and projected as Universal Transverse Mercator (UTM) Zone 30 North co-ordinates.

Sidescan Sonar data

2.2.8. The sidescan sonar data were acquired with a Klein 3900 towfish system. This system uses the latest technology in digital sidescan sonar imaging and can operate at either low (445kHz) or high (900kHz) frequency to provide high resolution images.

2.2.9. WA operated the system at the high frequency setting for all of the surveys. The system was operated at varying ranges (10-100m) with line spacing dependent on the height of the towfish above the seafloor. The height of the towfish is partially dependant on water depth and strong currents.

2.2.10. The data were digitally recorded in *xtf* format using SonarPro Software. The sidescan sonar towfish layback values were recorded on survey logs and also applied to the raw data in SonarPro as it was recorded. In cases where the layback calculation failed, this was corrected using CODA Geosurvey processing software. The software also permits offsets to be adjusted, optimising the recorded position of the towfish.

2.2.11. An optimum survey arrangement using 30m range and 20m line spacing was used where possible. This was the case for the majority of the shallow survey areas but that undertaken along St. Patrick's Causeway, where a 50m range and 40m line spacing was used. In both cases, this method provided 250% coverage of the seafloor. This high level of ensonification enhanced the probability for the detection of objects and sites lying on the seabed, and allowed for more accurate positioning of objects identified on the sidescan sonar data. Whenever it was possible in terms of safe manoeuvrability and favourable water currents additional survey cross lines were acquired to ensure each detected wreck was ensonified in full providing detailed images of the wrecks from at least four different angles.

Gradiometer data

2.2.12. The magnetic gradiometer data were acquired using Geomatrix's G882 gradiometer system consisting of two marine caesium vapour magnetometers arranged horizontally 1.5m apart on a transverse gradiometer tow frame. The gradiometer frame was deployed independently of the sidescan sonar system, permitting the

GSA III: Possible SS *St Jacques 2*	North	20m	No data acquired
GSA IV: *Possible SS St Jacques 3*	East-West	20m	100m
GSA V: Possible SS *Clapham 1*	North	20m	No data acquired
GSA VI: Possible SS *Clapham 2*	North-South	20m	No data acquired
GSA VII: *SS Philotis*	North-South	20m	No data acquired
GSA VIII: *Thor*	North	Single line	50m
GSA IX: Sunderland	East-West	20m	40m
GSA X: WA1002 & WA1011 *Peter Varkevissar*	South	15m	30m
GSA XI: WA2036 *Elizabeth & Jane*	North-South	35m	50m
GSA XII: WA1014 & WA2085 *Miss Madock*	North-South	15m	30m
GSA XIII: WA1004 and WA1012 Unknown wreck	East	25m	50m
GSA XIV: WA1013 Unknown wreck	North-South	25m	75m
GSA XV: WA1006 Unknown wreck	North	Single line	75m
GSA XVI: WA 1008 Unknown wreck	North-South	35m	50m
GSA XVII: Tal-Y-Bont	Northeast	20m	20m
GSA XVIII: St Patrick's Causeway	Northeast-Southwest	40m	50m
GSA XVIII detail: *Diamond*	Northeast-Southwest	20m	30m

2.3. DATA PROCESSING AND INTERPRETATION

2.3.1. The sidescan sonar data were processed by WA using Coda Geosurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were initially scanned to give an understanding of the geological nature of the area and were then interpreted for any objects of possible anthropogenic origin: the position and dimensions of any such objects were recorded into a gazetteer and an image of each anomaly acquired.

Wexford. All three crew members survived. The vessel was owned at the time of loss by E. Hughes of Borth-y-Gest (Wessex Archaeology 2009a).

3.2.3. The UKHO wreck number is 11990. Records suggest the wreck had been dispersed in 1916, presumably because it represented a hazard to shipping. The UKHO status is therefore "dead" (Wessex Archaeology 2009a).

3.2.4. The geophysical anomalies that may relate to this loss are as follows:

3.2.5. Anomaly **7000** is a probable wreck site located roughly 275m to the north-east of **GSA I**. The anomaly was identified using sidescan sonar and appears to be an angular structure. The wreck measures 5.2m long, with a width of 7.7m and a height of 0.6m on a northeast southwest orientation. A magnetic gradient of 0.34nT/m was recorded over the site. **7000** appears to be lying in an area of sand ripples with crests roughly perpendicular to the wreck, orientated roughly northwest southeast. A rocky outcropping can be seen to the south of the wreck.

3.2.6. **7001** is a square anomaly measuring 2.7m by 2.4m with a height of 0.6m which is probably debris. A magnetic gradient of 0.26nT/m was also recorded. This anomaly is located within the survey area and the seafloor appears to be exposed bedrock.

3.2.7. **7002** is an anomaly measuring 4.7m by 1.6m with a height of 1.2m. This is probably a piece of debris. The seafloor around the anomaly appears to be exposed bedrock with a possible boulder field lying to the south.

3.2.8. A total of ten magnetic anomalies were identified during the survey of **GSA I**. At the north-east corner of **GSA I** is a cluster of five anomalies (**7005**, **7008**, **7008**, **7010** and **7011**) with **7012** closer to wreck **7000**. Two of these, **7004** and **7006**, are located near the centre of **GSA I** close to **7001** and **7002**. **7009** and **7013** are outside of **GSA I** to the south-east, at a maximum of 145m for **7013**.

PRN 102467

3.3. GSA II: Possible Remains of *St. Jacques*, Position 1

3.3.1. *SS St Jacques* (**WA2023**) was a French steel screw-steamship built in 1909. The ship had a length of 288.8ft (85.3m), a breadth of 38.9ft (12.3m) and a draft of 16.6ft (5.6m). The tonnage of the vessel is recorded as was 2,459 gross and 1,339 net. The ship had two steel boilers providing steam for three-cylinder triple expansion engines developing 221nhp (Wessex Archaeology 2009a).

3.3.2. On 15th November 1917 the vessel was torpedoed the starboard side by UC-51 and sank in the Bristol Channel off St Ann's Head, Pembrokeshire within 15 minutes (Wessex Archaeology 2009a). The vessel was on a passage from Barry to Bizerta in France with a cargo of coal. The vessel was owned at the time of loss by the Société Navale de l'Ouest.

3.3.3. The UKHO wreck number is 58707 with the wreck's identity first recorded by the UKHO in 1998, prior to this its identity was regarded as being an unknown. The wreck is described as being well broken up and partially buried. It has a least depth of 29m in an area with a general bed depth of 33m, although in 1998 it was described in the reporting history as standing up to 8m high (Wessex Archaeology 2009a).

3.5.2. **7021** is the largest section of wreck within **GSA IV**. The wreck measures 70.2m long, 23.4m wide and 3.1m high. A magnetic gradient of 120.1nT/m was recorded over the site.**7021** lies on a roughly northeast by southwest orientation on a sandy seafloor with sand ripples running across the site with crests aligned east to west. There are some possible rocky outcroppings to the north of the wreck site. The wreck itself appears to be partially buried although a large number of parallel dark reflectors may relate to the internal structure of the wreck. **7021** appears to have broken up into at least two large sections and it is unclear from the sidescan image if the ship is lying on its keel or side. There is a large linear anomaly at the northeast end of the wreck which may be part of the ship's superstructure. A large upstanding anomaly can be seen near the centre of the wreck. It is unclear whether this is a single or multiple objects. If this is the wreck of the *St. Jacques* this anomaly may indicate a possible location for the ship's boilers.

3.5.3. **7022** is a debris field to the north of wreck **7021**. It is comprised of at least eight objects, with the anomaly location centred on the largest piece of debris. The size of the pieces of debris range from 8.9m long, 4.6m wide and 0.5m high for the largest, to 4.1m long, 1.1m wide and 0.2m high for the smallest.

3.5.4. **7023** is a debris field lying to the northeast of wreck **7021**. The location of the debris field is centred on the largest piece of debris which measures 5.6m long, 3.6m wide and 0.3m high. The smallest piece of debris measures 1.9m long, 1.3m wide and 0.4m high.

PRN 102468

3.6. GSA V: Possible Remains of *Clapham*, Position 1

3.6.1. SS *Clapham* (**WA2049** and **WA2050**) was a steel single deck screw-steamship of the Port of London and built by S M. Knight & Co. Ltd of Ayr in Scotland with machinery aft. The vessel was 61.1m long, a breath of 9.3m and a depth of 3.5m, with a gross tonnage of 763. It was powered by a three-cylinder triple expansion engine generating 116hp from a single boiler (Wessex Archaeology 2009a).

3.6.2. SS *Clapham* was lost as a result of a collision on 23rd July 1943 south of St Ann's Head, Pembrokeshire, whilst on passage from Cardiff to Belfast with a cargo of coal (Wessex Archaeology 2009a).

3.6.3. There are two UKHO wreck numbers for SS *Clapham*, 11961 and 11962. The latter is now listed as 'dead' because nothing was found during hydrographic survey in 1977. The same year the UKHO recorded the presence of a wreck (11961) approximately 60m long and lying at an orientation of approximately 030/210 degrees. It had a least depth of 48.2m in a general depth of 50-52m. This wreck is regarded as probably being the SS *Clapham*, although the possibility that it is a natural rock pinnacle cannot apparently be discounted (Wessex Archaeology 2009a).

3.6.4. There were no anomalies of archaeological significance identified during the survey of **GSA V**.

3.7. GSA VI: Possible Remains of *Clapham*, Position 2

3.7.1. This is the second site associated with the loss of the SS *Clapham*. The geophysical anomalies that may relate to this loss are as follows:

3.9.5. **7030** is a wreck in **GSA VIII**. The wreck measures 48.6m long, 13.8m wide and 1.8m high, it has a magnetic gradient of 45.63nT. **7030** lies on a roughly north-south orientation on what appears to be a sandy seafloor. The wreck appears to be partially buried although there is evidence surviving structure. The wreck appears to be particularly damaged at its southern end, but overall appears to be a single cohesive feature, possibly lying on its side. A linear feature with a shadow can be seen at the northern end of the wreck. This may be a mooring associated with the diver surveys.

3.9.6. There are two spreads of debris associated with wreck **7030**. The first is comprised of four objects (**7031, 7032, 7033** and **7034**) which are located roughly 44m southeast of the wreck.

3.9.7. The second group of objects is located in an area roughly 40m west of the wreck. This group is composed of five objects **4035, 4036, 4037, 4038** and **4039**. The spread of debris covers an area of roughly 30m by 24m.

PRN 102471

3.10. GSA IX: Possible Remains of a Sunderland Flying Boat

3.10.1. The wreck of an RAF Short Sunderland Mark I flying boat T9044 is located on the northern edge of the main channel leading into Pembroke in roughly 16m-18m of water (Wessex Archaeology 2008). The aircraft sank without loss of life in November 1940 in gale force winds while moored at Pembroke Dock. While in service she had flown 14 operational missions, with two months served a part of RAF 210 Squadron flying out of Oban in Scotland and Pembroke Dock in Wales. During the second World War RAF Pembroke Dock was the world's largest flying boat base with 99 flying boats based there at one time.

3.10.2. In 2003 the wreck site was discovered by local recreational divers recovering lobster pots. Subsequently the Pembroke Dock Sunderland Trust was founded and the site investigated periodically. A marine geophysical survey, comprising of swath bathymetry and sidescan sonar, was conducted by Mr. Isherwood on the Pembroke Dock Sunderland Trust's behalf in 2007 (John Evans pers. comm.). The geophysical anomalies that may relate to this loss are as follows:

3.10.3. **7040** is the wreck of a Sunderland flying boat. The wreck measures 26m long, 23m wide and 3.4m high. The wreck is orientated with the nose of the aircraft to the west and the tail to the east. A large section of wing appears to extend from the fuselage to the south with an upstanding object on it measuring 3.7m long, 2.9m wide and 1.5m high, which may be an engine. The wreck lies on a predominantly fine grained seafloor with several possible rocky outcroppings to the north.

3.10.4. A spread of ten objects is located to the east of wreck **7040**. These are probably debris associated with the aircraft and include anomalies **7041, 7042, 7043, 7044, 7045, 7048, 7049, 7050, 7055** and **7056**.

3.10.5. Anomalies **7053** and **7059** are located immediately to the west of wreck **7040**. Further to the east is a spread of five objects including **7046, 7047, 7054, 7057** and **7060**. These anomalies are all likely to be debris associate with **7040**, although **7046** may be part of a mooring associated with the wreck.

are six recorded losses around Bardsey Island, Pen-y-Cil headland and Aberdaron Bay and there is therefore the possibility that additional wrecks exist in this area.

3.11.7. The geophysical anomalies that may relate to vessel remains are as follows:

3.11.8. **7062** appears to be a slate mound and is probably a ship's cargo which may overlie additional wreck structure. There are several linear anomalies on the southeast edge of the mound which may be ship structure. The mound itself measures 8.5m long, 5.1m wide and 0.2m high and is located on an area of sandy seafloor with ripple crests on a roughly northeast southwest alignment, perpendicular to the wreck. There are also numerous boulders in the area ranging from roughly 1m to 4m in diameter.

3.11.9. **7063** is an object of unknown origin which lies roughly 69m to the east of wreck **7062**. The anomaly measures 5.3m long, 2.5m wide and 0.6 m high, it has a magnetic gradient of 0.76nT/m.

3.11.10. **7064** is possible debris located roughly 135m to the east of wreck **7062**. The anomaly measures 1.7m long, 1m wide and 1m high.

3.11.11. **7065** is possible debris located roughly 123m east of 7062 in an area of dense boulder field. The anomaly measures 1.1m long, 0.5m wide and 0.3m high.

3.11.12. **7066** is possible debris located roughly 87m north of **7062**. The anomaly measures 1.7m long, 0.5m wide and 0.2m high. A magnetometer response of 0.4nT was recorded within 10m of the sidescan sonar anomaly and may be associated with it.

3.11.13. There is a wide spread of magnetic anomalies to the northeast of **7062**. This is comprised of eight anomalies covering an area of roughly 280m by 100m. The anomalies range from a magnetic gradient of 0.26nT/m to 0.89nT/m. The spread is comprised of anomalies **7067** (0.68nT/m), **7068** (0.89nT/m), **7069** (0.31nT/m), **7070** (0.26nT/m), **7071** (0.44nT/m), **7072** (0.44nT/m), **7074** (0.58nT/m) and **7075** (0.82nT/m).

3.12. GSA XI: Possible Remains of *Elizabeth & Jane* (WA2036)

3.12.1. The *Elizabeth & Jane* (**WA2036**) was a Preston schooner built in 1861 and owned by J. Mostyn of Amlwch. It was stranded and lost en route from Porthmadog to Great Yarmouth off the south-east point of Bardsey Island, Caernarfonshire on the 27th April 1899 (Wessex Archaeology 2009b). The geophysical anomalies that may relate to this loss are as follows:

3.12.2. **7076** is a possible wreck located at the southwest limit of **GSA XI** on a sandy seafloor with some possible rocky outcroppings and boulder field. The anomaly appears as a mound with two associated distinct objects. The first is a probable anchor measuring 1.3m long, 2.1m wide and 0.2m high. The second is an angular object measuring 5.6m long, 1.7m wide and 0.4m high.

3.12.3. **7077** is an angular object of unknown origin located roughly 224m northeast of **7076**, with a second similar anomaly just to the east. **7077** measures 2.2m long, 2.8m wide and 0.9m high.

carrier, though no evidence of ship structure has been found (Wessex Archaeology 2009b).

3.14.2. The remains of the unknown wreck referred to as **WA1012** consist of two anchors and neatly stacked slates located in 28m of water off Pen-y-Cil, Aberdaron Bay. The find was made approximately 10 years ago and reported by C. Holden (Wessex Archaeology 2009b). This is almost certainly a duplicate position for wreck **WA1004**.

3.14.3. The geophysical anomalies that may relate to this loss are as follows:

3.14.4. **7107** is a possible wreck site at the eastern edge of **GSA XIII**. The anomaly is comprised of angular material in an area of predominantly sandy seafloor. This covers an area measuring 32m long, 17m wide and 0.8m high. A magnetic gradient of 0.68nT/m was also recorded over the area.

3.14.5. Magnetic anomaly **7108** (0.76nT/m) is located roughly 247m northwest of wreck **7107**.

3.15. GSA XIV: Possible Remains of Unknown Wreck (WA1013)

3.15.1. **WA2126** records the loss of a sloop of unknown identity on the 13th October 1822 one mile south-east of Bardsey Island with the loss of the crew. The loss record does not indicate any known remains (Wessex Archaeology 2009b).

3.15.2. The remains of the unknown wreck,**WA1013**, was reported by C. Holden as a trail of roofing slates running north-west from the southern tip of Bardsey Island, an anchor and chain at the tip of the island may be related to this. The reported find may represent the confirmed remains of **WA2126**.

3.15.3. The area **WA 1013** is situated in is lacking in any sediments that are likely to preserve timber ships structure. The seabed in this area is composed of mainly pre-Quaternary rock outcrops with bold topography (BGS 1988). Archaeological remains in this area are likely to comprise stacks of slate cargoes which are substantial enough not to be removed by the high energy hydrodynamic processes that have prevented sedimentation of the area. However, elements of timber structure may still survive in this area trapped in rock crevices or gullies, but the presence of any coherent ship structure in this area is unlikely (Wessex Archaeology 2009b).

3.15.4. The geophysical anomalies that may relate to this loss are as follows:

3.15.5. **7109** is a possible wreck site which appears as an area of angular material on the sidescan sonar image which may be a ship's cargo. The possible cargo mound measures roughly 28.2m by 48m with a height of 1.2m and is aligned on a roughly northwest by southeast orientation. A magnetometer response of 0.45nT was recorded over the area. The surrounding seafloor is predominantly sandy with a few possible boulders.

3.15.6. **7110** is an angular object located roughly 18m southwest of **7109**. The anomaly measures 5.6m long, 4.6m wide and 0.8m high and could be a boulder or possibly debris associated with **7109**.

3.17.4. **7128** is an angular object, possibly wreck debris associated with **7126**. The anomaly is located roughly 14m northwest of **7126** and measures 2.5m long, 1.2m wide and 0.6m high. A magnetic gradient of 0.6nT/m was recorded over the area.

3.17.5. **7129** is possible debris associated with **7126**, located roughly 33m northwest of the mound. The anomaly measures 1.2m long, 0.2m wide and 0.2m high.

3.17.6. **7130** appears to be an elongated object of unknown origin located roughly 106m north of **7126** in a possible boulder field. The anomaly measures 7m long, 1m wide and 0.95m high.

3.17.7. **7131** is an angular object located roughly 85m southeast of **7126** within a boulder field. The anomaly measures 1.4m long, 1.6m wide and 0.5m high.

3.17.8. **7132** is an elongated object located roughly 13m south of **7126** and may be debris associated with it. The anomaly is orientated roughly northwest by south east and measures 3.1m long, 0.8m wide and 0.3m high.

3.17.9. There are four magnetic anomalies distributed around wreck **7126**. These are **7133** (1.5nT/m) to the southeast, **7134** (1.14nT/m) to the north, **7135** (1.14nT/m) to the south, and **7136** (0.86nT/m) to the northwest.

3.18. GSA XVII: TAL-Y-BONT WRECK

3.18.1. The Tal-y-Bont wreck is thought to be the remains of a 700-ton Genoese vessel carrying a cargo of Italian (Carrara) marble and paper (Wessex Archaeology 2006). The site is located roughly 2km south-east of the East Passage at the shoreward end of St. Patrick's Causeway and about 0.75km south-west of the present shoreline. Although there is no known surviving ship's structure there is a large mound of marble blocks and other artefacts under which some structure may be buried. A chart published in 1748 by Lewis Morris suggests that a vessel matching this description sank in 1709.

3.18.2. The artefacts associated with the wreck site have been dated from the late 16th to early 18th century. These include at least 26 guns, an anchor and anchor fragments and a bronze bell dated 1677. If the bell was made for the vessel, its construction may have been as early as 1677, although a later date of between 1690 and 1709 is also possible (Wessex Archaeology 2006).

3.18.3. The site seems to have been discovered as part of a magnetometer survey in 1966 (e-mail from Phil Mycock 2003). It was rediscovered by local divers in 1978, who subsequently formed the Cae Nest dive group. The wreck site was designated in 1979, possibly related to a program of survey and investigation led by Sidney Wignall (an independent wreck investigator), John Illsey and Robin Livens of University College of North Wales Bangor. This led to the publication of a limited circulation report in 1981. The Cae Nest Group continued to investigate the site between 1980 and 1986. Angus Konstam of the Royal Armouries conducted another season of work in 1987 and an unpublished interim report was produced (Konstam 1987). Limited monitoring work has been conducted since 1987 and in 2004 Wessex Archaeology conducted fieldwork as part of the PWA contract (Wessex Archaeology 2004; Wessex Archaeology 2006).

September 1924 and four French sailors were rescued by Barmouth lifeboat (Wessex Archaeology 2009).

3.19.5. A representation of 19th century wrecks on St Patrick's Causeway shows the large Portuguese ship *Caminhando,* wrecking in March 1805 on the southern end of the causeway carrying corn, wine and fruit, most of which was salvaged (Jones 2001).

3.19.6. The geophysical anomalies recorded along the causeway that may relate to wrecks are as follows:

3.19.7. **7176** is a possible wreck site located at the northeast end of St. Patrick's Causeway in the channel running between the causeway and the shore. The seafloor around the wreck site appears to be predominantly sandy with some shallow scouring along the western edge of the wreck. The most clearly identifiable feature appears to be a roughly linear piece of structure with a north by south orientation. At the southern end of this feature is a less cohesive group of anomalies which may be structural or associated debris. The site covers an area of 9.7m by 11.m and reaches a maximum height of 0.3m. A magnetic gradient of 3.92nT/m was recorded over the area. Anomalies **7182, 7183, 7184, 7185** and **7186** are located to the north of the site and may be debris associated with the wreck.

3.19.8. To the north of **7176** is a spread of debris comprised of anomalies **7182, 7183, 7184, 7185** and **7186**. These anomalies area all likely to be debris associated with the wreck.

3.19.9. **7177** is a wreck on the northern tip of St. Patrick's Causeway, roughly 1.7km west of the shore. The seafloor around the wreck is sandy with no obvious features such as ripples or boulder fields. The surrounding sand has largely covered the wreck, forming a mound with a roughly east-west orientation. Some structural elements are exposed at the western end of the mound with two roughly parallel linear features following the orientation of the mound and spaced roughly 5m apart. Six separate elements can be seen along the more northerly of these features. These run south towards the other long linear feature and are fairly evenly spaced at roughly 2m intervals. The site measures a total of 35.3m long, 16.4m wide and reaches a height of 1.3m. A magnetic gradient of 1.3nT/m was recorded over the site.

3.19.10. **7178** is possible debris associated with **7177** formed of two elongated parallel anomalies. The anomaly is located roughly 81m west of the wreck and is orientated roughly north-south. **7178** measures 5.7m long, 2.2m wide and 0.3m high.

3.19.11. **7179** is a possible wreck site on the northern side of St. Patrick's causeway and roughly 315m west of **7254**. The site is formed of a mound surrounded by elongated pieces of debris. The seafloor in the area of the wreck is fairly coarse with no apparent hydrographic features in the area. The mound is orientated on a roughly east-west alignment. There are no clear structural features associated with the mound which measures 9.4m long, 3.9m wide and 1m high. A magnetic gradient of 20.2nT/m was recorded over the site. There are at lest eight pieces of debris around the site with an average size of 3m long, 0.5m wide and 0.2m high.

3.19.12. There is a southward spread of 12 anomalies of from wreck **7179**. This includes seven anomalies identified on sidescan sonar: **7191, 7192, 7193, 7195, 7197, 7198**

measures 2.7m long, 1.3m wide and 1.1m high. **7211** is an object of unknown origin, possibly debris, located on the northern side of St. Patrick's causeway roughly 82m south-west of **7210**. The anomaly measures2.5m long, 1.3m wide and 0.3m high.

3.19.22. **7212** is possible debris on the northern side of St. Patrick's Causeway. The anomaly measures 2.5m long, 1.3m wide and 0.3m high.

3.19.23. **7213** is an elongated mound orientated roughly northeast by southwest on the southern side of St. Patrick's Causeway. The mound measures 20.4m long, 3.1m wide and 0.2m high.

3.19.24. There is a loose spread of anomalies located on both sides of St. Patrick's Causeway. These include five sidescan sonar (**7181, 7218, 7219, 7221** and **7222**) anomalies and one magnetic anomaly (**7220**).

3.19.25. **7181** is a mound on the southern side of St. Patrick's Causeway in an area of coarse seafloor, possibly sand and cobbles. The mound measures15.4m long, 30.9m wide and 1.4m high and is orientated roughly north by south. This may be a buried wreck site.

3.19.26. **7218** is a linear seafloor disturbance, possibly a buried feature, located on the southern side of St. Patrick's Causeway to the east of **7181**. The anomaly covers an area of 13.9m by 37.5m and reaches a height of 0.2m.

3.19.27. **7219, 7220, 7221** and **7222**all lie to the west of **7181**. **7219** is an isolated object of unknown origin on the northern side of St. Patrick's Causeway. The anomaly measures 1.6m by 2m and reaches a height of 0.2m. **7221** is a dark reflector on the southern side of St. Patrick's Causeway. The anomaly measures 3.4m by 6.2m. **7222** is a possible debris field on the northern side of St. Patrick's Causeway. The anomaly measures 5.4m long, 4m wide and a height of 0.2m.

3.19.28. **7220** is a magnetic anomaly with a magnetic gradient of 5.88nT/m. The anomaly is located on the northern side of St. Patrick's Causeway roughly 273m southwest of **7219**.

3.19.29. There is a collection of 12 anomalies near the western end of St. Patrick's Causeway. These include the six sidescan sonar anomalies 7228, 7230, 7231, 7234, 7251 and 7252. **7228** is a piece of linear debris, possibly a cable, on the northern side of St. Patrick's Causeway. The anomaly measures 4.9m long, 0.4m wide and 0.1m high.

3.19.30. **7230** is a square object roughly 220m west of magnetometer anomalies **7223** and **7224**, and 106m west of magnetometer anomaly **7226**. The anomaly measures 3m long, 2.8m wide and 0.1m high. **7231** is an angular object roughly 23m southwest of **7230** on the northern side of St. Patrick's Causeway. The anomaly measures 3.5m long, 3.6m wide and 0.3m high. **7234** is an angular object of unknown origin, possibly debris, located on the on the northern side of St. Patrick's Causeway at its western end. The anomaly measures 2.4m long, 2.4m wide and 0.6m high. **7251** and **7252** are elongated objects on the northern side of the Causeway. **7251**measures 16.2m long, 0.9m wide and 0.2m high. **7252** is roughly 35m north of **7251** and measures 1.2m by 15m and reaches a height of 0.3m. A magnetic gradient of 25.29nT/m was also recorded.

3.19.44. **7244** is possible debris on the West Prong of St. Patrick's Causeway. The anomaly measures 4.7m long, 2m wide and 0.8m high.

3.19.45. **7245** is possible debris located in a rocky area of seafloor on the West Prong of St. Patrick's Causeway. The anomaly measures 2.3m long, 1.4m wide and 0.4m high.

3.19.46. **7246** is possible debris on the West Prong of St. Patrick's Causeway, roughly 7m southwest of **7245**. The anomaly measures 3.1m long, 0.9m wide and 0.7m high.

3.19.47. **7247** is a square shaped object, possibly debris, located on the West Prong of St. Patrick's Causeway. The anomaly measures 3.2m long, 2.2m wide and 0.9m high.

3.19.48. **7248** is an angular object, possibly debris, on the West Prong of St. Patrick's Causeway. The anomaly measures 2m by 3.2m with a height of 0.9m.

3.19.49. **7249** is an isolated area of disturbed seafloor on the southern side of St. Patrick's Causeway. The anomaly covers an area 21.2m long by 14.3m wide.

3.20. THE *DIAMOND*

3.20.1. The Lloyd's Register of Shipping and the Lloyd's List of 1824 and 1825 record the *Diamond* as being built in New York in 1823 and sinking in Cardigan Bay on 2nd of January 1825 on St. Patrick's Causeway. The *Diamond* was a three-masted square rigged vessel measuring 36.5m long, with a beam of 9m and a tonnage of 491.62 tons. She was built of white oak and locust with a copper sheathed hull and designed to make fast passages across the Atlantic carrying passengers and cargo (cf. Harvey 2006: 22).

3.20.2. The wreck site was discovered in 2000 by a magnetometer survey conducted by Tony and Helen Iles. From 2002, the site was regularly dived by the licensed Malvern Archaeological Diving Unit (MADU; contact: Ian Cundy). The site was also dived by Wessex Archaeology and MADU in 2004 and 2007 resulting in a preliminary georeferenced site plan, and two sample trenches excavated (WA 2004; 2007; Cundy 2004).

3.20.3. In 2006 the site was dived by MADU and MA student Mary Harvey (Bristol University) under the guidance of Nigel Nayling. This work included re-excavating Trench 1 from 2004 and obtaining samples for dendrochronological analysis (Cundy 2006; Harvey 2006).

3.20.4. The dendrochronological results indicate that the timbers used for the construction of the vessel were felled after 1828. Additional evidence recorded during survey and excavation suggests that this is not in fact the wreck of the *Diamond* but an as yet unidentified vessel (WA 2007: 11-12).

3.20.5. The geophysical anomalies with this survey area that may relate to this wreck are as follows:

3.20.6. **7254** is a wreck site that was thought to be the *Diamond*. The site is located on the northern side of St. Patrick's causeway near its north-eastern end, roughly 4.6km west of the shore. The wreck lies in an area of predominantly fine grained seafloor with few boulders. Most of the visible wreck elements appear fragmentary. A

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APPENDIX I: LIST OF SURVEY TARGETS OFF SOUTH WALES

KNOWN WRECKS

WA ID*	Name of vessel	Easting	Northing	UKHO Source no.	Date of loss	Type	Gross Tonnage	Voyage from -to	Cause of loss
2019	*Faith*	349916	5727586	11990	1916	SV	76	Cardiff - Wexford	Stranded
2023	*St Jacques* (Probable position 1)	350091	5726238	58707	1917	SS	2459	Barry - Bizerta	Enemy action
2027	*St Jacques* (Position 2)	344230	5720802	11984	1917	SS	2459	Barry - Bizerta	Enemy action
2043	*Philotis* (probable position)	350891	5720592	11960	1940	SS	880	Swansea - Lisbon	Unknown
1567	*Philotis*	Recorded loss	Recorded loss	11960	1940	Steel Steamship St Govan's Light Vessel (8m NW of), Pembrokeshire		Swansea - Lisbon	Unknown
2048	*Thor*			12016	1943	MV	326	Partington - Fremington	Foundered
2049	*Clapham* (Probable position 1)	345726	5720781	11961	1943	SS	785	Cardiff - Belfast	Collision
2050	*Clapham* (Position 2)	347635	5721303	11962	1943	SS	785	Cardiff - Belfast	Collision
-	*St. Jacques* (Position 3)	353795	5722924	-	1917	SS	2459	Barry - Bizerta	Enemy action
-	Sunderland			-	1940	Aircraft	-	Docked at Pembroke	Storm

*WA ID derived from desk-based assessment 'The Maritime Archaeology of the Welsh Coal Trade', report reference 53111.02s-3

WA ID*	Vessel	Date of loss	Details	Easting	Northing	Sources
1011	Unknown	Unknown	A reef at the east side of Aberdaron Bay has a considerable number of roofing slates scattered about the seabed, but no evidence of wreckage. This is almost certainly a duplicate position for wreck WA 1002.	385686	5850813	Chris Holden
1012	Unknown	Unknown	Two anchors and neatly stacked slates were found off Pen-y-Cil, Aberdaron Bay, in 28 metres of water, about 10 years ago. This is almost certainly a duplicate position for wreck WA 1004.	383143	5849316	Chris Holden
1013	Unknown	Unknown	There is a trail of roofing slates running north-west from the southern tip of Bardsey Island, an anchor and chain at the tip of the island may be related to this. An unknown sloop sank on 13/10/1822 one mile south-east of Bardsey Island with the loss of all hands; these archaeological remains may be connected with this reported loss (WA 2126).	380854	5846988	Chris Holden
1014	Unknown	Unknown	C. Holden states that there is a slate wreck off Porthdinllaen. The slates have a curve on one edge.	395966	5867520	Chris Holden
1015	Unknown	Unknown	There are slates on the seabed near Llanddwyn Island, which may or may not be from a wreck.	405332	5888687	Chris Holden
1019	Unknown	Unknown	C. Holden has dived a slate wreck off the Great Orme.	442137	5911402	Chris Holden

RECORDED LOSSES

WA ID*	Vessel	Date of loss	Details	Approximate location of loss	Sources
2036	*Elizabeth and Jane*	27/04/1899	A Preston schooner, built in 1861 and owned by J. Mostyn of Amlwch; it was stranded and lost en route from Porthmadog to Great Yarmouth.	Off SE point of Bardsey Island, Caernarfonshire	Richard Larn Coflein database (NPRN-271417)
2085	*Miss Madock*	02/02/1873	A Caernarfon vessel, lost en route to Swansea. Lloyd's List reported on 4/2/1873 that the Miss Madock was stranded in Porthdinllaen Bay and likely to become a total wreck. On 5/2/1873 Lloyd's list reported that the Miss Madock was sunk and badly damaged but that the cargo would be saved.	Porthdinllaen 395818E, 5867285N	Chris Holden

APPENDIX III: GAZZETTER OF GEOPHYSICAL SURVEY RESULTS

GSA I: *FAITH*

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag Gradient (nT/m)	Description	Discrimination
7000	Wreck	350200	5727890	5.2	7.7	0.6	0.34	7000 is a probable wreck roughly 275m to the north-east of GSA I. The anomaly was identified using sidescan sonar and appears to be an angular structure. The wreck measures 5.2m long, with a width of 7.7m and a height of 0.6m on a northeast southwest orientation. A magnetic gradient of 0.34nT per metre was recorded over the site.7000 appears to be lying in an area of sand ripples with crests roughly perpendicular to the wreck, orientated roughly northwest southeast. A rocky outcropping can be seen to the south of the wreck.	A1
7001	Debris	349949	5727547	2.7	2.4	0.6	0.26	7001 is a square anomaly measuring 2.7m by 2.4m with a height of 0.6m which is probably debris. A magnetic gradient of 0.26nT per metre was also recorded. This anomaly is located within the survey area and the seafloor appears to be exposed bedrock.	A2
7002	Debris	349838	5727619	4.7	2.6	1.2		7002 is an anomaly measuring 4.7m by 1.6m with a height of 1.2m. This is probably a piece of debris located within the survey area. The seafloor around the anomaly appears to be exposed bedrock with a possible boulder field lying to the south.	A2
7003	Magnetometer	349901	5727557				0.24		A2
7004	Magnetometer	349917	5727572				0.24		A2
7005	Magnetometer	350009	5727657				0.4		A2
7006	Magnetometer	349919	5727545				0.22		A2
7007	Magnetometer	349994	5727681				0.93		A2

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag Gradient (nT/m)	Description	Discrimination
7021	Wreck	353795	5722924	70.2	23.4	3.1	120.1	7021 is the largest section of wreck within GSA IV. The wreck measures 70.2m long, 23.4m wide and 3.1m high. A magnetic gradient of 120.1nT per metre was recorded over the site.7021 lies on a roughly northeast by southwest orientation on a sandy seafloor with sand ripples running across the site with crests aligned east to west. There are some possible rocky outcroppings to the north of the wreck site. The wreck itself appears to be partially buried although a large number of parallel dark reflectors may indicate internal structure of the wreck. 7021 appears to have broken up into at least two large sections and it is unclear from the sidescan image if the ship is lying on its keel or side. There is a large linear anomaly at the northeast end of the wreck which may be part of the ship's superstructure. A large upstanding anomaly can be seen near the centre of the wreck. It is unclear whether this is a single or multiple objects. If this is the wreck of the St. Jacques this anomaly may indicate a possible location for the ship's boilers.	A1
7022	Debris	353792	5722956	8.9	4.6	0.5		7022 is a debris field to the north of wreck 7021. It is comprised of at least eight objects, with the anomaly location centred on the largest piece of debris. The size of the pieces of debris range from 8.9m long, 4.6m wide and 0.5m high for the largest, to 4.1m long, 1.1m wide and 0.2m high for the smallest.	A2

7029	Magnetometer	350898	5720586				34.05	Two magnetometer anomalies identified 48m apart in one single magnetometer survey line show the presence of anthropogenic material likely to be the wreck of the Philotis. Smallest value is over 27nT/m	A2

GSA VIII: Possible Remains of *Thor*

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag Gradient (nT/m)	Description	Discrimination
7030	Wreck	351642	5729274	48.6	13.8	1.8	45.63	7030 is a wreck in GSA VIII. The wreck measures 48.6m long, 13.8m wide and 1.8m high, it has a magnetic gradient of 45.63nT. 7030 lies on a roughly north-south orientation on what appears to be a sandy seafloor. The wreck appears to be partially buried although there is evidence surviving structure. The wreck appears to be particularly damaged at its southern end, but overall appears to be a single cohesive feature, possibly lying on its side. A linear feature with a shadow can be seen at the northern end of the wreck. This may be a mooring associated with the diver surveys.	A1
7031	Debris	351668	5729234	2.2	0.7	0.2		7031 is a rounded object roughly 28m to the southeast of wreck 7030, and just to the south of anomalies 7032 and 7033. This is an unidentified object which may be debris associated with the wreck. The anomaly measures 2.2m long, 0.7m wide and 0.2m high.	A2
7032	Debris	351668	5729239	1.8	0.8	0.6		7032 is a rounded object of unknown origin located roughly 5m to the north of 7031 and just to the east of 7033. The anomaly measures 1.8m long, 0.8m wide and 0.6m high. Lying to the southeast of 7030, it may be debris associated the wreck.	A2

GSA IX: Possible Remains of a Sunderland Flying Boat

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag_Gradient (nT/m)	Description	Discrimination
7040	Wreck	364986	5729829	26	23	3.4		7040 is the wreck of a Sunderland flying boat. The wreck measures 26m long, 23m wide and 3.4m high. The wreck is orientated with the nose of the aircraft to the west and the tail to the east. A large section of wing appears to extend from the fuselage to the south with an upstanding object on it measuring 3.7m long, 2.9m wide and 1.5m high, which may be an engine. The wreck lies on a predominantly fine grained seafloor with several possible rocky outcroppings to the north.	A1
7041	Debris	365015	5729826	5.1	1.7	0.2		7041 is an anomaly located roughly 10mto the east of the main wreck site. This appears to be an elongated object measuring 5.1m long, 1.7m wide and 0.2m high. 7041 may be debris associated with the wreck of the aircraft.	A1
7042	Debris	365021	5729824	3.6	1.6	0.2		7042 is an anomaly comprised of two possible objects to the east of 7041 which may be debris associated with wreck 7040. The first element measures 2.4m long, 0.7m wide and 0.2m high while the second measures 1.4m long, 0.6m wide and 0.3m high.	A1
7043	Debris	365003	5729821	3.2	1.6	0.3		7043 is a possible piece of debris associated with 7040. The anomaly measures 3.2m long, 1.6m wide and 0.3m high and is located roughly 7m to the southeast of 7040.	A1

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag_Gradient (nT/m)	Description	Discrimination
7051	Debris	365049	5729820	0.6	0.2	0.1		7051 is located roughly 44m m to the east of wreck 7040. The anomaly measures 0.6m long, 0.2m wide and 0.1m high. There is possible associated scour extending roughly 24m to the west of the anomaly.	A2
7052	Debris	365024	5729872	1.5	0.9	0.9		7052 is an angular object, possibly debris, located roughly 50m northeast of wreck 7040 on a rocky outcropping. The object measures 1.5m long, 0.9m wide and 0.9m high.	A2
7053	Debris	364983	5729834	3	2	0.2		7053 is a probable debris field associated with wreck 7040. The debris field includes at least three objects covering an area roughly 3m long by 2m wide located to the north of the nose of the aircraft. The first of the debris pieces is 0.7m long, 0.6m wide and 0.2m high. The second measures 0.8m long, 0.8m wide and 0.2m high. The third piece is the longest and thinnest measuring 1.2m long, 0.1m wide and 0.1m high.	A2
7054	Debris	364974	5729800	1.9	1.4	0.2		7054 appears to be a piece of rope or possible debris roughly 20m southwest of wreck 7040. The anomaly measures 1.9m long, 1.4m wide and has a height of 0.2m.	A2
7055	Debris	365007	5729817	1.4	0.9	0.2		7055 is located roughly 12m southeast of 7040 and may be debris associated with the wreck. The anomaly appears rounded on its north side and measures 1.4m long, 0.9m wide and 0.2 m high	A2
7056	Debris	365016	5729832	1.2	0.6	0.2		7056 is an upstanding anomaly of uncertain shape located roughly 11m to the east of wreck 7040. The object measures 1.2m long, 0.6m wide and 0.2m, this may be debris associated with the wreck or related to a possible mooring.	A2

GSA X: POSSIBLE REMAINS OF *PETER VARKEVISSAR* (WA1011)

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag_Gradient (nT/m)	Description	Discrimination
7062	Wreck	385626	5850720	8.5	5.1	0.2		7062 appears to be a slate mound and is probably a ship's cargo which may overlie additional wreck structure. There are several linear anomalies on the southeast edge of the mound which may be ship structure. The mound itself measures 8.5m long, 5.1m wide and 0.2m high and is located on an area of sandy seafloor with ripple crests on a roughly northeast southwest alignment, perpendicular to the wreck. There are also numerous boulders in the area ranging from roughly 1m to 4m in diameter.	A1
7063	Dark reflector	385694	5850713	5.3	2.5	0.6	0.76	7063 is an object of unknown origin which lies roughly 69m to the east of wreck 7062. The anomaly measures 5.3m long, 2.5m wide and 0.6 m high, it has a magnetic gradient of 0.76nT per metre.	A2
7064	Debris	385760	5850706	1.7	1	1		7064 is possible debris located roughly 135m to the east of wreck 7062. The anomaly measures 1.7m long, 1m wide and 1m high.	A2
7065	Debris	385749	5850715	1.1	0.5	0.3		7065 is possible debris located roughly 123m east of 7062 in an area of dense boulder field. The anomaly measures 1.1m long, 0.5m wide and 0.3m high.	A2
7066	Debris	385626	5850808	1.7	0.5	0.2	0.4	5.11.9. 7066 is possible debris located roughly 87m north of 7062. The anomaly measures 1.7m long, 0.5m wide and 0.2m high. A magnetometer response of 0.4nT was recorded within 10m of the sidescan sonar anomaly and may be associated with it.	A2
7067	Magnetometer	385680	5850810				0.68	7067 is a magnetic anomaly located roughly 105m northeast of wreck 7062. A magnetic gradient of 0.68nT per metre was recorded.	A2
7068	Magnetometer	385586	5850779				0.89		A2
7069	Magnetometer	385554	5850858				0.31		A2

GSA XII: POSSIBLE REMAINS OF *MISS MADOCK* (WA2085 AND WA1014)

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag_Gradient (nT/m)	Description	Discrimination
7086	Dark reflector	395790	5867492	0.6	0.8	0		7086 is one of three dark reflectors slightly west of the centre of GSA XII. The anomaly measures 0.6m long by 0.8m wide.	A2
7087	Dark reflector	395893	5867479	2.5	1.1	0.3		7087 is an angular elongated object of unknown origin near the centre of GSA XII. The seafloor around the anomaly is predominantly sandy but of varying texture and includes a large number of small boulders roughly 1m in diameter. 7087 measures 2.5m long, 1.1m wide and 0.3m high.	A2
7088	Debris	395866	5867392	10	3	0.3	1.33	7088 is possible debris field roughly 93m south of 7087 and covers an area of roughly 10m by 3m. There are two identifiable angular, elongated objects. The first measures 1.6m long, 1.5m wide and 0.2m high. The second is 1.5m long, 2.2m wide and 0.3m high. A magnetic gradient of 1.33nT per metre was also recorded over the area	A2
7089	Magnetometer	395874	5867104				1.1	Anomaly of unknown origin	A2
7090	Magnetometer	395820	5867262				6.01		A2
7091	Magnetometer	395818	5867675				1.29		A2
7092	Magnetometer	395824	5867733				0.97		A2
7093	Magnetometer	395841	5867632				0.92		A2
7094	Magnetometer	395868	5867772				1.28		A2
7095	Magnetometer	395867	5867282				1.53		A2
7096	Magnetometer	396021	5867769				3.32		A2
7097	Magnetometer	395802	5867789				2.62		A2
7098	Magnetometer	395809	5867700				1.23		A2
7099	Magnetometer	395899	5867388				1.5	Clear magnetometer response of unknown origin	A2
7100	Magnetometer	395899	5867228				2.26	Possible archaeology or response associated with near by fishing gear	A2

GSA XIV: Possible Remains of Unknown Wreck (WA1013)

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag_Gradient (nT/m)	Description	Discrimination
7109	Wreck	380858	5847087	28.2	48	1.2	0.45	7109 is a possible wreck site which appears as an area of angular material on the sidescan sonar image which may be a ship's cargo. The possible cargo mound measures roughly 28.2m by 48m with a height of 1.2m and is aligned on a roughly northwest by southeast orientation. A magnetometer response of 0.45nT was recorded over the area. The surrounding seafloor is predominantly sandy with a few possible boulders.	A1
7110	Debris	380842	5847050	5.1	4.6	0.8		7110 is an angular object located roughly 18m southwest of 7109. The anomaly measures 5.6m long, 4.6m wide and 0.8m high and could be a boulder or possibly debris associated with 7109.	A2
7111	Debris	381008	5847067	4	2.4	0.8		7111 is an angular object located roughly 125m east of 7109.The anomaly measures 4m long, 2.4m wide and 0.8m high. This may be a boulder or debris associated with the possible wreck site.	A2
7112	Debris	380817	5847096	5	2	0.5		7112 is an object of unknown origin located roughly 23m west of 7109. The anomaly measures 5m long, 2m wide and 0.5m high and may be debris associated with the possible wreck.	A2
7113	Debris	380778	5847086	3.4	0.9	0.2		7113 is an object of unknown origin located roughly 62m west of 7109. The anomaly measures 3.4m long, 0.9m wide and 0.2m high.	A2
7114	Debris	380739	5846957	7	1	0.2		7114 is an elongated object of unknown origin located roughly 156m southwest of 7109. The anomaly measures 7m long, 1m wide and 0.2m high.	A2

7127	Debris	394050	5868365	8.3	2	0.5	2.28	7127 appears to be debris, possibly associated with 7126. The anomaly is located roughly 16m from 7126 and is orientated roughly southwest by northeast. 7127 measures roughly 8.3m long, 2m wide and 0.5m high. A magnetic gradient of 2.28nT per metre was recorded over the area.	A2
7128	Debris	394077	5868377	2.5	1.2	0.6	2.17	7128 is an angular object, possibly wreck debris associated with 7126. The anomaly is located roughly 14m northwest of 7126 and measures 2.5m long, 1.2m wide and 0.6m high. A magnetic gradient of 0.6nT per metre was recorded over the area.	A2
7129	Debris	394043	5868399	1.2	0.2	0.2		7129 is possible debris associated with 7126, located roughly 33m northwest of the mound. The anomaly measures 1.2m long, 0.2m wide and 0.2m high	A2
7130	Debris	394068	5868479	7	1	0.95		7130 appears to be an elongated object of unknown origin located roughly 106m north of 7126 in a possible boulder field. The anomaly measures 7m long, 1m wide and 0.95m high.	A2
7131	Debris	394095	5868296	1.4	1.6	0.5		7131 is an angular object located roughly 85m southeast of 7126 within a boulder field. The anomaly measures 1.4m long, 1.6m wide and 0.5m high	A2
7132	Debris	394066	5868360	3.1	0.8	0.3		7132 is an elongated object located roughly 13m south of 7126 and may be debris associated with it. The anomaly is orientated roughly northwest by south east and measures 3.1m long, 0.8m wide and 0.3m high.	A2
7133	Magnetometer	393945	5868271				1.5		A2
7134	Magnetometer	394054	5868501				1.14		A2

GSA XVII: Tal-y-Bont Wreck

WAID	Classification	Easting	Northing	Length (m)	Width (m)	Height (m)	Mag_Gradient (nT/m)	Description	Discrimination

7140	Magnetometer	423777	5848554				8.66		A2
7141	Magnetometer	424090	5848040				8.34		A2
7142	Magnetometer	423911	5848234				5.61	One of two anomalies. Second one lies approximately 13m south along the track. It measures 3.52nT/m	A2
7143	Magnetometer	424103	5848156				5.6		A2
7144	Magnetometer	423996	5848332				4.76		A2
7145	Magnetometer	423957	5848341				3.49		A2
7146	Magnetometer	424008	5848337				3.47		A2
7147	Magnetometer	424028	5848366				2.85		A2
7148	Magnetometer	424106	5848382				2.44		A2
7149	Magnetometer	424097	5848083				2.41		A2
7150	Magnetometer	424019	5848317				2.27		A2
7151	Magnetometer	424020	5848380				2.2		A2
7152	Magnetometer	424067	5848400				2.15		A2
7153	Magnetometer	424008	5848375				2.13		A2
7154	Magnetometer	423925	5848371				2.02		A2
7155	Magnetometer	424165	5847954				1.98		A2
7156	Magnetometer	423912	5848391				1.96		A2
7157	Magnetometer	424003	5848116				1.96		A2
7158	Magnetometer	423903	5848278				1.91		A2
7159	Magnetometer	424000	5848313				1.82		A2
7160	Magnetometer	423984	5848352				1.78		A2
7161	Magnetometer	423996	5848081				1.69		A2
7162	Magnetometer	423847	5848573				1.58		A2
7163	Magnetometer	424041	5848259				1.58		A2
7164	Magnetometer	423905	5848406				1.56		A2
7165	Magnetometer	424006	5848287				1.52		A2
7166	Magnetometer	424044	5847992				1.41		A2
7167	Magnetometer	423781	5848311				1.39		A2
7168	Magnetometer	424131	5847929				1.24		A2
7169	Magnetometer	423815	5848267				1.21		A2
7170	Magnetometer	424008	5848201				1.2		A2
7171	Magnetometer	423893	5848395				1.16		A2
7172	Magnetometer	423971	5848178				1		A2
7173	Magnetometer	423911	5848337				0.98		A2
7174	Magnetometer	423732	5848603				0.93		A2

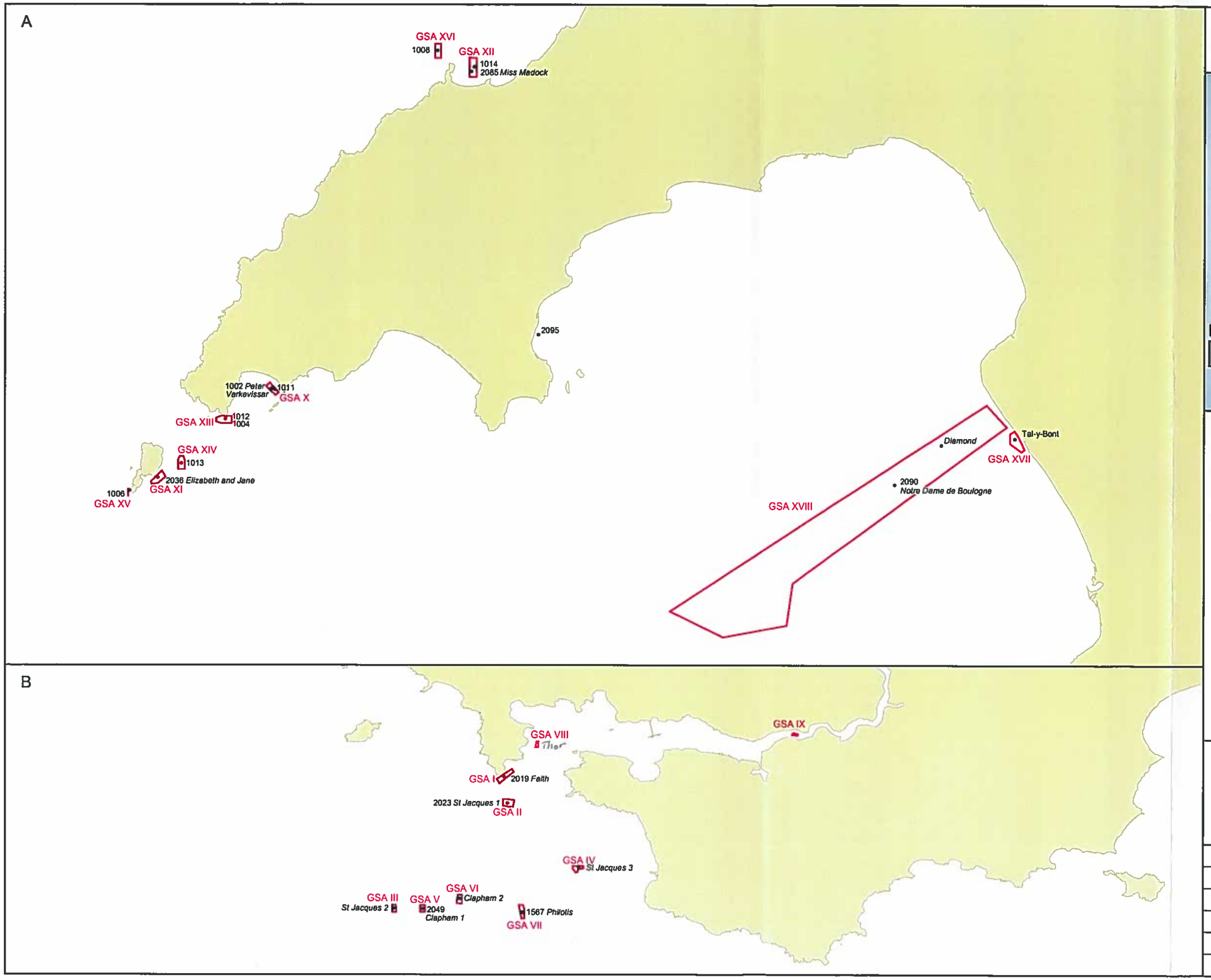
7177	Wreck	422333	5849478	35.3	16.4	1.3		7177 is a wreck on the northern tip of St. Patrick's Causeway, roughly 1.7km west of the shore. The seafloor around the wreck is sandy with no obvious features such as ripples or boulder fields. The surrounding sand has largely covered the wreck, forming a mound with a roughly east-west orientation. Some structural elements are exposed at the western end of the mound with two roughly parallel linear features following the orientation of the mound and spaced roughly 5m apart. Six separate elements can be seen along the more northerly of these features. These run south towards the other long linear feature and are fairly evenly spaced at roughly 2m intervals. The site measures a total of 35.3m long, 16.4m wide and reaches a height of 1.3m. A magnetic gradient of 1.3nT per metre was recorded over the site.	A1
7178	Debris	422253	5849467	5.7	2.2	0.3		7178 is possible debris associated with 7177 formed of two elongated parallel anomalies. The anomaly is located roughly 81m west of the wreck and is orientated roughly north-south. 7178 measures 5.7m long, 2.2m wide and 0.3m high.	A1
7179	Wreck	419823	5847893	9.4	3.9	1	20.2	5.19.4. 7179 is a possible wreck site on the northern side of St. Patrick's causeway and roughly 315m west of 7254. The site is formed of a mound surrounded by elongated pieces of debris. The seafloor in the area of the wreck is fairly coarse with no apparent hydrographic features in the area. The mound is orientated on a roughly east-west alignment. There are no clear structural features associated with the mound which measures 9.4m long, 3.9m wide and 1m high. A magnetic gradient of 20.2nT per metre was recorded over the site. There are at lest eight pieces of debris around the site with an average size of 3m long, 0.5m wide and 0.2m high.	A1

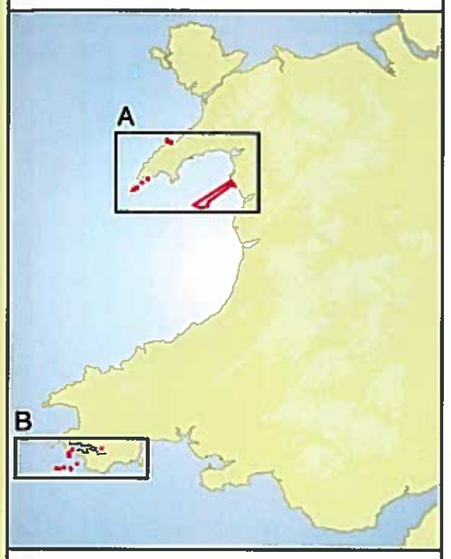
7186	Dark reflector	422808	5849416	1.2	0.7	0		7186 is a dark reflector located roughly 24m northwest of 7176. This may be debris associated with the wreck and measures 1.2m long by 0.7m wide.	A2
7187	Debris	421317	5848549	4.6	4.5	0		7187 is a possible piece of angular debris located on the northern side of St. Patrick's Causeway roughly equidistant between wrecks 7177 and 7254. The anomaly measures 4.6m long by 4.5m wide.	A2
7188	Magnetometer	420020	5847910				3.2		A2
7189	Debris	420018	5848013	4.4	1	0.7		7189 is possible debris located roughly 126m northwest of wreck 7254. The object measures 4.4m long, 1m wide and 0.7m high.	A2
7190	Debris	419957	5847880	1.4	1	0.2		7190 is possible debris located roughly 135m east of wreck 7179 and 190m southwest of wreck 7254. The anomaly is an angular object of unknown origin measuring 1.4m long, 1m wide and 0.2m high.	A2
7191	Debris	419915	5847820	0.2	0.3	0.2		7191 is possible debris located roughly 118m southeast of wreck 7179 and roughly 22m east of possible anchor 7195. The anomaly measures 0.2m by 0.3m with a height of 0.2m.	A2
7192	Debris	419907	5847831	3.7	0.7	0.1		7192 is an elongated object located roughly 104m southeast of wreck 7179 and 17m northeast of 7195. The anomaly measures 3.7m long, 0.7m wide and 0.1m high.	A2
7193	Debris	419902	5847820	1.3	0.4	0.3		7193 is an elongated object located roughly 108m southeast of wreck 7179 and 9m east of 7195. The anomaly measures 1.3m long, 0.4m wide and 0.3m high.	A2
7194	Magnetometer	419900	5847839				3.43		A2
7195	Debris	419893	5847821	3.3	2.6	0.4	29.66	7195 is a possible anchor located roughly 100m southeast of wreck 7179. The anomaly measures 3.3m long, 2.6m wide and 0.4m high, with a magnetic response of 29.66nT.	A2

7209	Debris	418738	5847395	2.4	0.9	0.9		7209 is an elongated object of unknown origin, possibly debris or fishing gear, located on the northern side of St. Patrick's Causeway. The anomaly measures 2.4m long, 0.9m wide and 0.9m high.	A2
7210	Dark reflector	417887	5846158	2.7	1.3	1.1		7210 is an object of unknown origin, possibly debris, on the northern side of St. Patrick's Causeway. The anomaly measures 2.7m long, 1.3m wide and 1.1m high.	A2
7211	Dark reflector	417832	5846096	2.5	1.3	0.3		7211 is an object of unknown origin, possibly debris, located on the northern side of St. Patrick's causeway roughly 82m south-west of 7210. The anomaly measures2.5m long, 1.3m wide and 0.3m high.	A2
7212	Debris	416461	5844724	3.4	1	0.7	1.3	7212 is possible debris on the northern side of St. Patrick's Causeway. The anomaly measures 2.5m long, 1.3m wide and 0.3m high.	A2
7213	Mound	415677	5843691	20.4	3.1	0.2		7213 is an elongated mound orientated roughly northeast by southwest on the southern side of St. Patrick's Causeway. The mound measures 20.4m long, 3.1m wide and 0.2m high.	A2
7214	Dark reflector	415340	5844159	2.8	1.4	0.4		7214 is possible piece of debris which appears to be located on the crest of a sand wave aligned northwest by southeast. The anomaly is located roughly 87m north-west of wreck 7180 and measures 2.8m long, 1.4m wide and 0.4m high.	A2
7215	Dark reflector	415311	5844129	1	0.6	0.3		7215 is possible debris located roughly 46m northeast of wreck 7180 on the crest of a possible sand wave aligned east to west. The anomaly measures 1m long, 0.6m wide and 0.3m high.	A2
7216	Dark reflector	415292	5844151	0.8	0.5	0.2		7216 is possible debris located roughly 63m north of wreck 7180. The anomaly measures 0.8m long, 0.5m wide and 0.2m high.	A2
7217	Magnetometer	415231	5843966				3.53	Linear feature 75m north	A2

7230	Debris	411336	5841337	3	2.8	0.1		7230 is a square object roughly 220m west of magnetometer anomalies 7223 and 7224, and 106m west of magnetometer anomaly 7226. The anomaly measures 3m long, 2.8m wide and 0.1m high.	A2
7231	Debris	411322	5841318	3.5	3.6	0.3		7231 is an angular object roughly 23m southwest of 7230 on the northern side of St. Patrick's Causeway. The anomaly measures 3.5m long, 3.6m wide and 0.3m high.	A2
7232	Magnetometer	411288	5841034				2.87		A2
7233	Debris	411259	5840323	9.8	6.2	0.1		7233 is a possible debris field on the southwest end of St. Patrick's Causeway. The debris field covers an area of roughly 9.8m by 6.2m, with the largest piece of debris measuring 3.3m long, 1m wide and 0.1m high.	A2
7234	Debris	411159	5841154	2.4	2.4	0.6		7234 is an angular object of unknown origin, possibly debris, located on the on the northern side of St. Patrick's Causeway at its western end. The anomaly measures 2.4m long, 2.4m wide and 0.6m high.	A2
7235	Magnetometer	410662	5840282				3.64		A2
7236	Magnetometer	410530	5840218				3.73		A2
7237	Magnetometer	409924	5840374				5.88		A2
7238	Dark reflector	409788	5840385	3.3	2.6	1.7		7238 is an angular object of unknown origin, possibly debris, located on the western end of St. Patrick's Causeway. The anomaly measures 3.3m long, 2.6m wide and 1.7m high.	A2
7239	Dark reflector	409770	5840322	3.7	2.4	0.5		7239 is possible debris located at the western end of St. Patrick's Causeway. The anomaly measures 3.7m long, 2.4m wide and 0.5m high.	A2
7240	Dark reflector	409752	5840326	4.7	2.7	1.2		7240 is possible debris located on the western end of St. Patrick's Causeway. The anomaly measures 4.7m long, 2.7m wide and 1.2m high.	A2

7249	Seafloor disturbance	417639	5844662	21.2	14.3	0		7249 is an isolated area of disturbed seafloor on the southern side of St. Patrick's Causeway. The anomaly covers an area 21.2m long by 14.3m wide.	U1
7251	Dark reflector	411315	5840985	16.2	0.9	0.2		7251 is an elongated object on the northern side of St. Patrick's Causeway. The anomaly measures 16.2m long, 0.9m wide and 0.2m high.	U1
7252	Debris	411314	5841020	1.2	15	0.3	25.29	7252 is an elongated object on the northern side of St. Patrick's Causeway, roughly 35m north of 7251. The anomaly measures 1.2m by 15m and reaches a height of 0.3m. A magnetic gradient of 25.29nT per metre was also recorded.	U1
7253	Magnetometer	409978	5840010				4.87	7253 is a magnetic anomaly on the western end of St. Patrick's Causeway. The anomaly has a magnetic gradient of 4.87nT per metre.	U1
7254	Wreck	420132	5847961	49.1	19.3	1.6	1162.53	7254 is a wreck site that was thought to be the Diamond. The site is located on the northern side of St. Patrick's causeway near its north-eastern end, roughly 4.6km west of the shore. The wreck lies in an area of predominantly fine grained seafloor with few boulders. Most of the visible wreck elements appear fragmentary. A reasonably cohesive ellipsoid can be seen, however, which may indicate the presence of more cohesive buried structural elements. The site is aligned on a roughly northwest by southeast orientation with the south-eastern end appearing more dispersed and possibly separated of the north-western end. The site measures 49.1m long, 19.3m wide and 1.6m high. There are a large number of elongated anomalies which may be debris associated with the ship's structure. A magnetic gradient of 1162.53nT per metre was recorded over the site.	A1





Wessex Archaeology

Geophysical Survey Area
Wreck location

0 10km

Drawing projection: UTM WGS84 Z30N

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Illustrator:	KJB
Date:	20/08/10
Scale:	1:200,000 @A3
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U:\PROJECTS\53111\7 Drawing

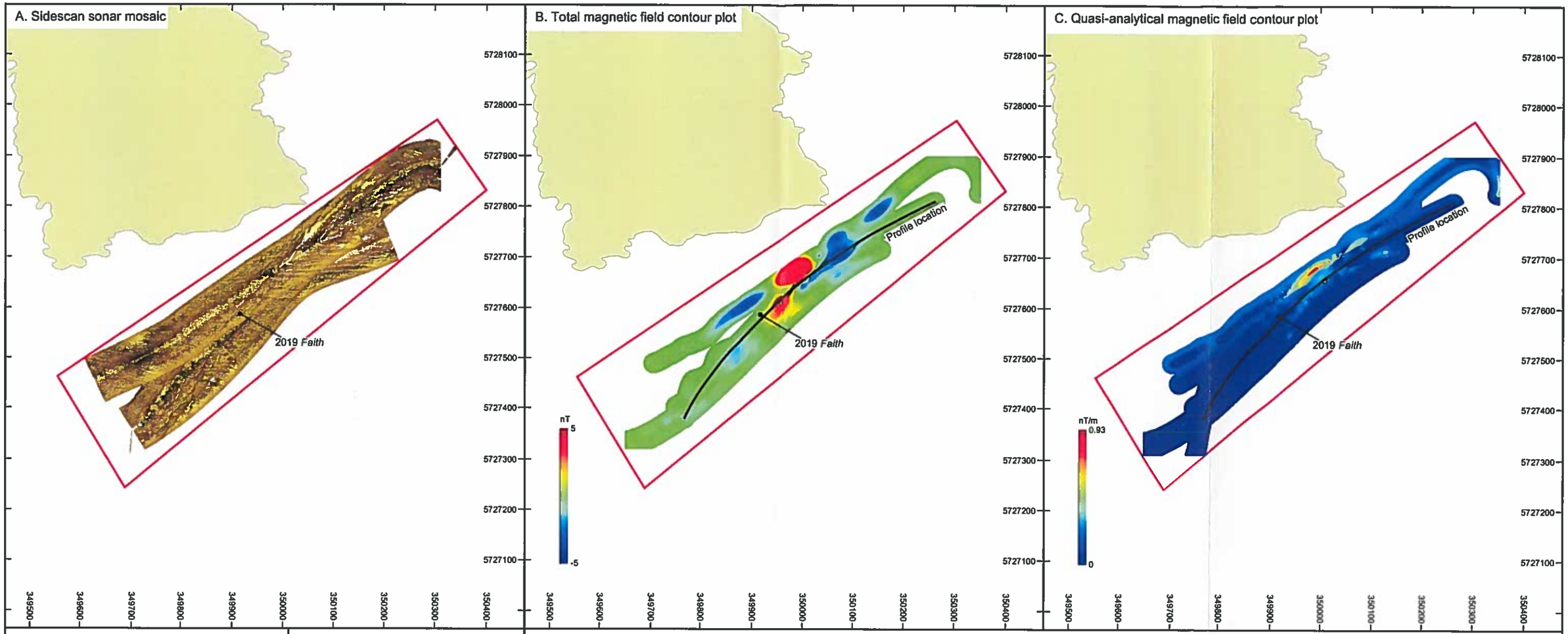
Location of Geophysical Survey Areas

Figure 1

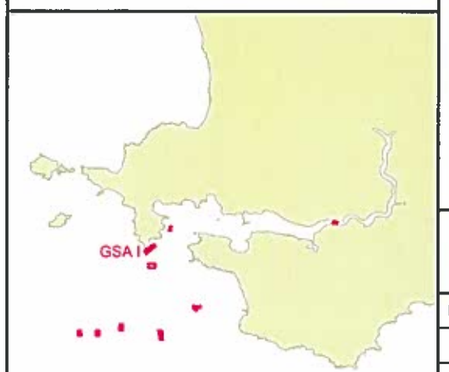
A. Sidescan sonar mosaic

B. Total magnetic field contour plot

C. Quasi-analytical magnetic field contour plot



Wessex Archaeology



Geophysical Survey Area

Wreck location

0 200m

Drawing projection: UTM WGS84 Z30N

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Illustrator:	KJB
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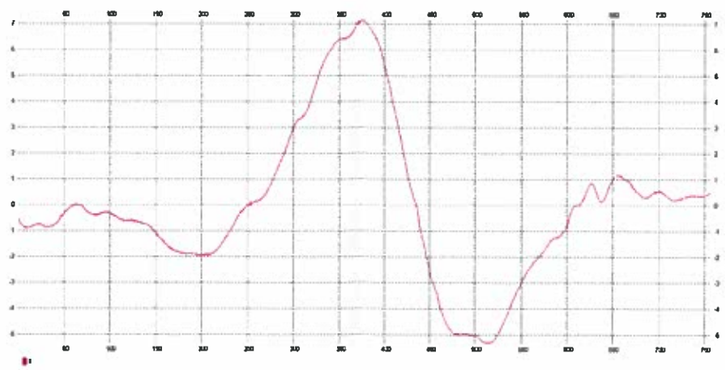
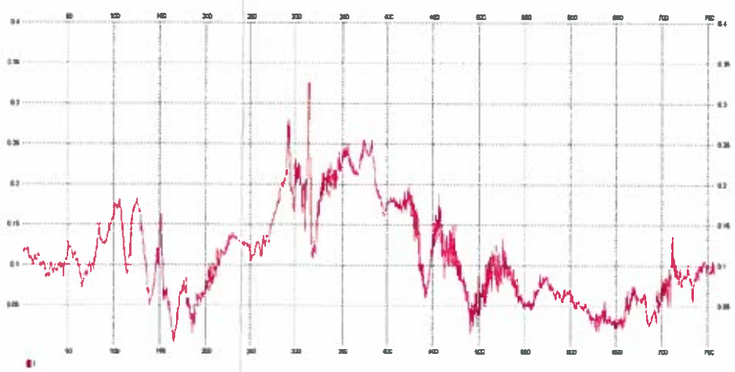
D. Total magnetic field profile

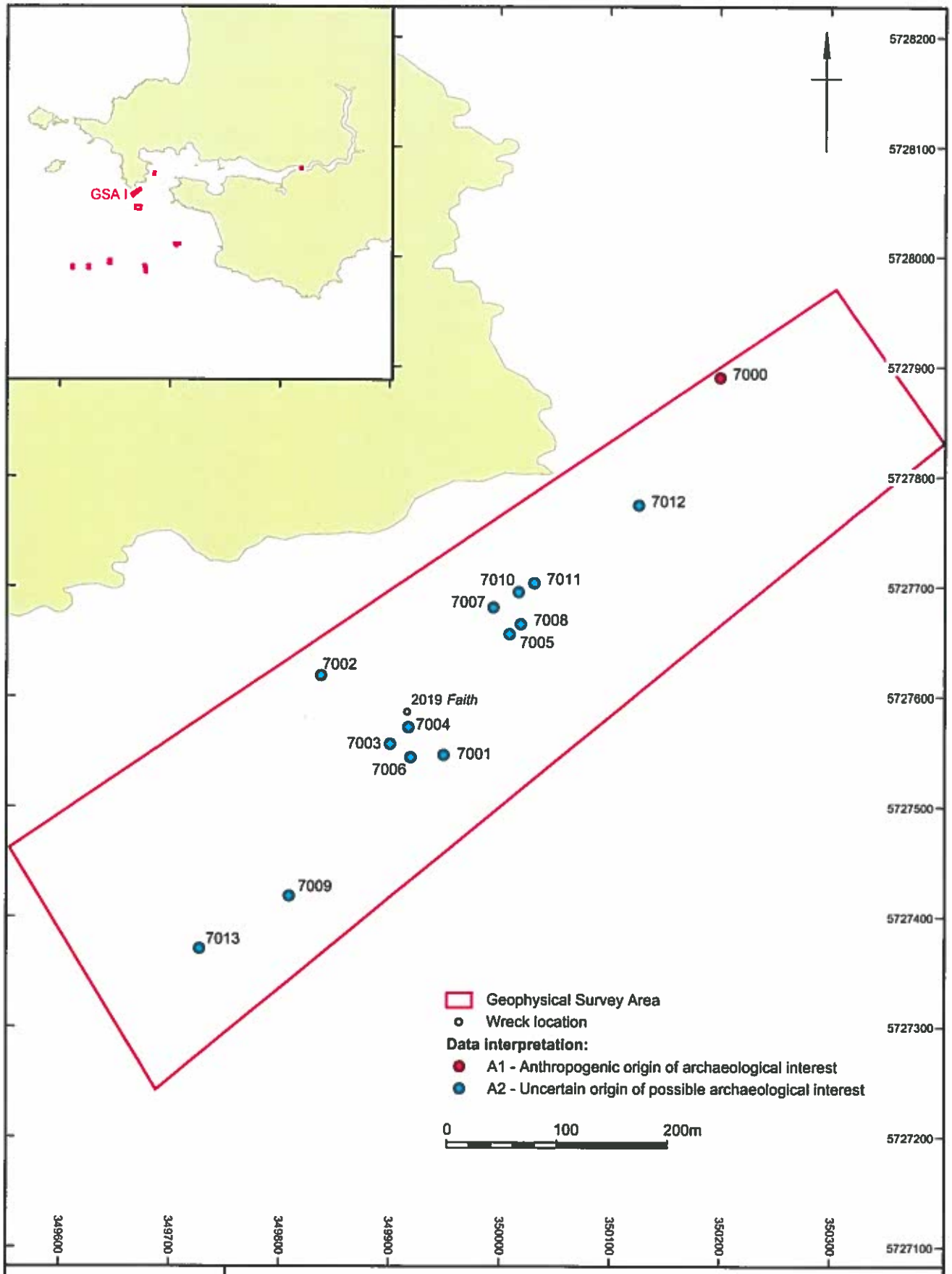


E. Quasi-analytical magnetic field profile



GSA I: Sidescan sonar mosaic and magnetometer plots

Figure 2



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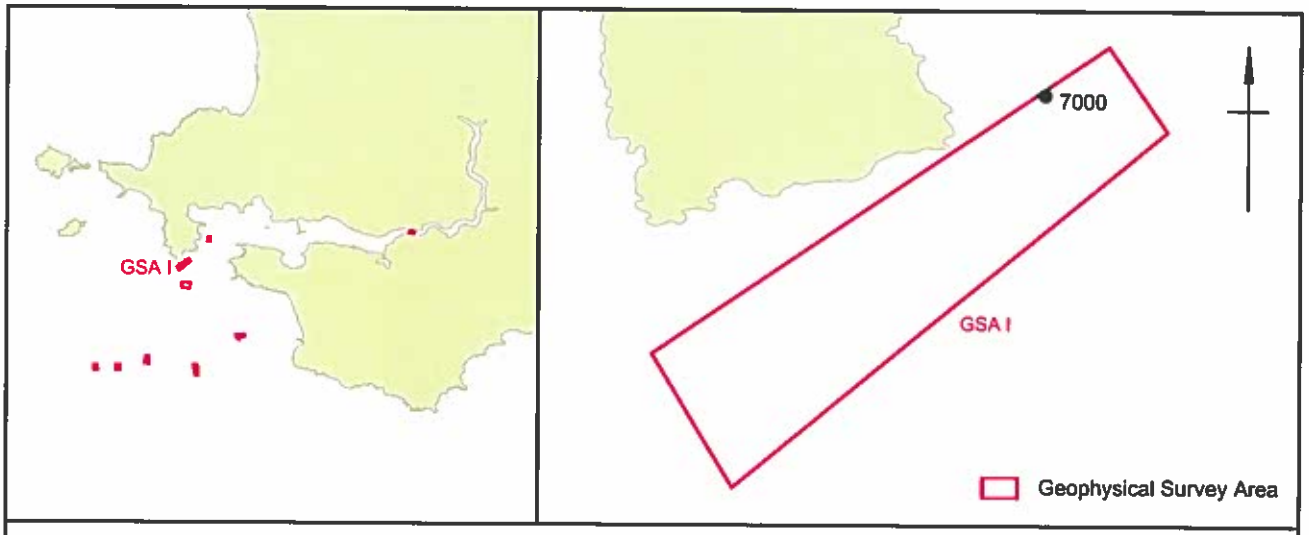
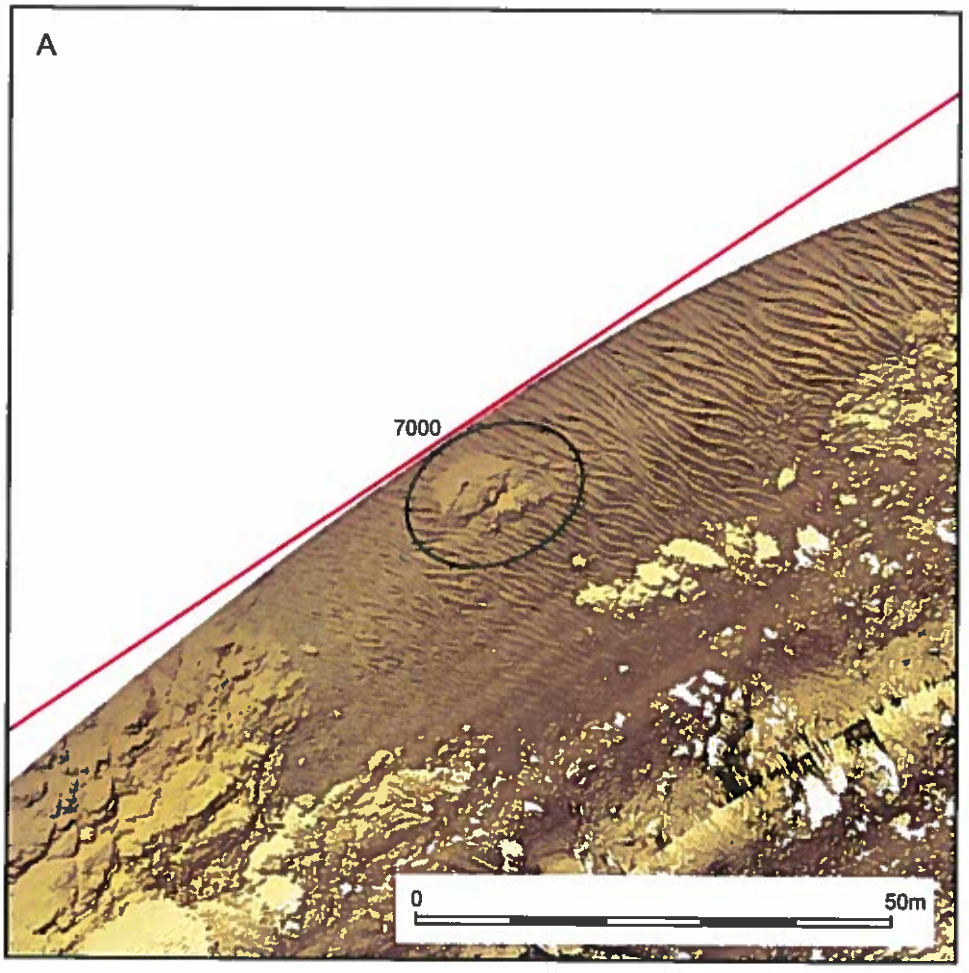
Wessex Archaeology

GSA I: Data interpretation

Figure 3





Drawing projection: UTM WGS84 Z30N

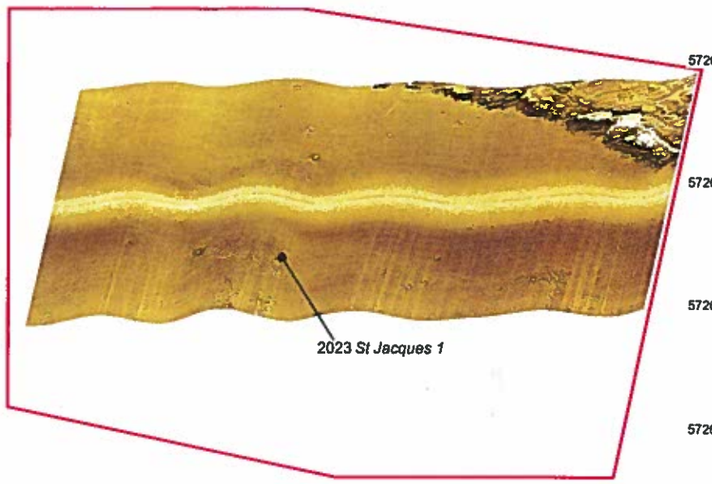
Date:	22/10/10	Revision Number:	0
Scale:	1:800 (insets 1:500,000 & 12500) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

Wessex Archaeology

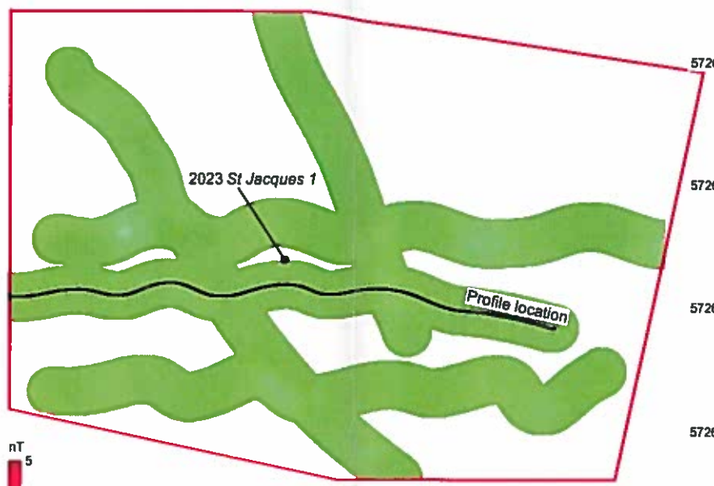
GSA I: Data sample

Figure 4

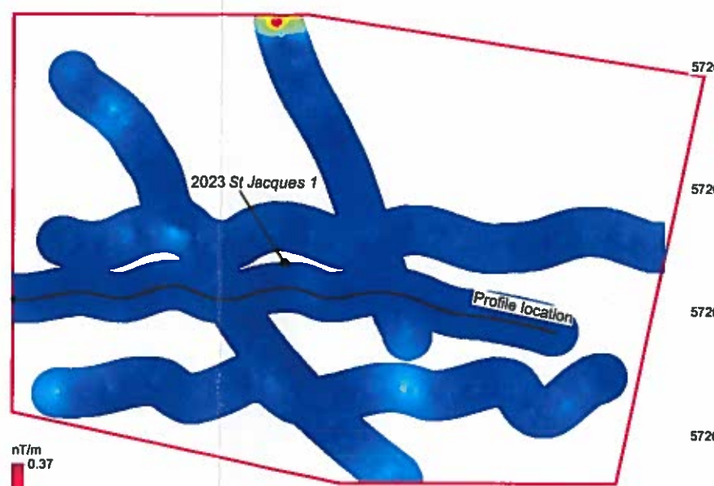
A. Sidescan sonar mosaic



B. Total magnetic field contour plot



C. Quasi-analytical magnetic field contour plot



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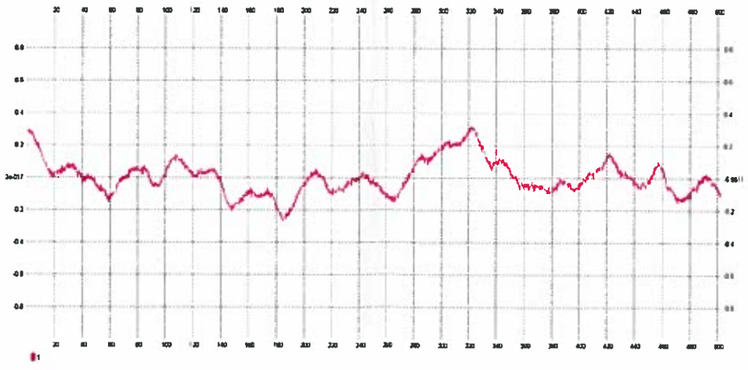
Geophysical Survey Area
Wreck location

0 200m

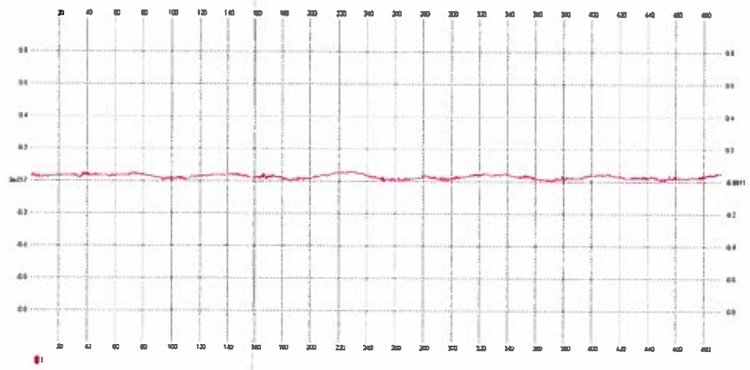
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:5000 (inset 1:500,000) @A3
Path:	U:\PROJECTS\53111\7 DO Report Figures\2010\Welsh Geophys

D. Total magnetic field profile

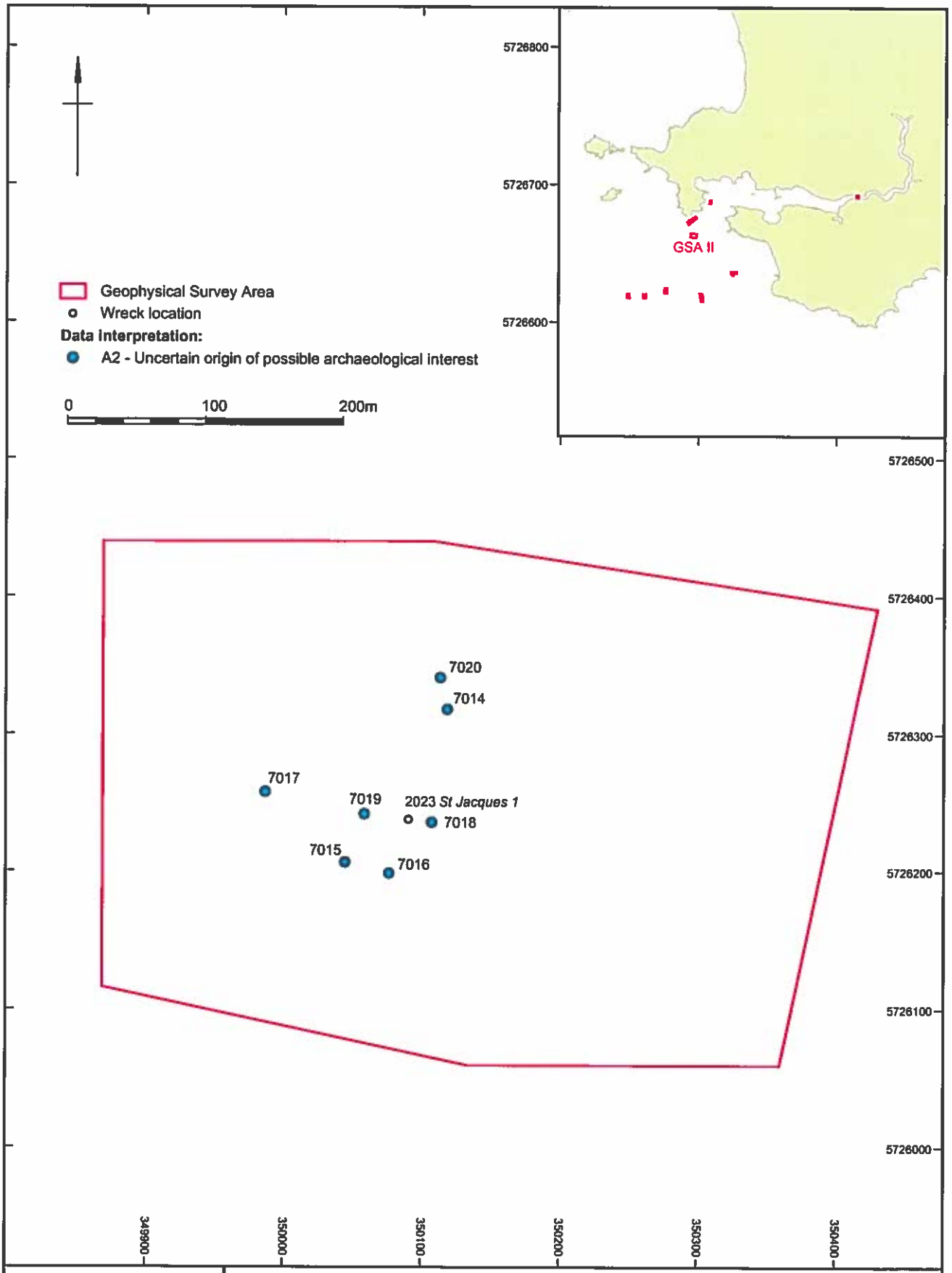


E. Quasi-analytical magnetic field profile



GSA II: Sidescan sonar mosaic and magnetometer plots

Figure 5



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:4000 (inset 1:500,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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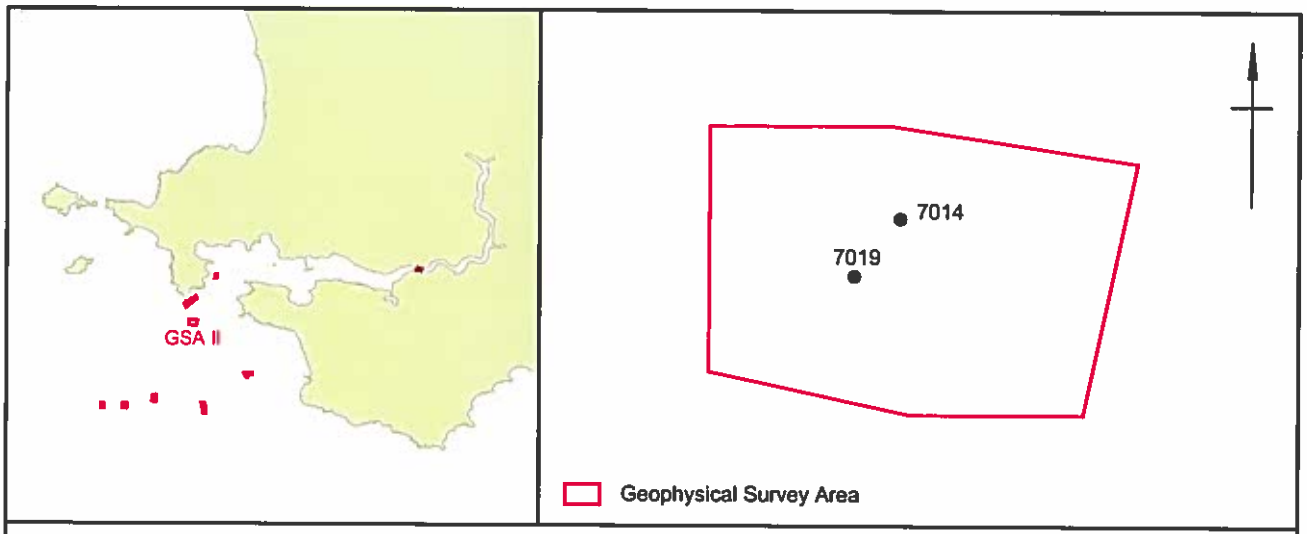
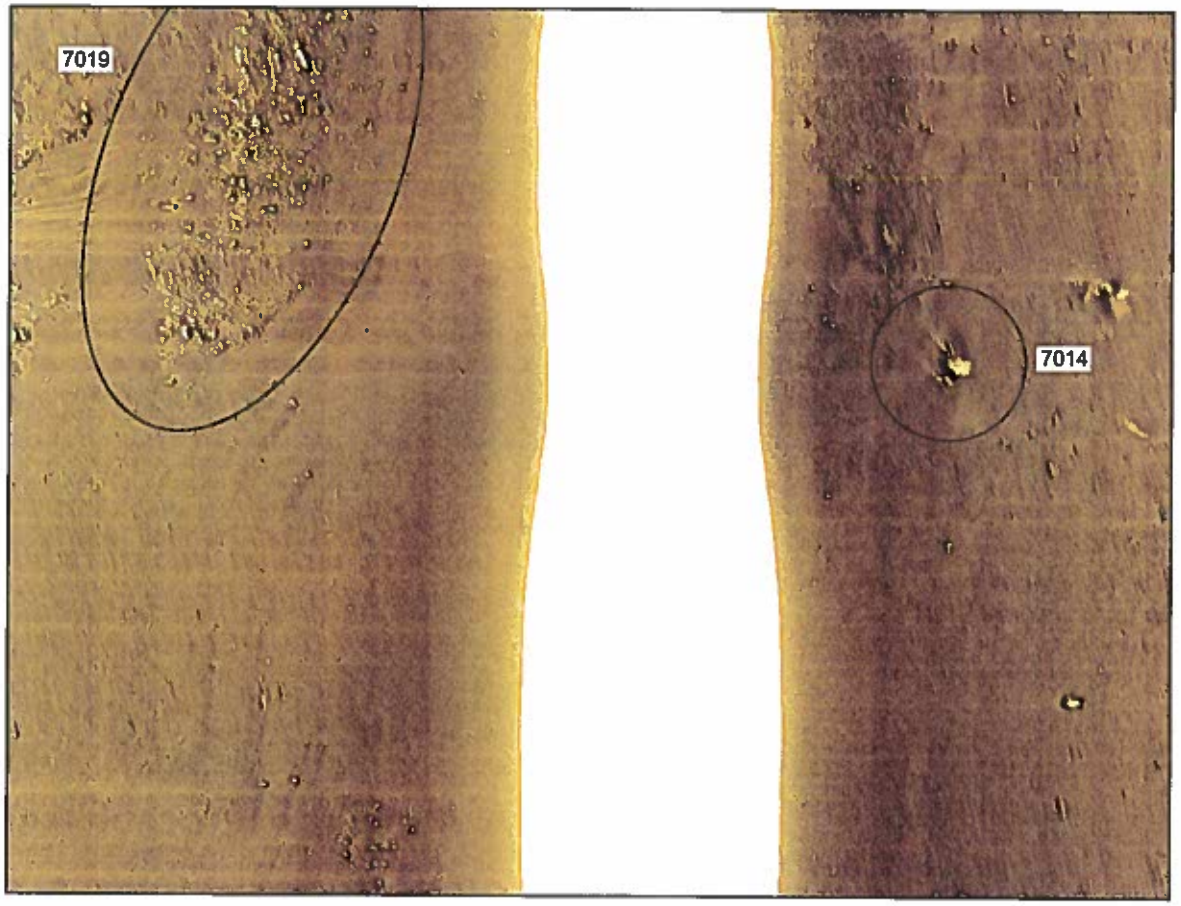
GSA II: Data interpretation

Figure 6





Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	NTS (insets 1:500,000 & 1:10,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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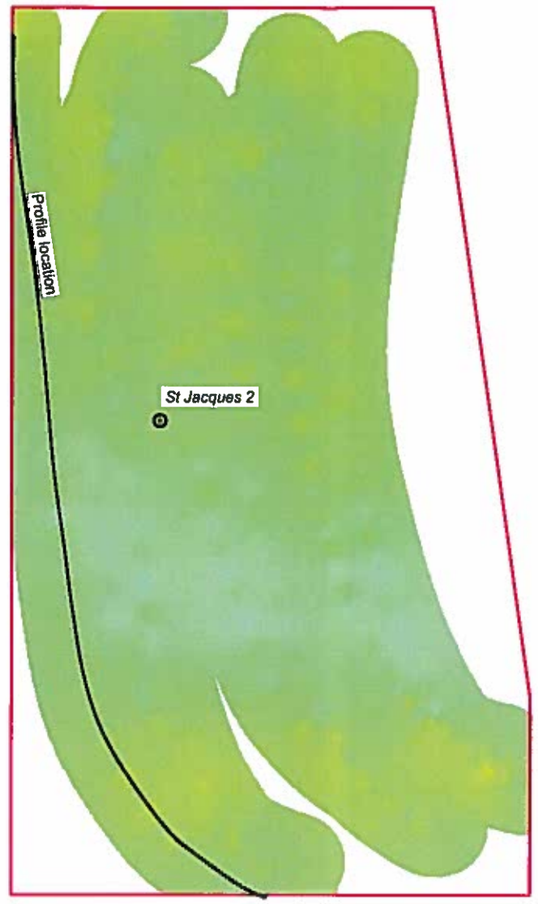
GSA II: Data sample

Figure 7

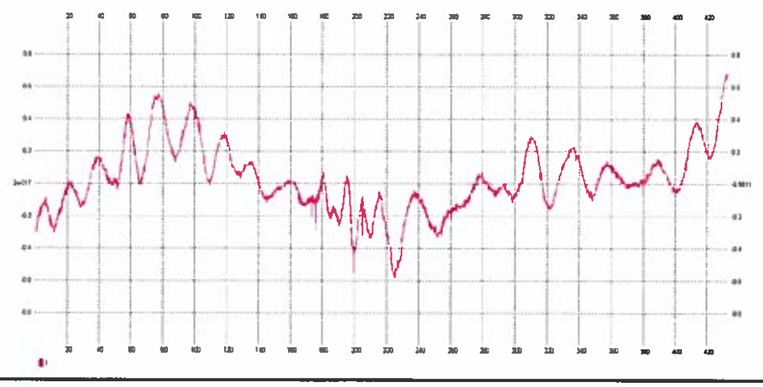
A. Total magnetic field contour plot



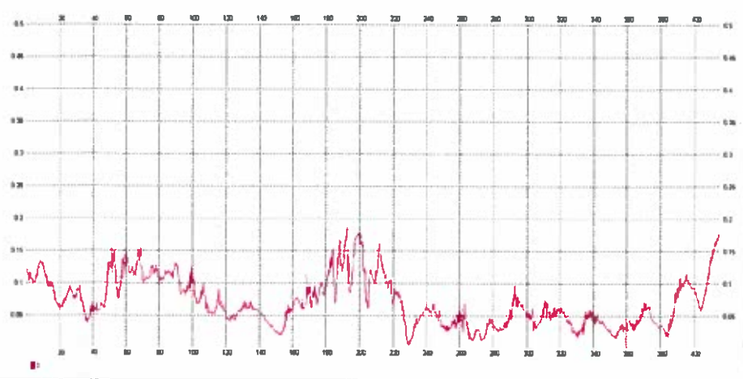
B. Quasi-analytical magnetic field contour plot

5721000
5720900
5720800
5720700
5720600
344100
344200
344300
344400

C. Total magnetic field profile



D. Quasi-analytical magnetic field profile



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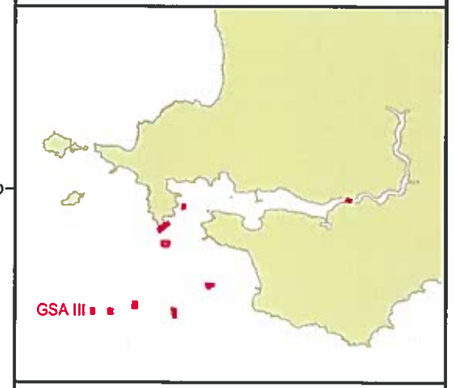


Geophysical Survey Area
Wreck location

0 100m

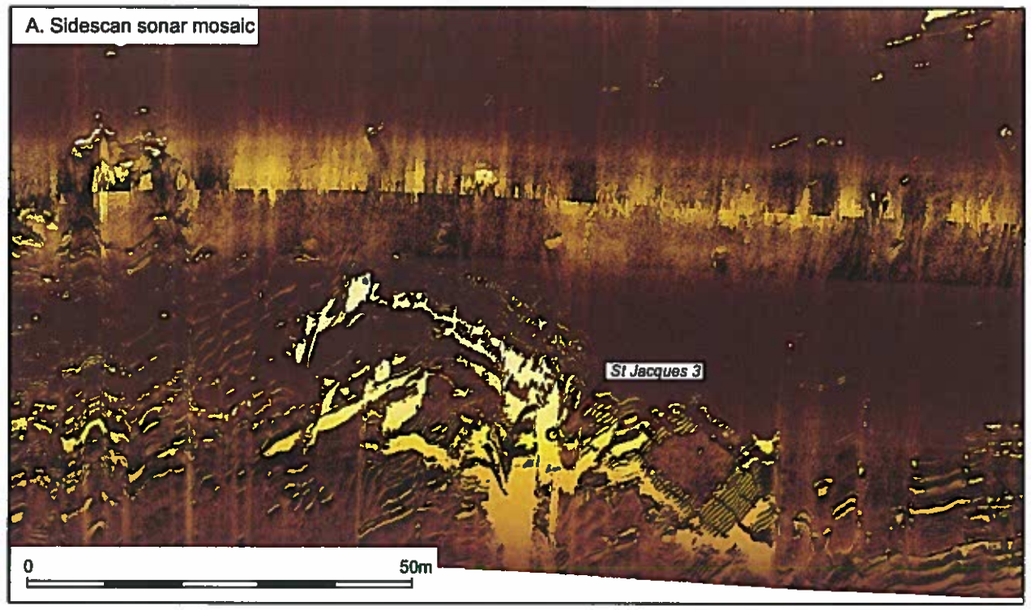
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:2500 (inset 1:500,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

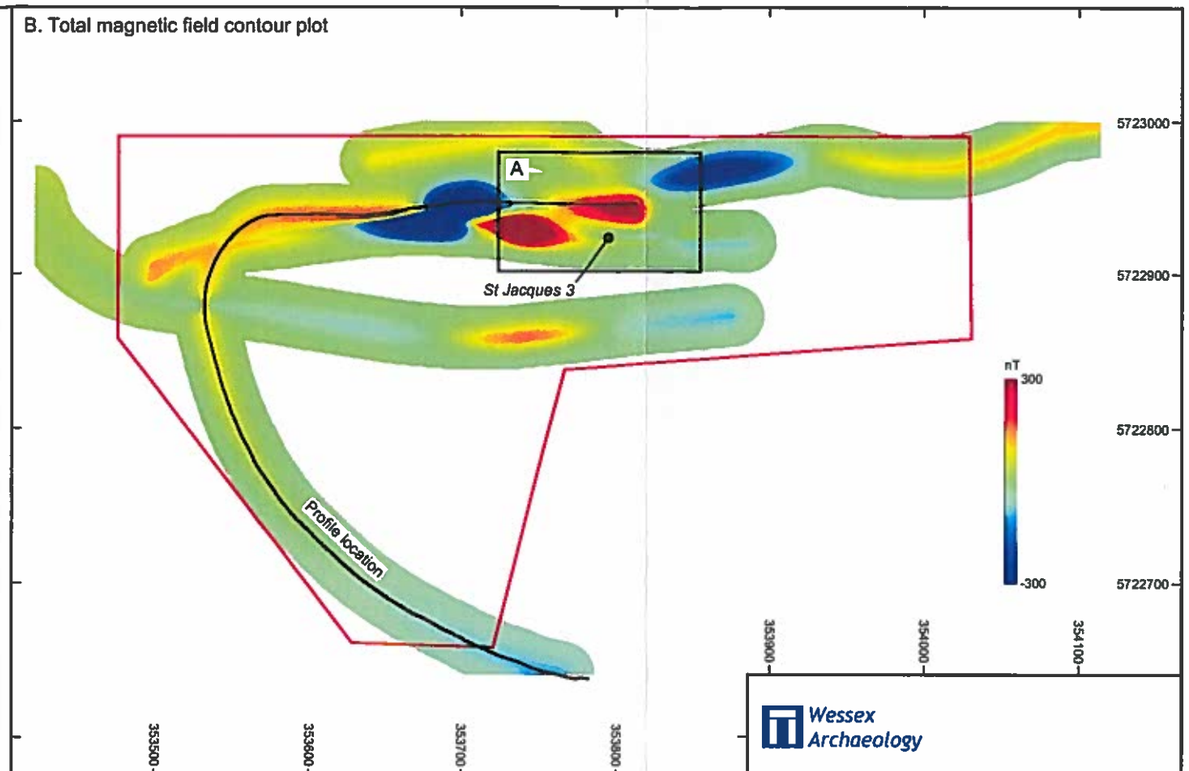
GSA III: Magnetometer colour plots

Figure 8

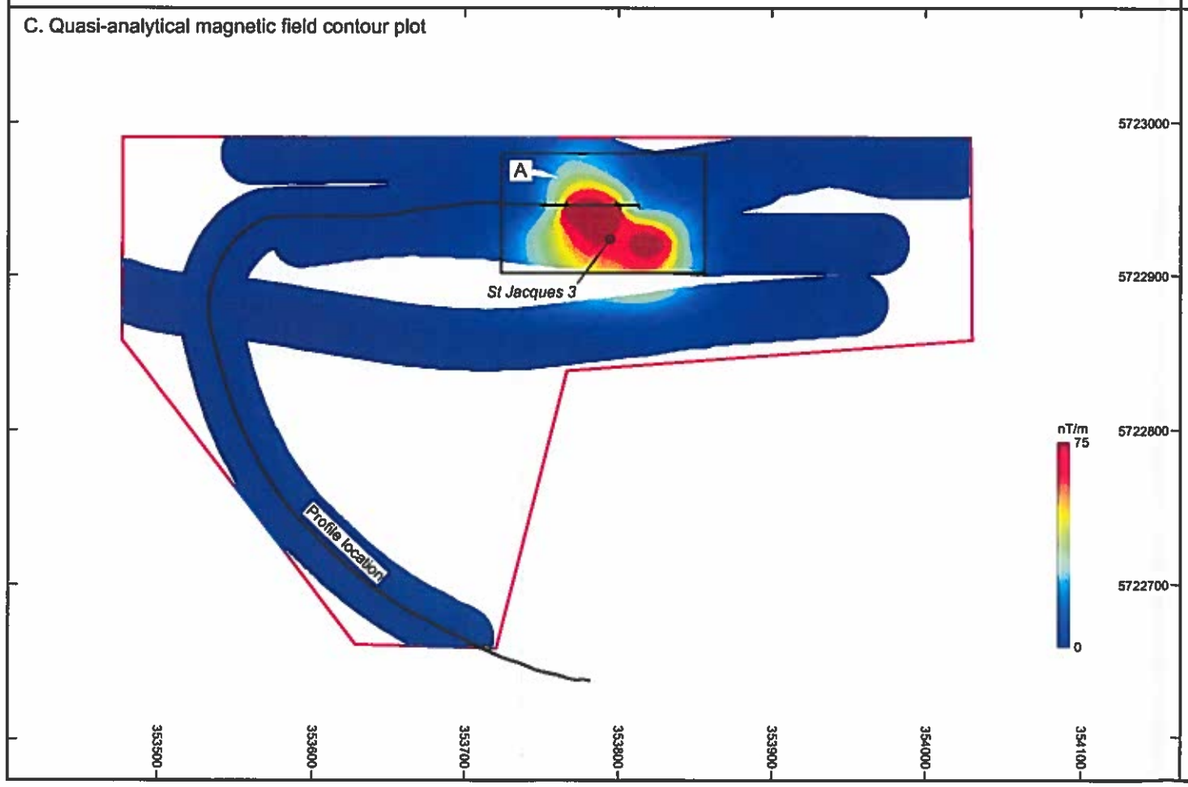
A. Sidescan sonar mosaic



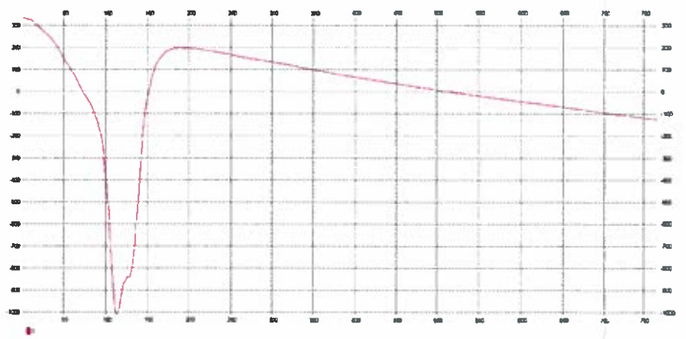
B. Total magnetic field contour plot



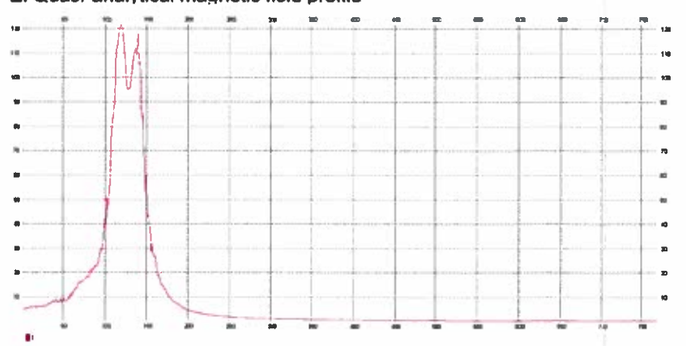
C. Quasi-analytical magnetic field contour plot

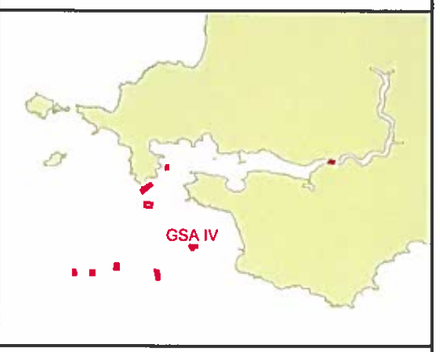


D. Total magnetic field profile



E. Quasi-analytical magnetic field profile





Geophysical Survey Area
Wreck location

0 100 200m

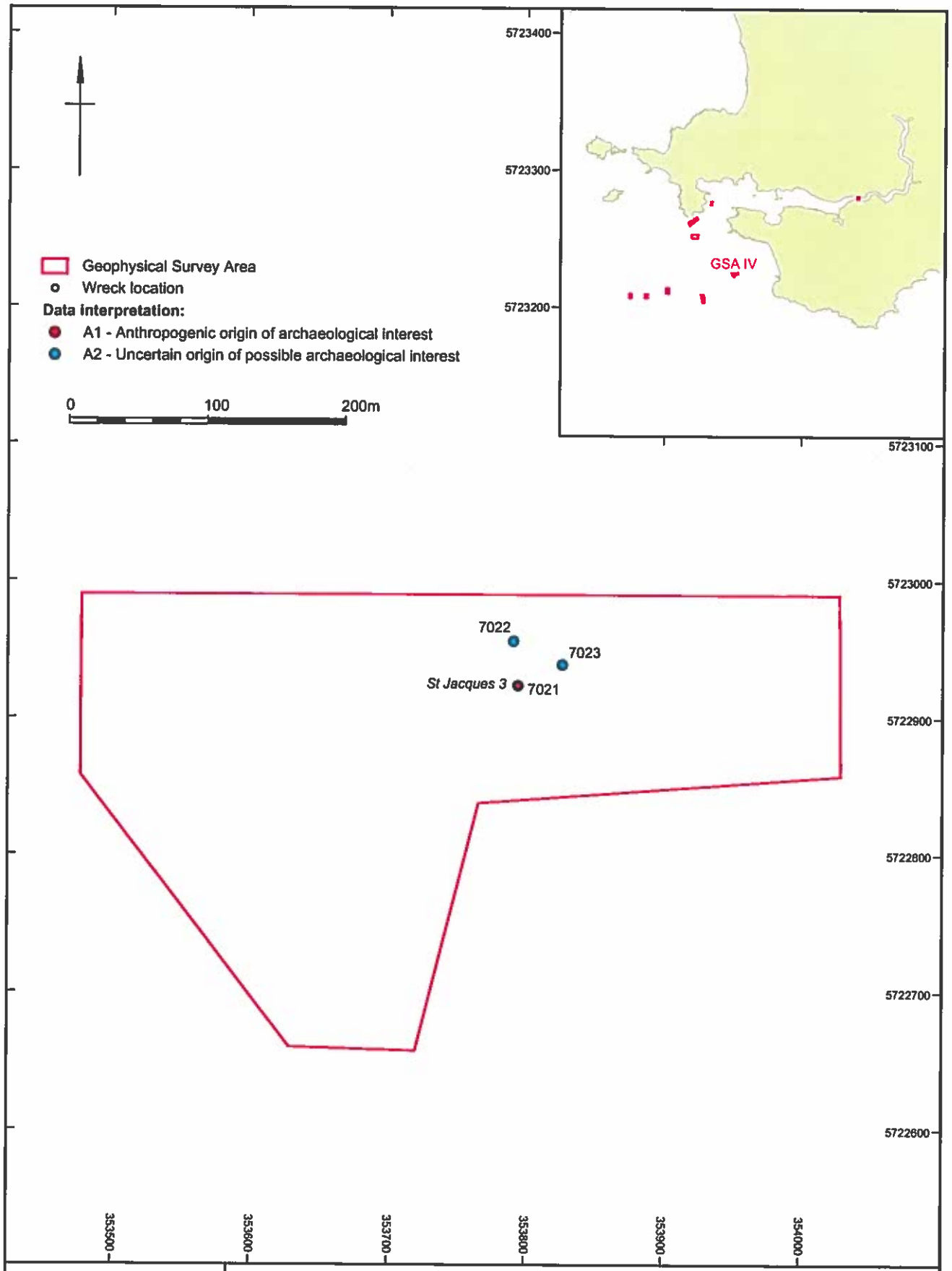
Wessex Archaeology

Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	A 1:800 B 1:4000 (inset 1:500,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA IV: Sidescan sonar mosaic and magnetometer plots

Figure 9



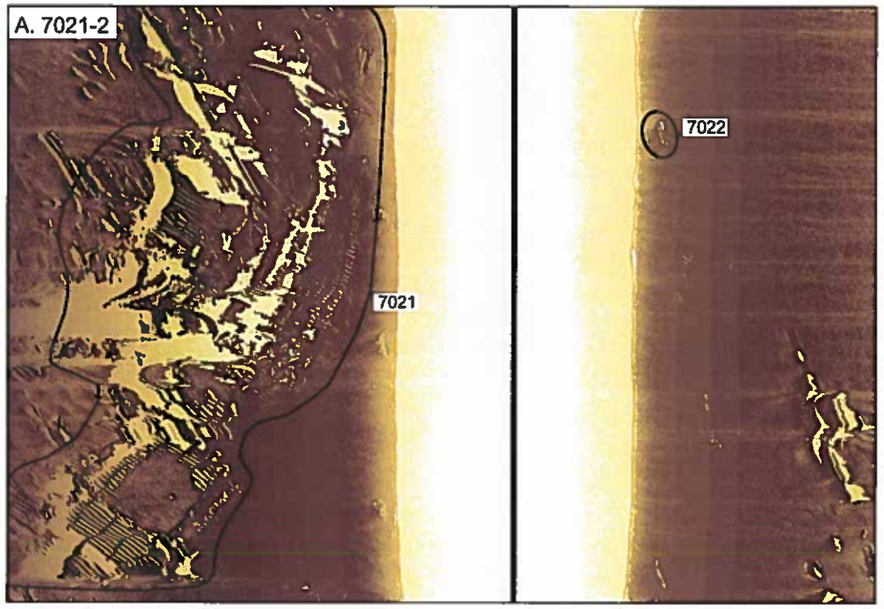
Drawing projection: UTM WGS84 Z30N

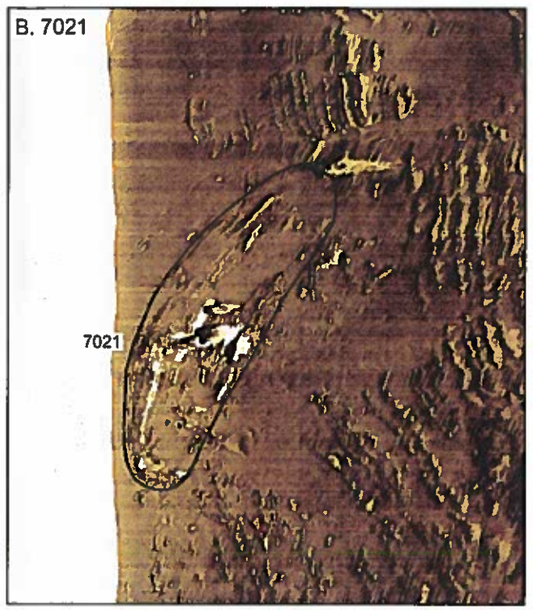
Date:	22/10/10	Revision Number:	0
Scale:	1:4000 (inset 1:500,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

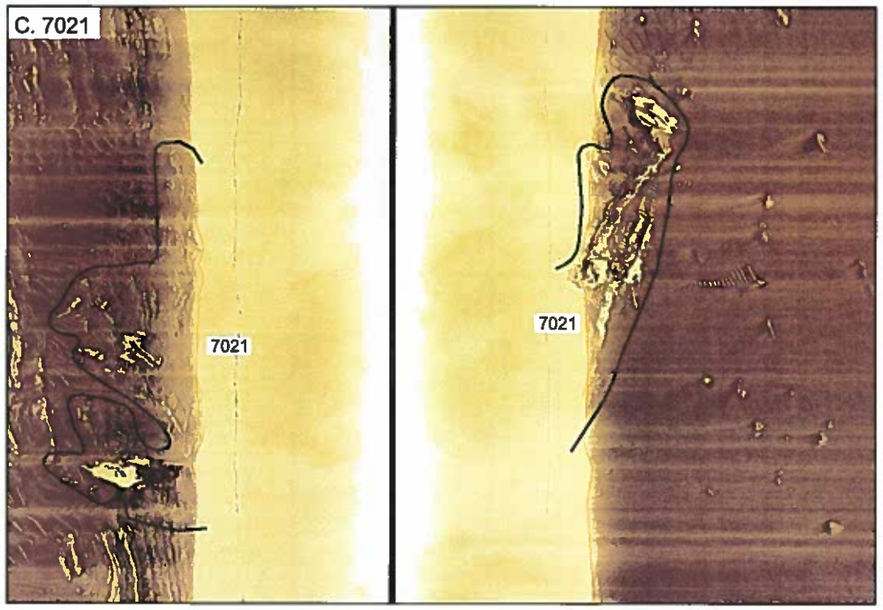
Wessex Archaeology

GSA IV: Data interpretation

Figure 10







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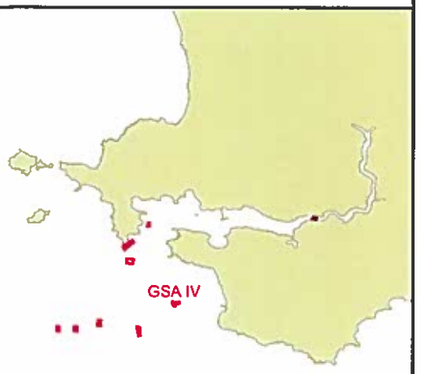
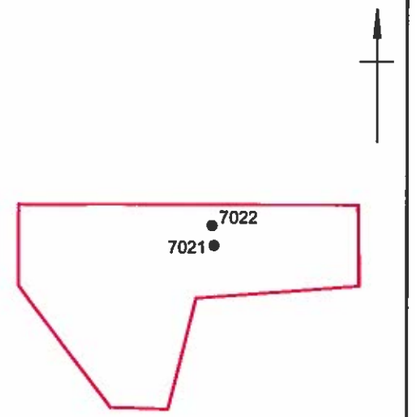




Geophysical Survey Area

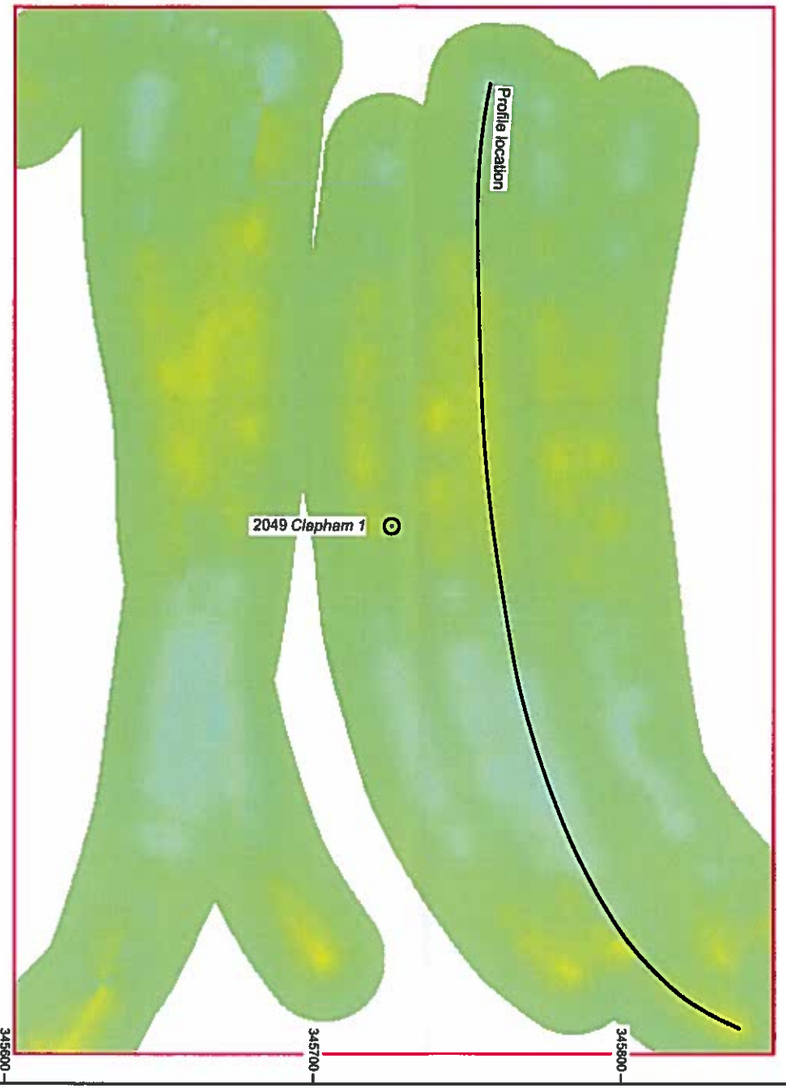
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	27/10/10
Scale:	NTS (insets 1:500,000 & 1:10,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA IV: Data samples

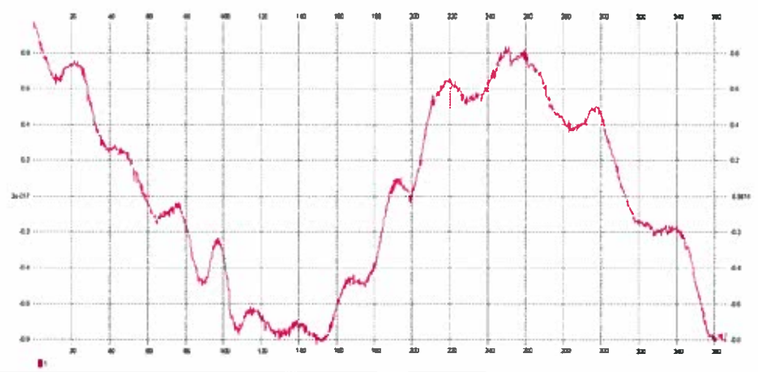
Figure 11

A. Total magnetic field contour plot

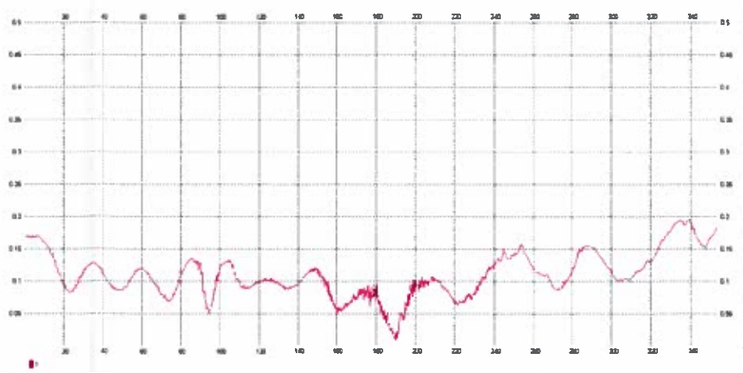


B. Quasi-analytical magnetic field contour plot

C. Total magnetic field profile



D. Quasi-analytical magnetic field profile



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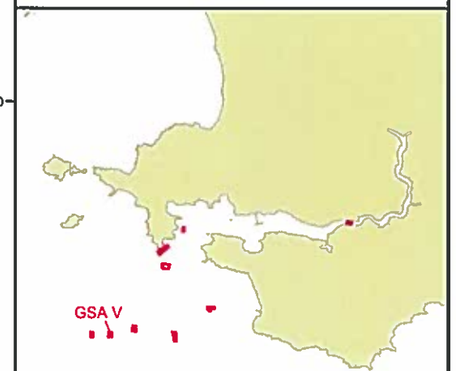


Geophysical Survey Area
Wreck location

0 100m

Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:2000 (inset 1:500,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA V: Magnetometer plots

Figure 12

A. Total magnetic field contour plot

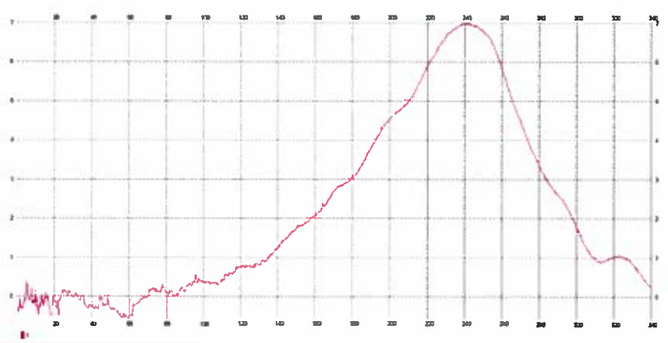
B. Quasi-analytical magnetic field contour plot

Wessex Archaeology

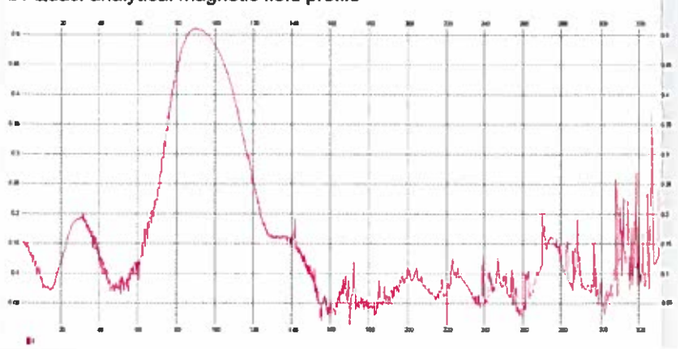
Geophysical Survey Area
Wreck location

0 100m

C. Total magnetic field profile



D. Quasi-analytical magnetic field profile



Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:2500 (Inset 1:500,000) @A3
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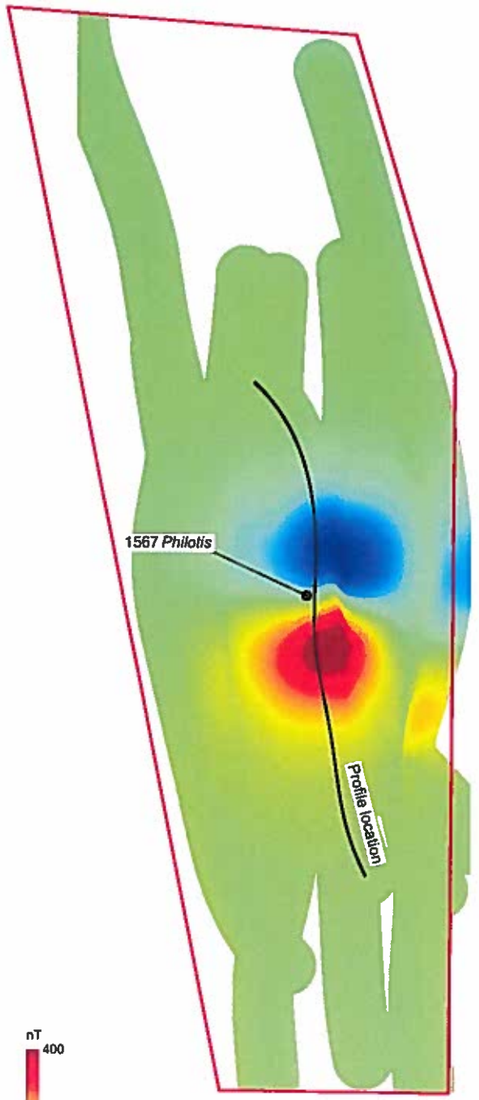
GSA VI: Magnetometer plots

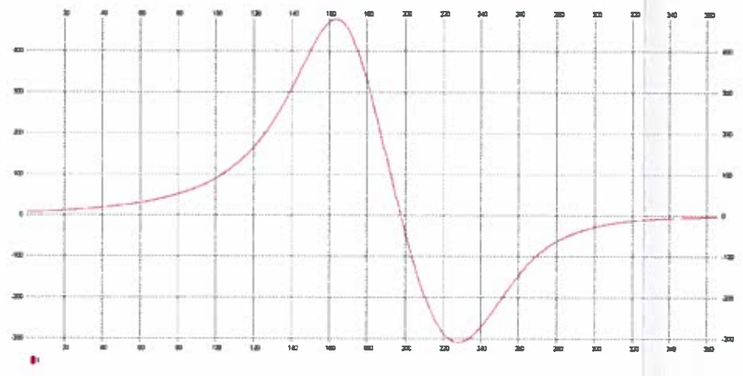
Figure 13

A. Total magnetic field contour plot

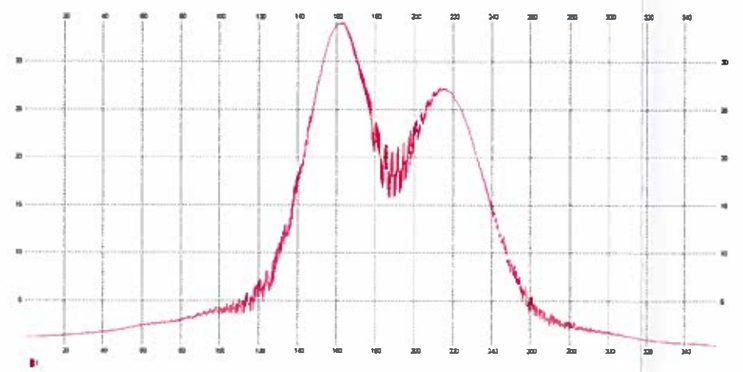


B. Quasi-analytical magnetic field contour plot

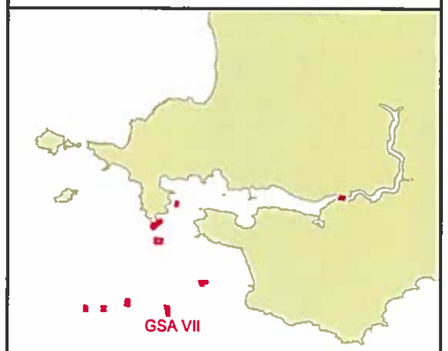
C. Total magnetic field profile



D. Quasi-analytical magnetic field profile



Wessex Archaeology



Geophysical Survey Area
Wreck location

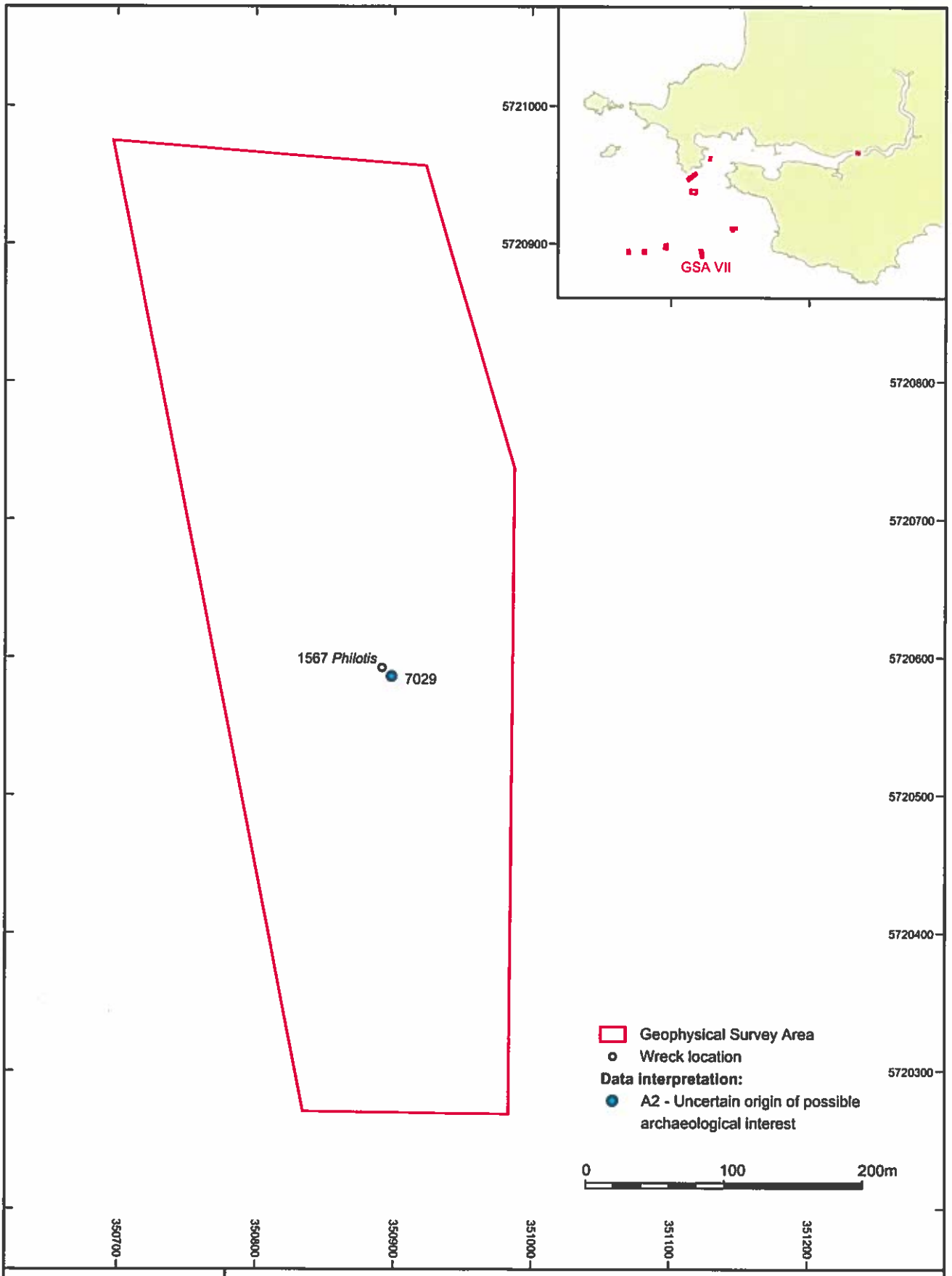
0 100 200m

Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:4000 (inset 1:500,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA VII: Magnetometer plots

Figure 14



Drawing projection: UTM WGS84 Z30N

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Scale:	1:4000 (inset 1:500,000) @A4	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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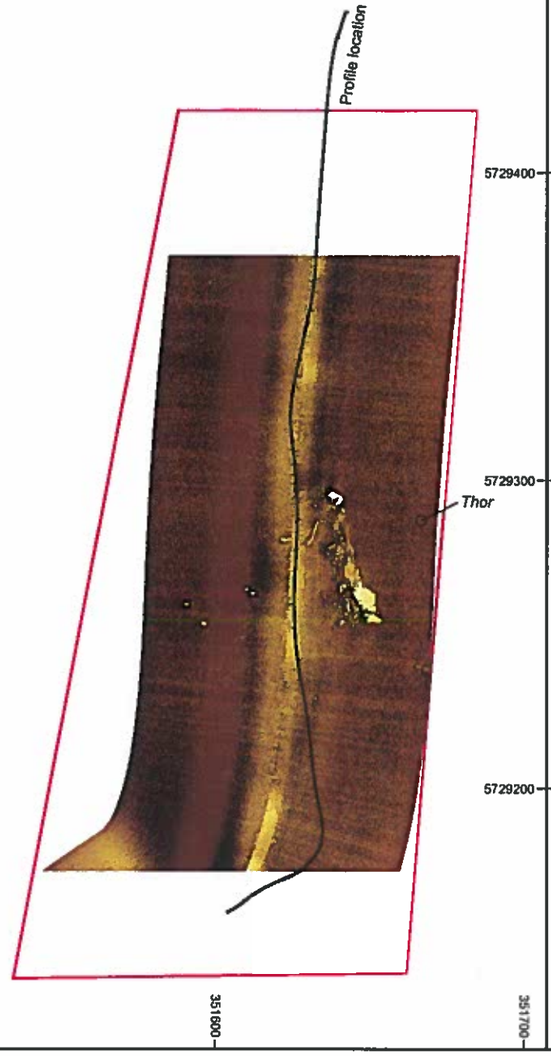
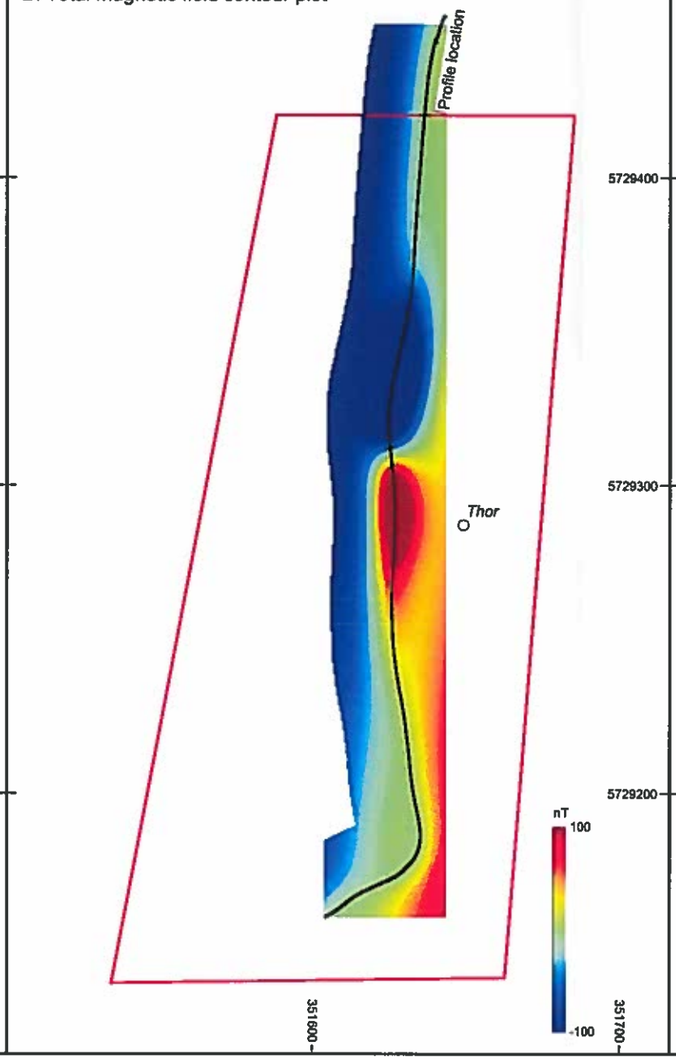
GSA VII: Data interpretation

Figure 15

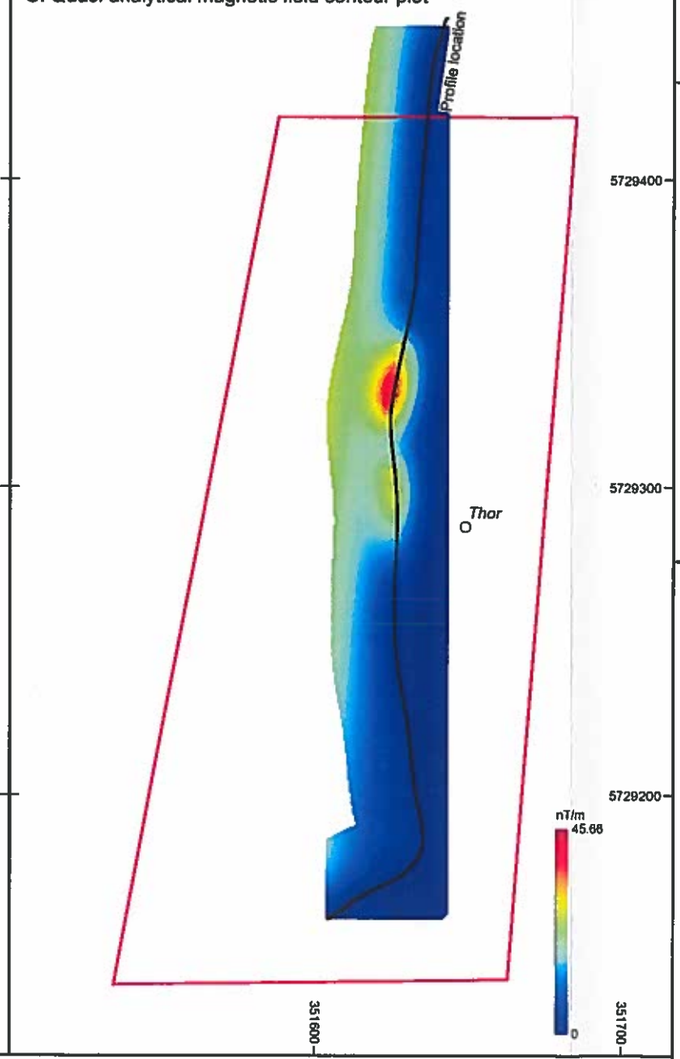
A. Sidescan sonar mosaic



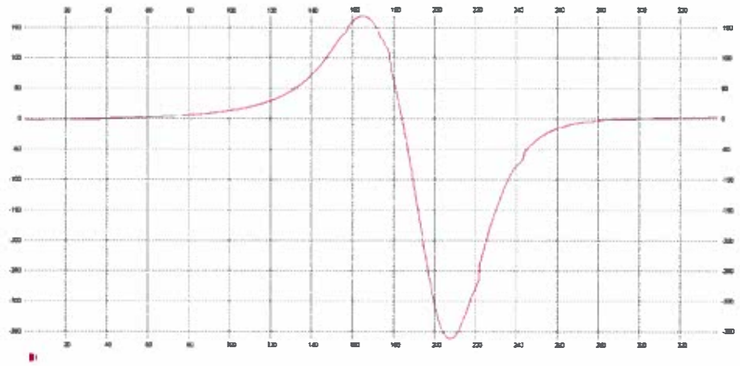
B. Total magnetic field contour plot



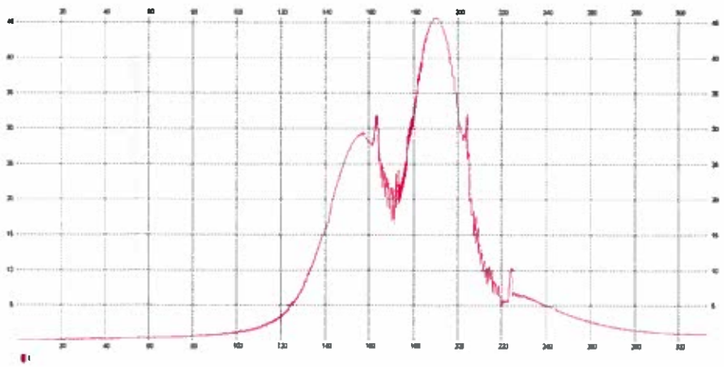
C. Quasi-analytical magnetic field contour plot

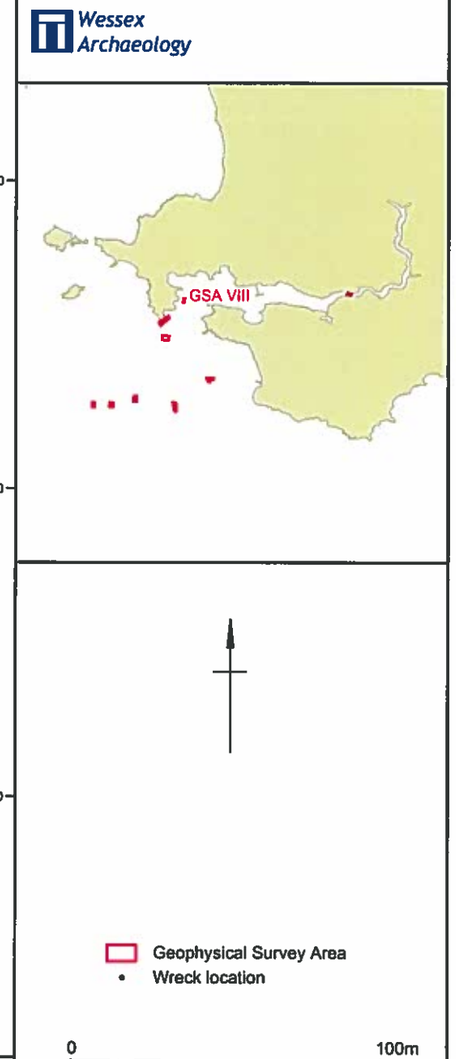


D. Total magnetic field profile



E. Quasi-analytical magnetic field profile





Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:2000 (inset 1:500,000) @A3
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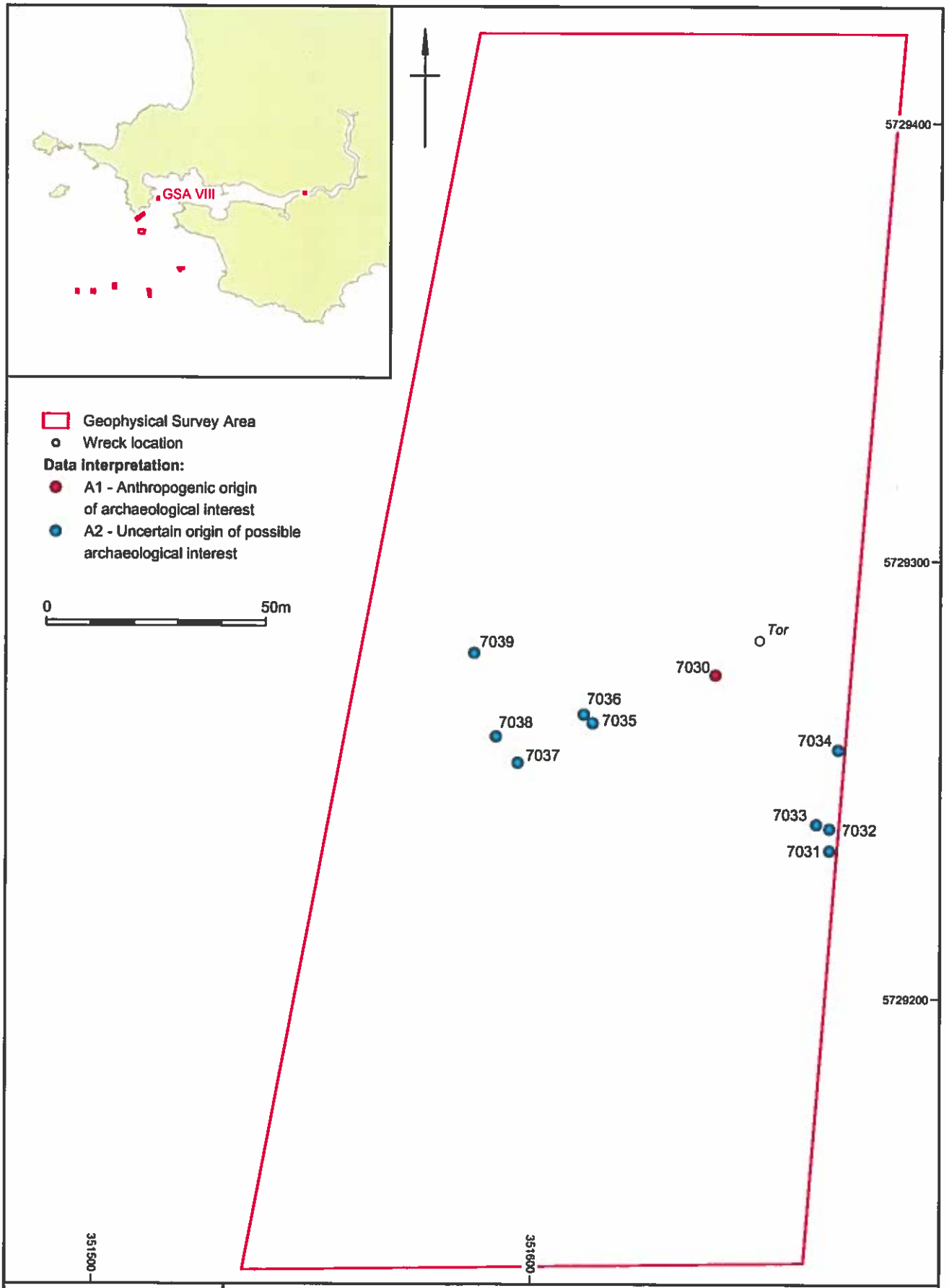
GSA VIII: Sidescan sonar mosaic and magnetometer plots

Figure 16



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:1250 (Inset 1:500,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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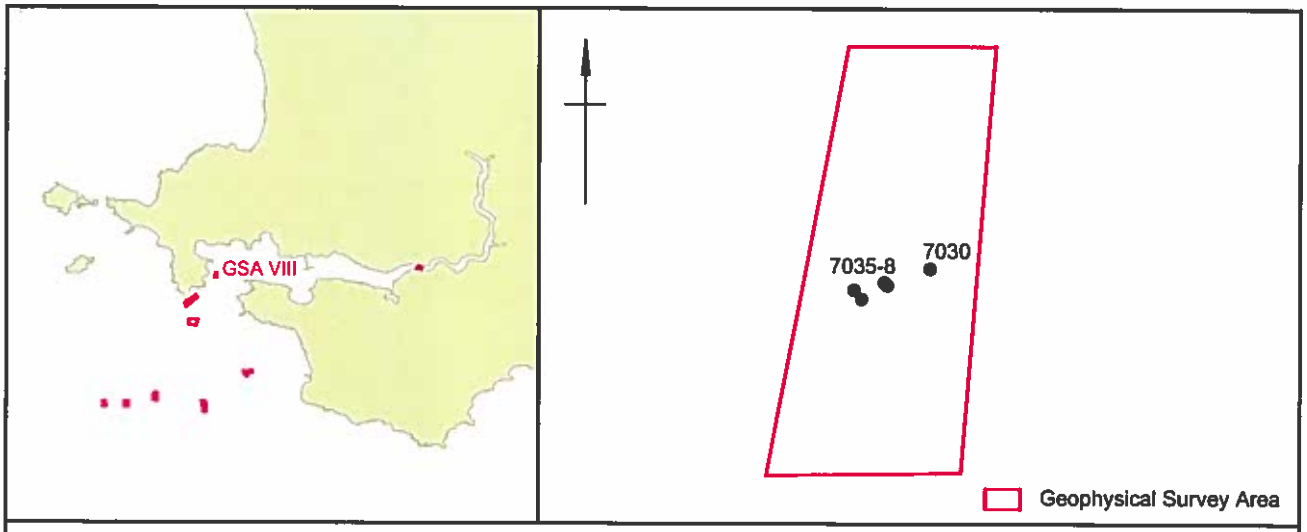
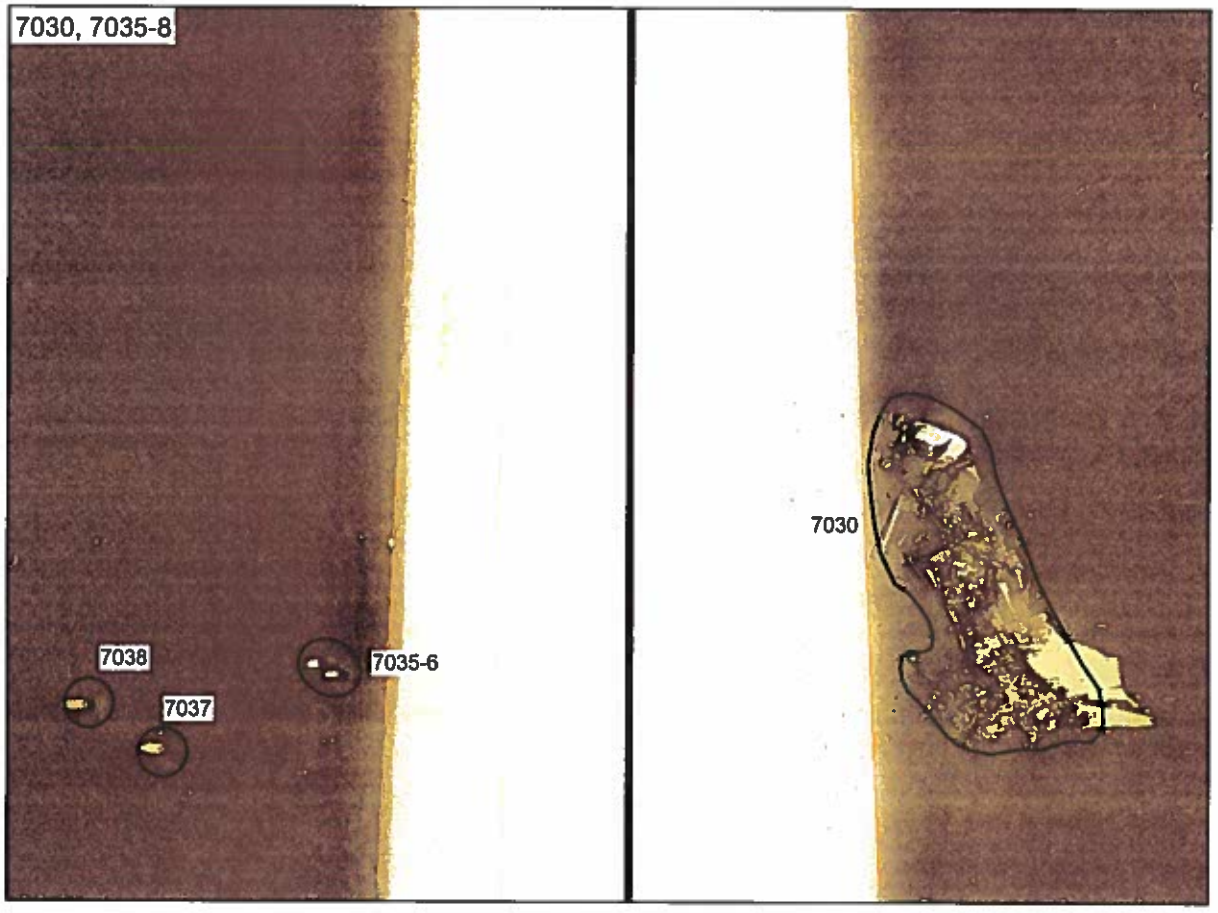
GSA VIII: Data interpretation

Figure 17





Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	NTS (insets 1:500,000 & 1:5000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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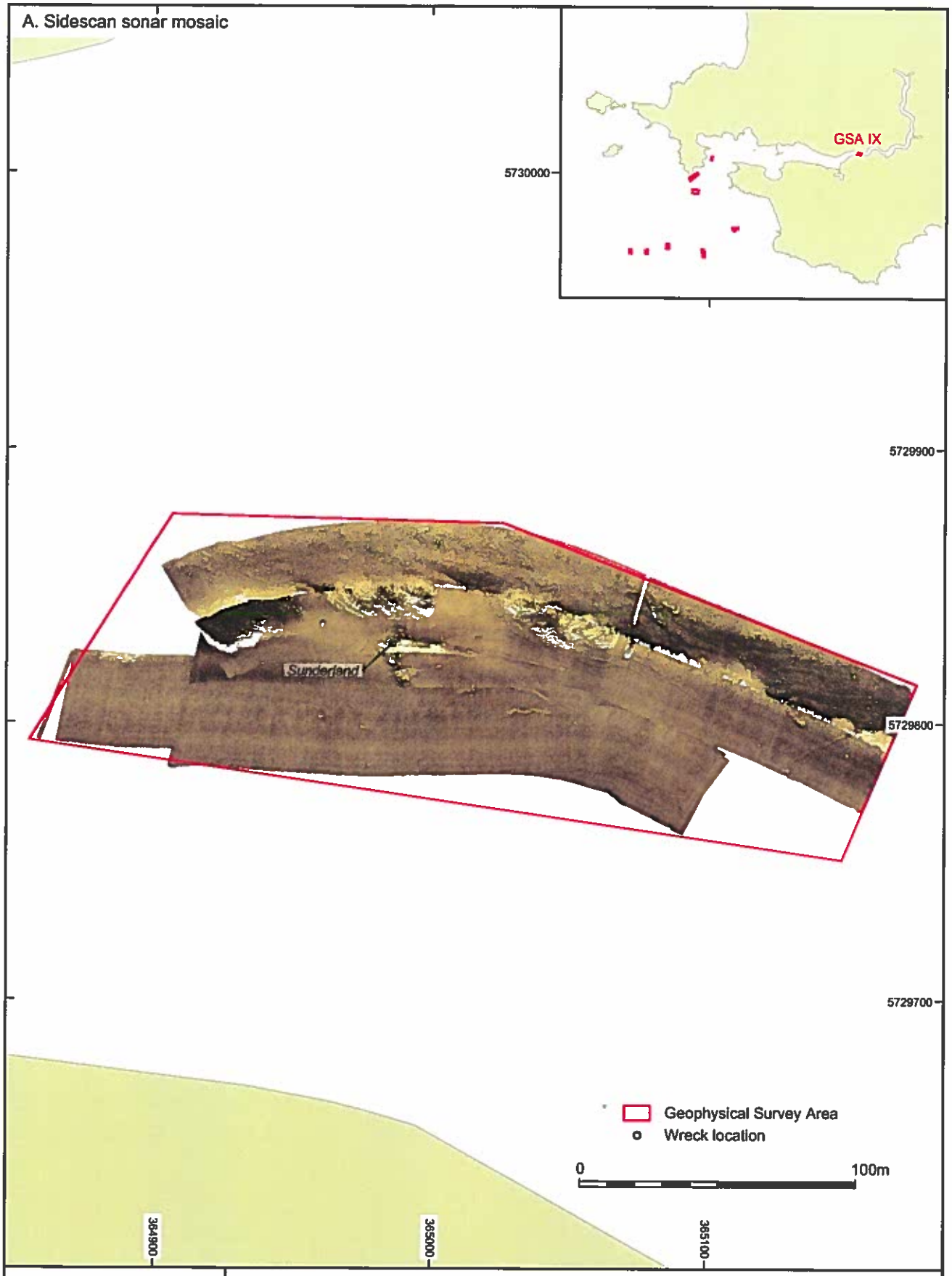
GSA VIII: Data sample

Figure 18



Drawing projection: UTM WGS84 Z30N

Date:	23/08/10	Revision Number:	0
Scale:	1:2000 (inset 1:500,000) @A4	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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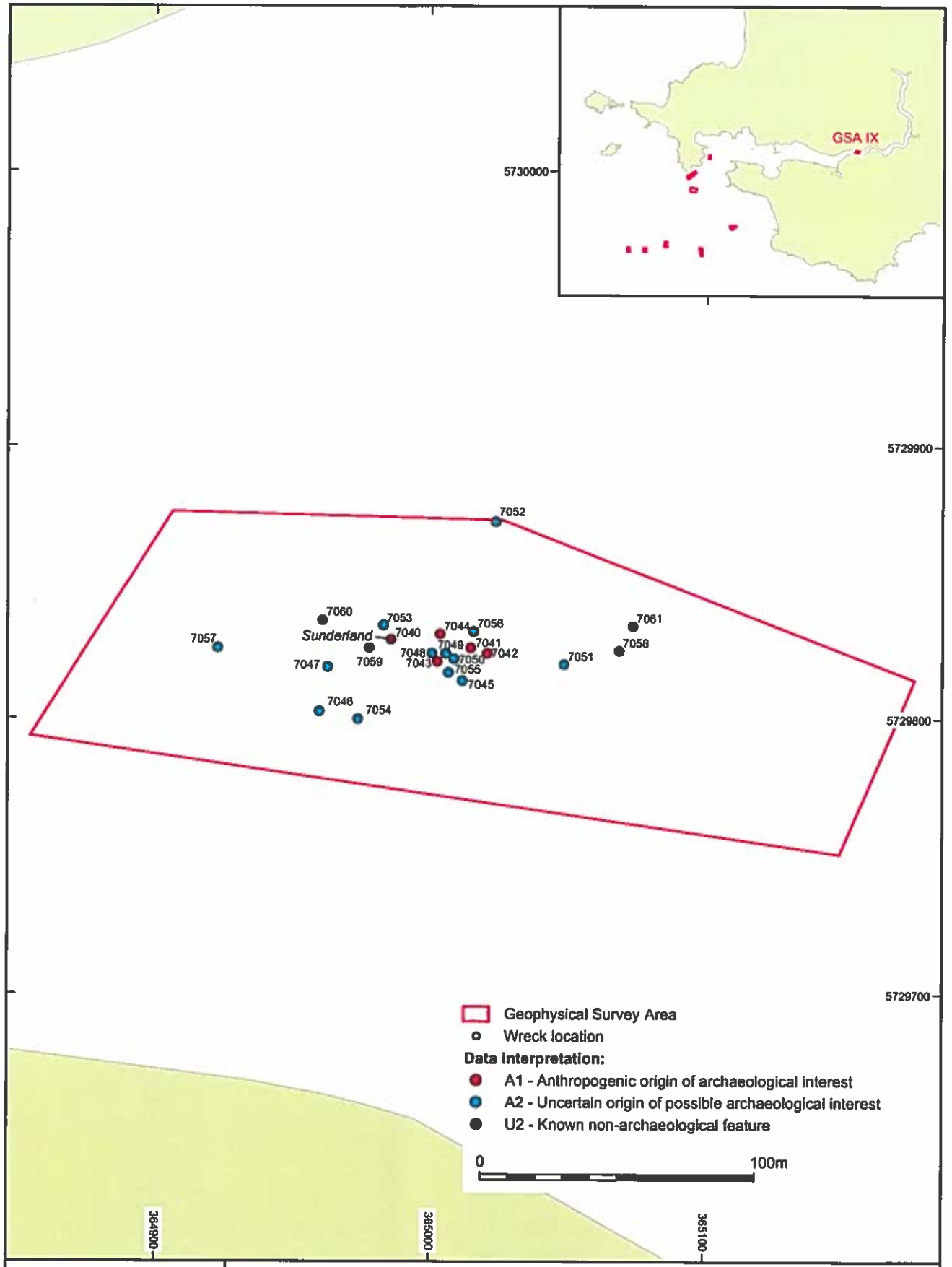
GSA IX: Sidescan sonar mosaic

Figure 19



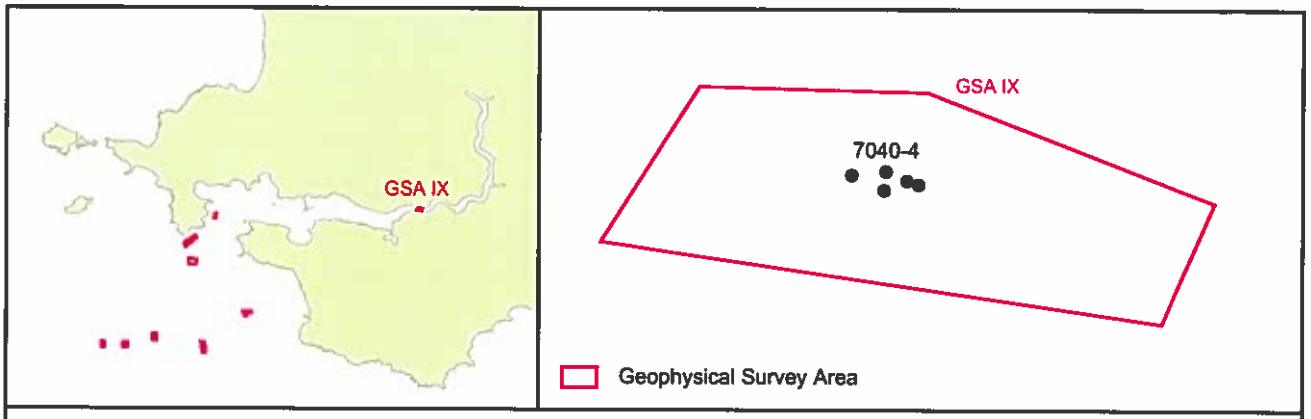
Drawing projection: UTM WGS84 Z30N

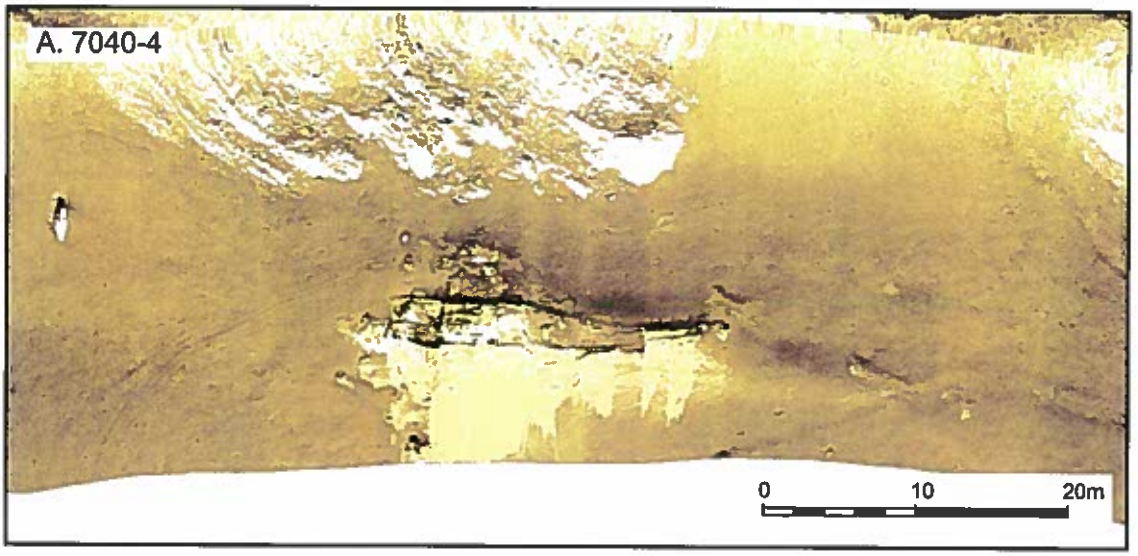
Date:	25/10/10	Revision Number:	0
Scale:	1:2000 (inset 1:500,000) @A4	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

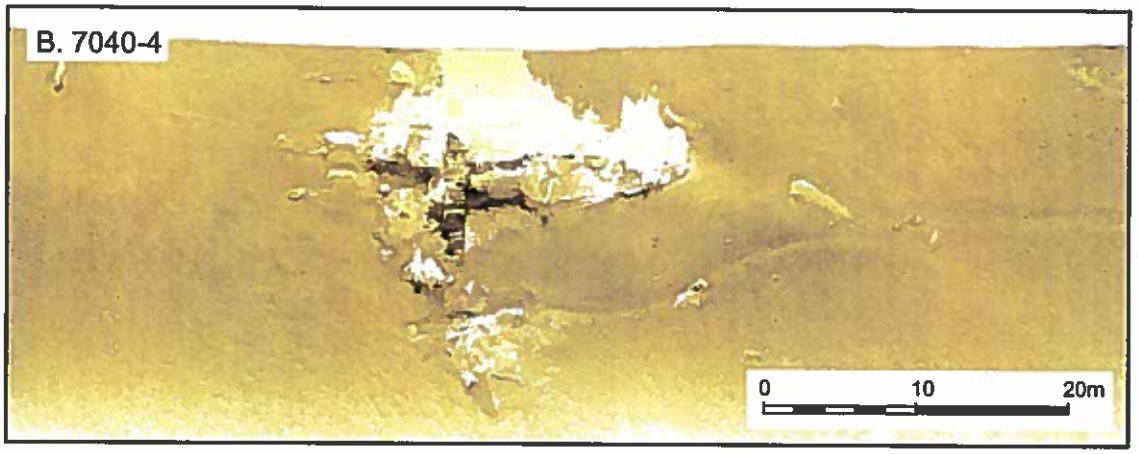
Wessex Archaeology

GSA IX: Data interpretation

Figure 20







Drawing projection: UTM WGS84 Z30N

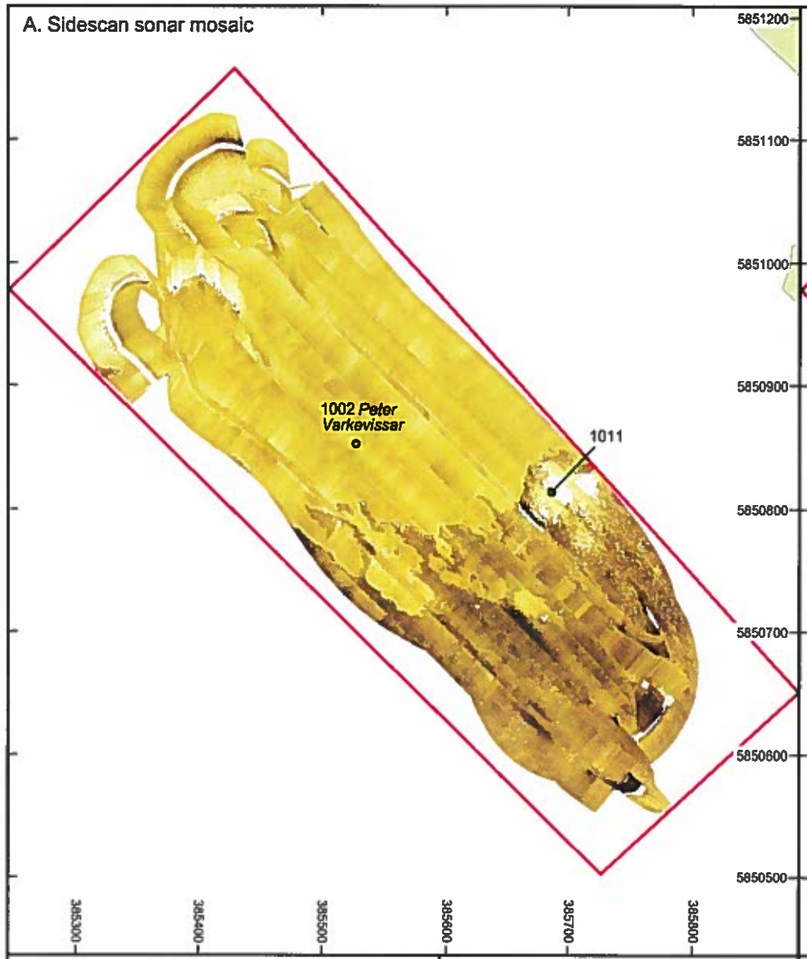
Date:	25/10/10	Revision Number:	0
Scale:	1:500 (insets 1:500,000 & 1:10,000) @A4	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

Wessex Archaeology

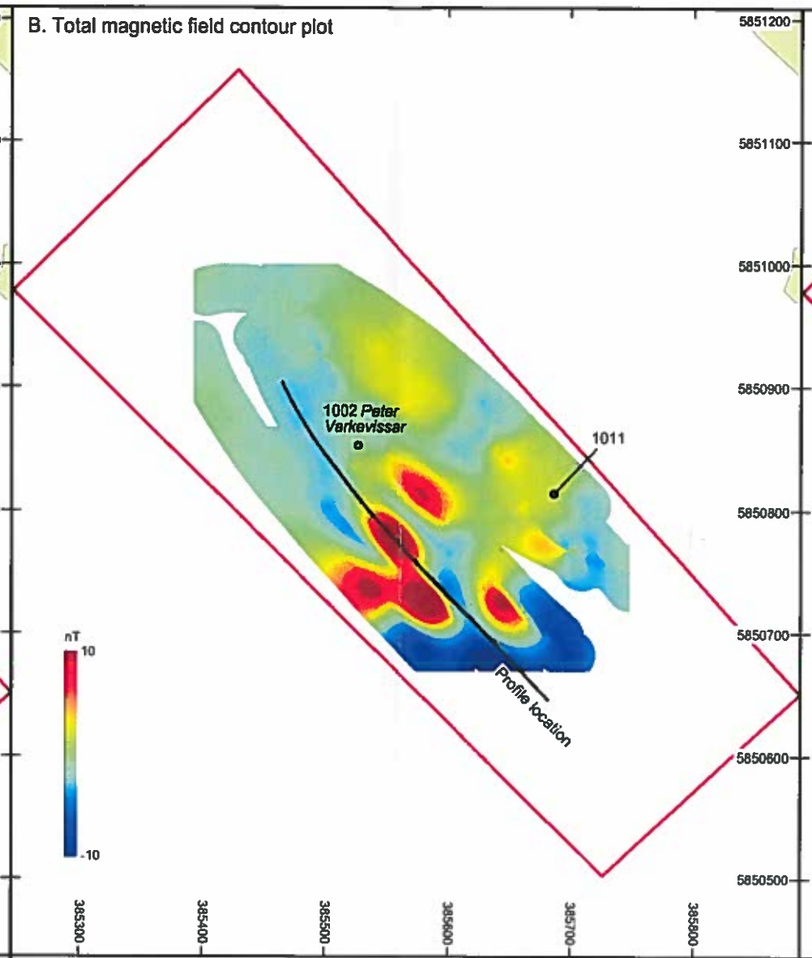
GSA IX: Data samples

Figure 21

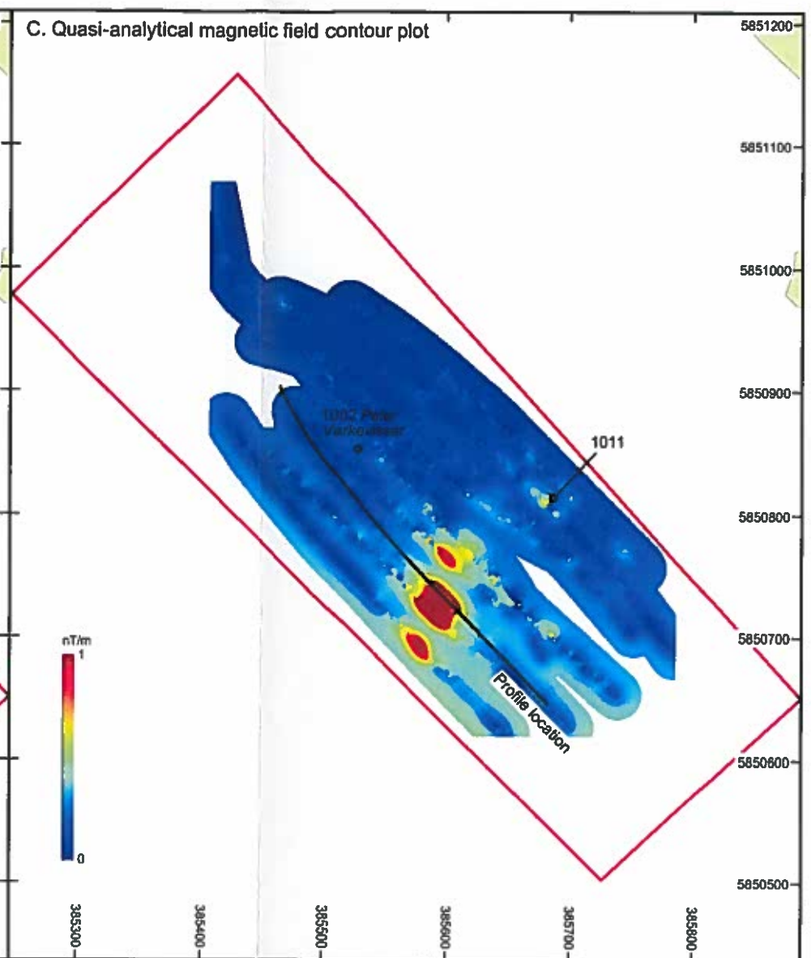
A. Sidescan sonar mosaic



B. Total magnetic field contour plot



C. Quasi-analytical magnetic field contour plot



5851200 5851100 5851000 5850900 5850800 5850700 5850600 5850500

385300 385400 385500 385600 385700 385800

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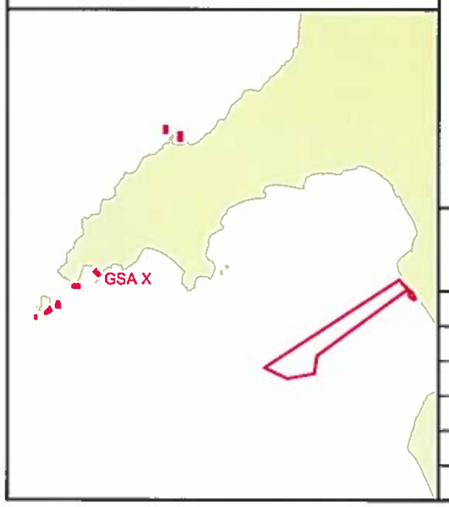


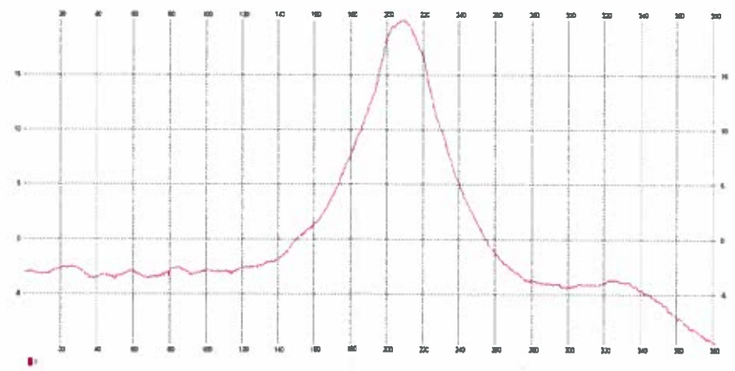
Geophysical Survey Area
Wreck location

0 100 200m

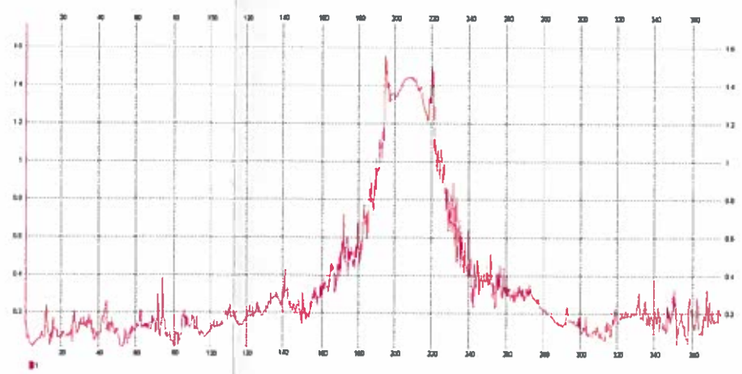
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:5000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 DO Report Figures\2010\Welsh Geophys

D. Total magnetic field profile

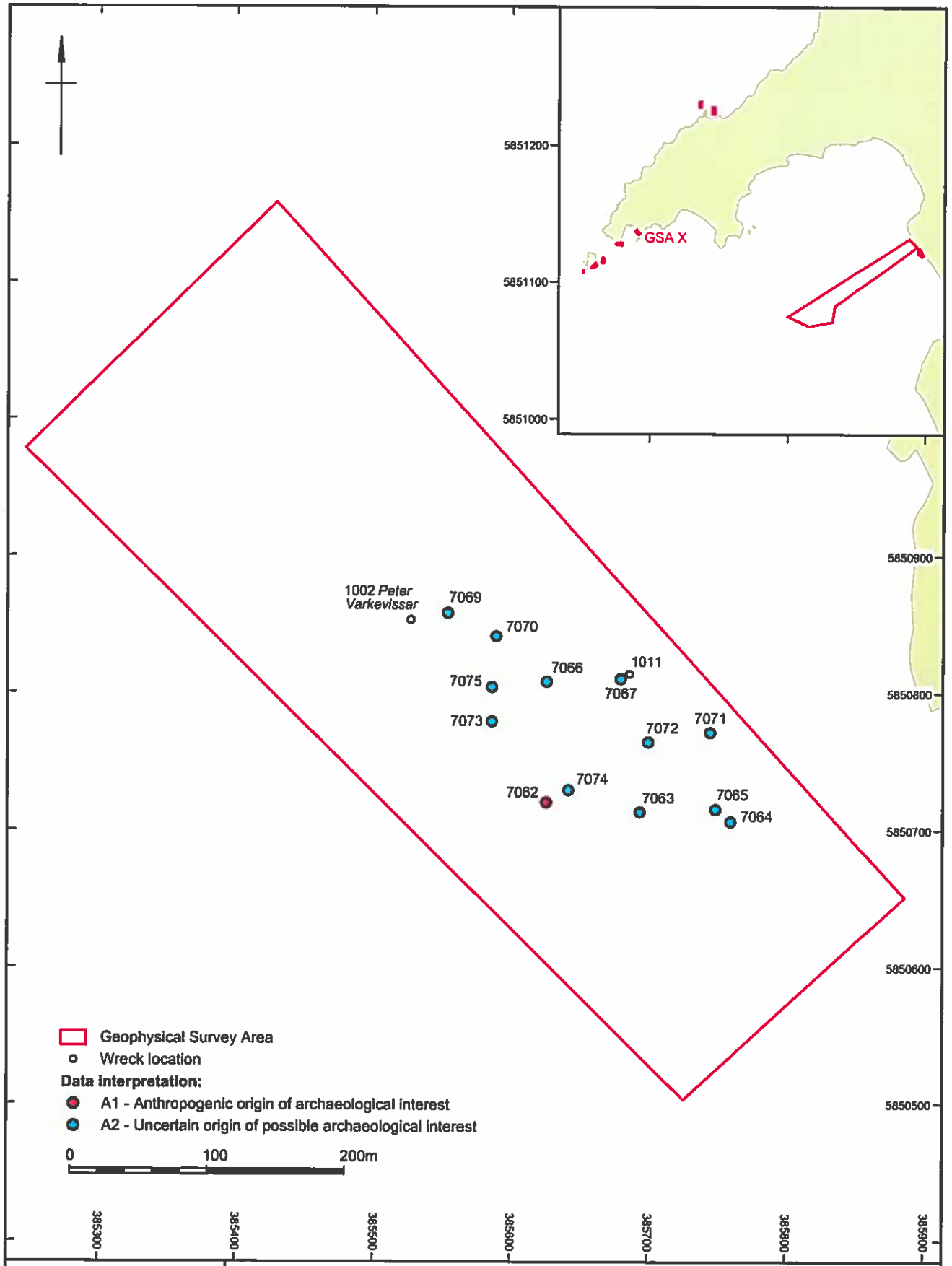


E. Quasi-analytical magnetic field profile



GSA X: Sidescan sonar mosaic and magnetometer plots

Figure 22



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:4000 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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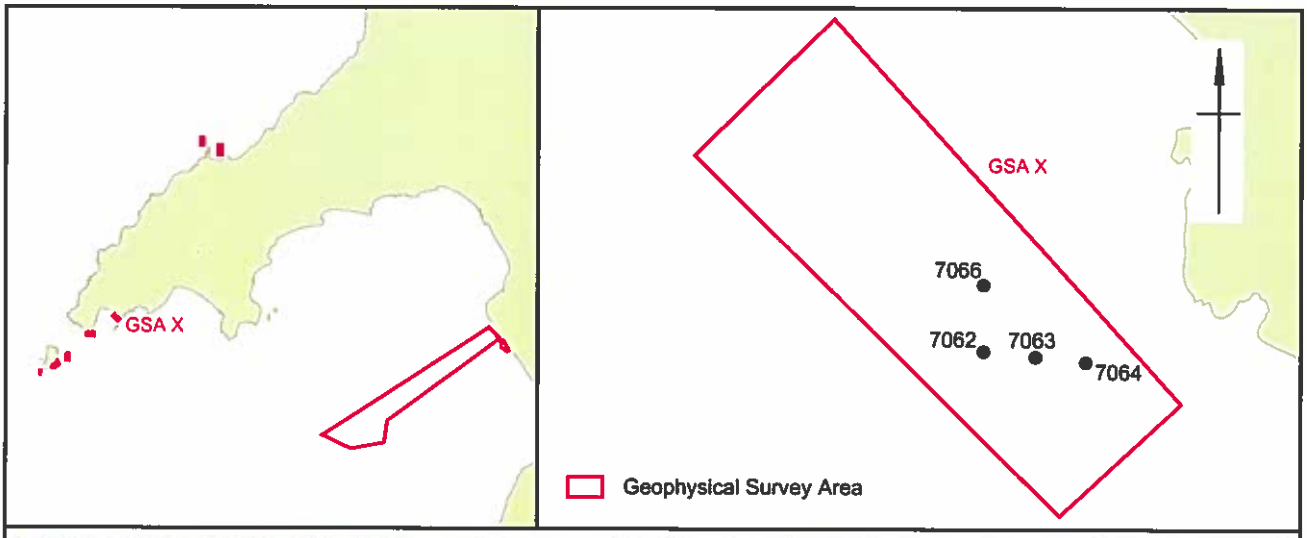
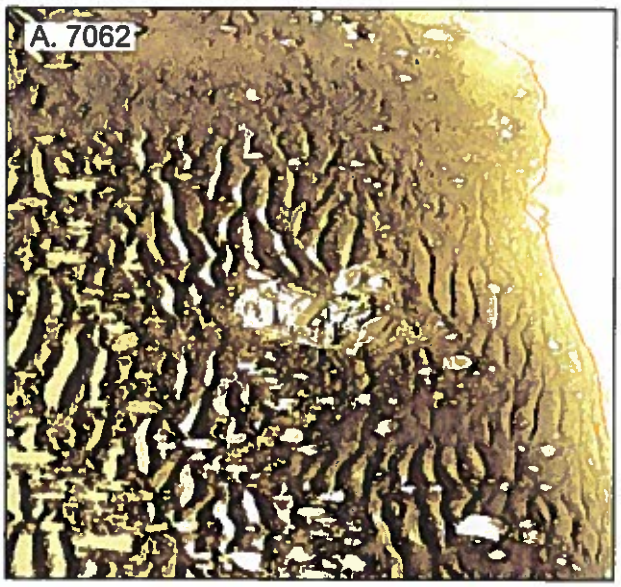
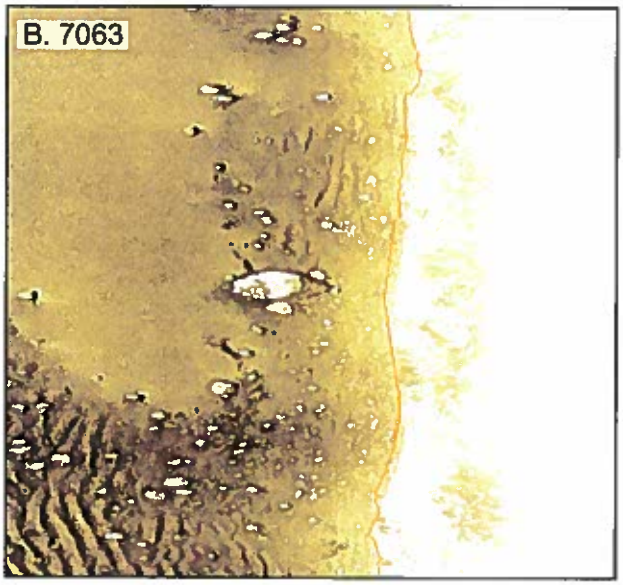
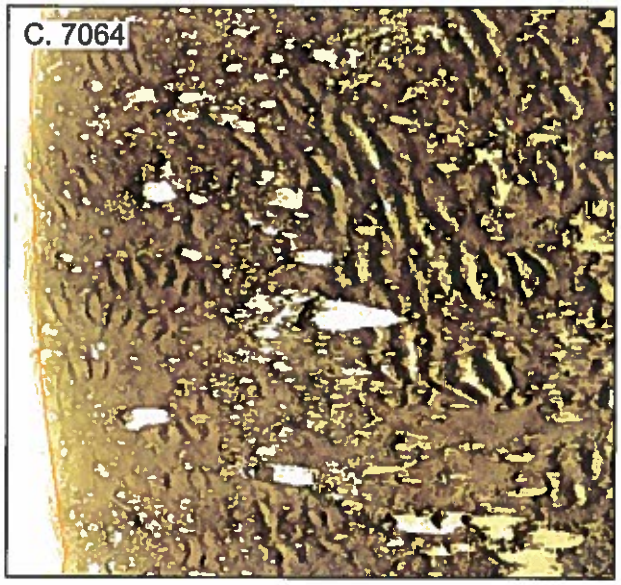
GSA X: Data interpretation

Figure 23









Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	NTS (insets 1:750,000 & 1:10,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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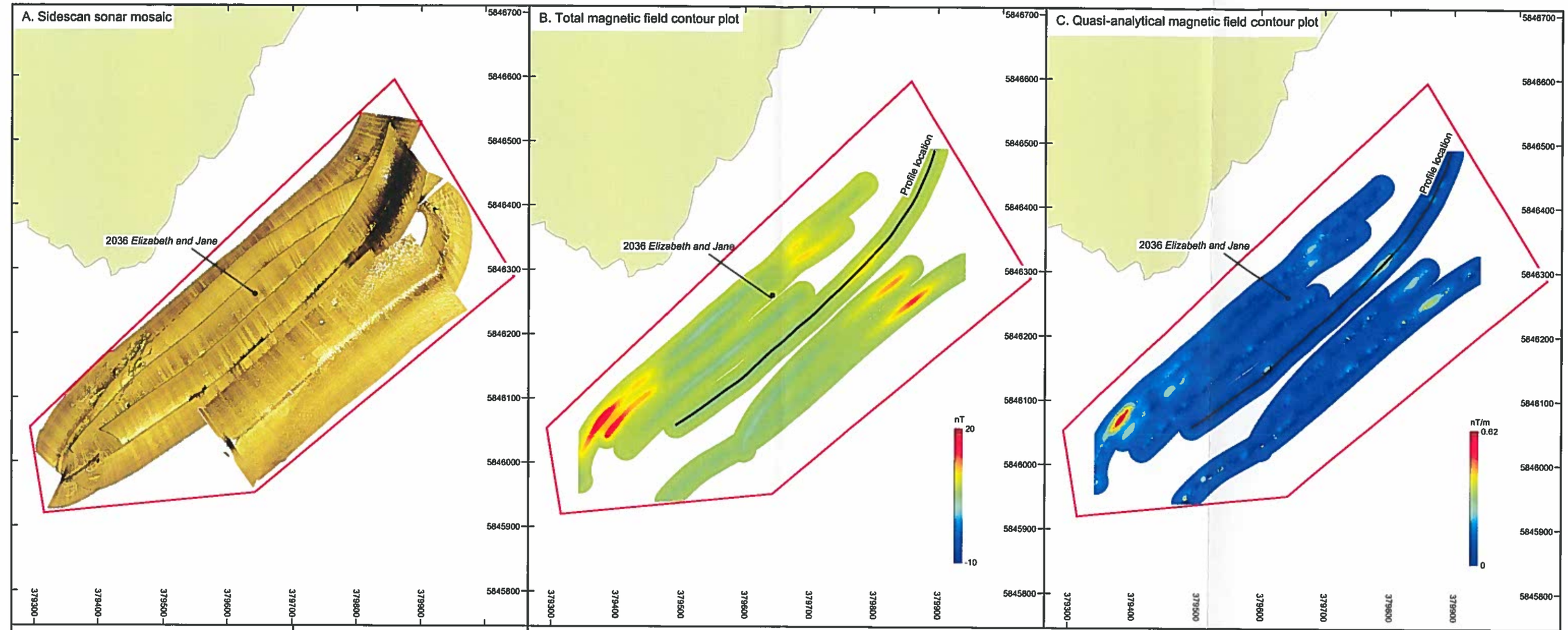
GSA X: Data sample

Figure 24

A. Sidescan sonar mosaic

B. Total magnetic field contour plot

C. Quasi-analytical magnetic field contour plot



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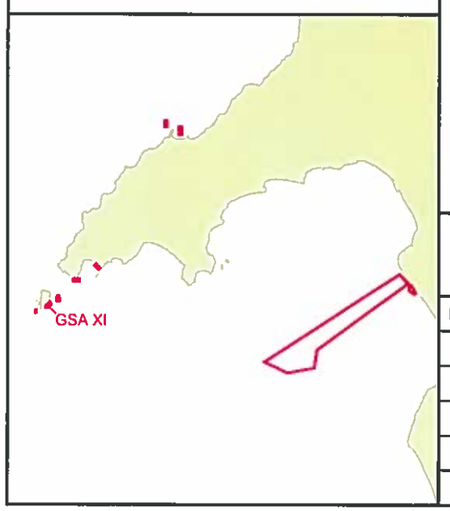


Geophysical Survey Area

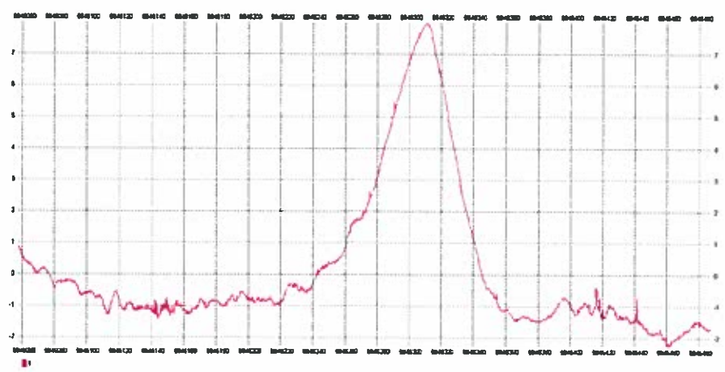
Wreck location

0 200m

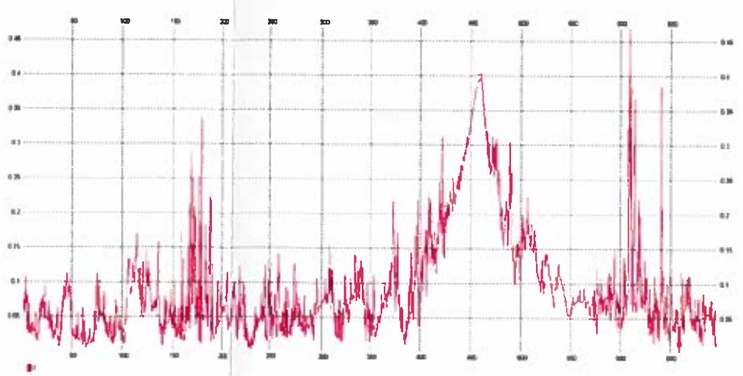
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:6250 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 DO Report Figures\2010\Welsh Geophys

D. Total magnetic field profile

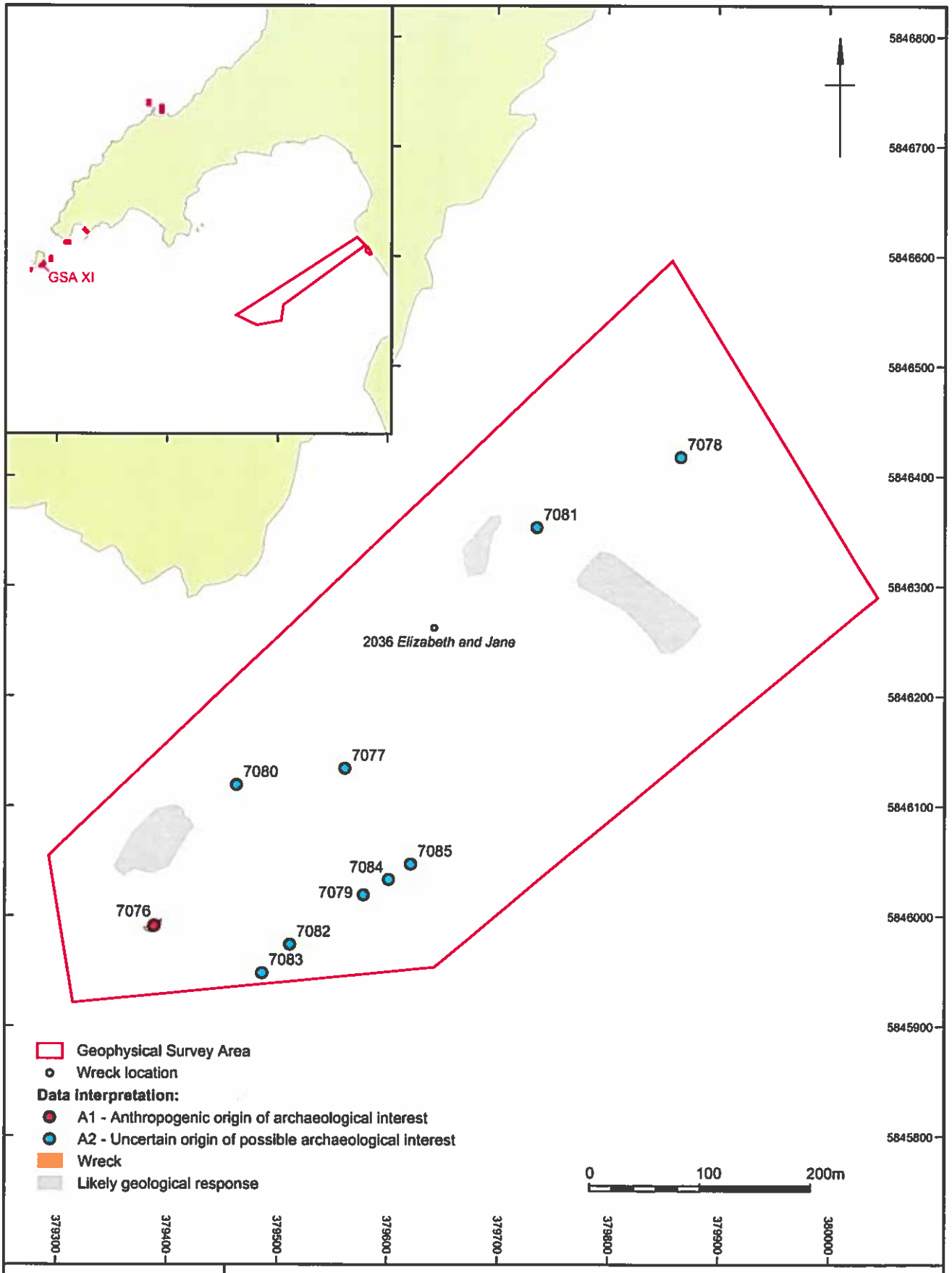


E. Quasi-analytical magnetic field profile



GSA XI: Sidescan sonar mosaic and magnetometer plots

Figure 25



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:5000 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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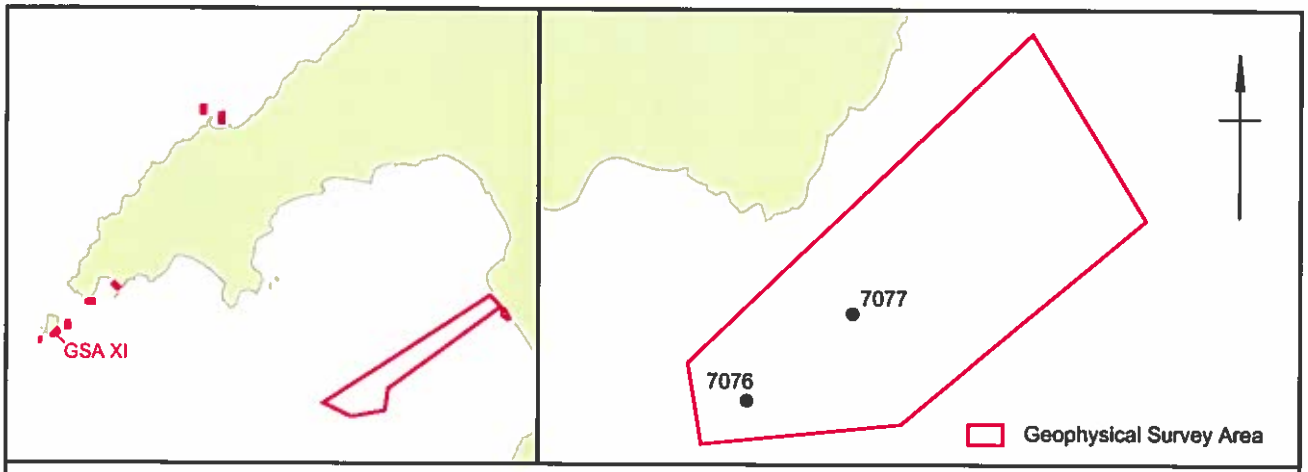
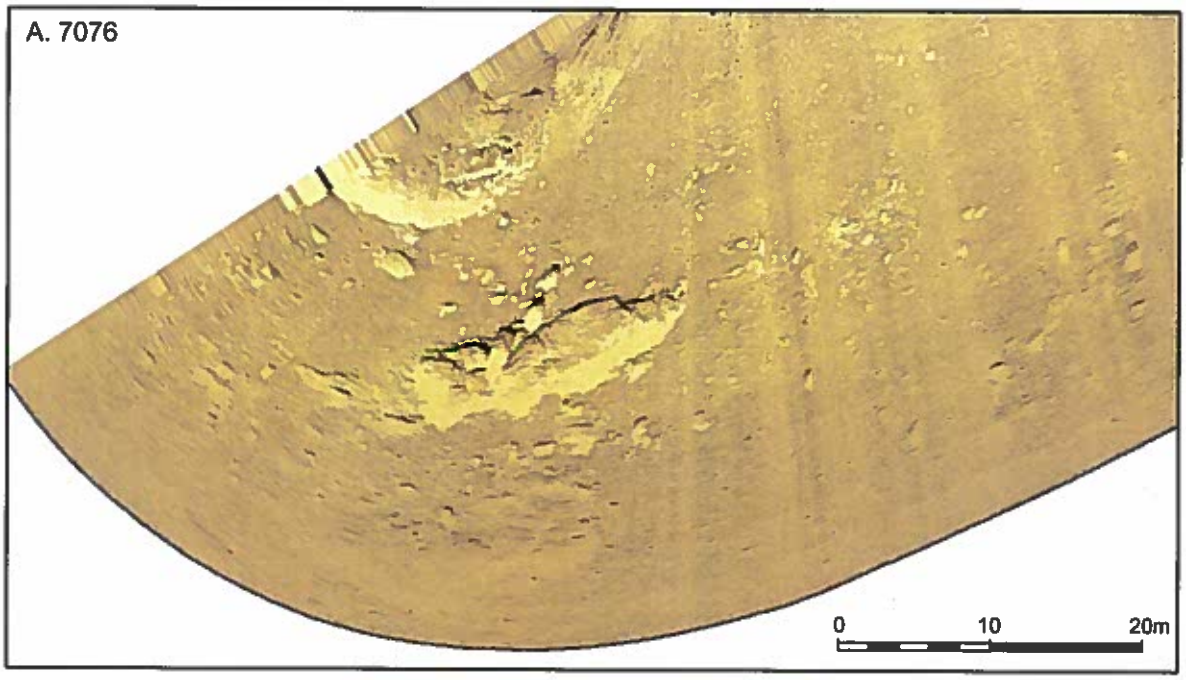
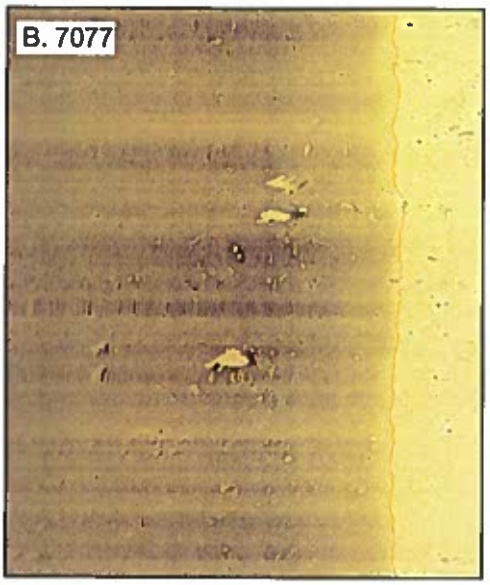
GSA XI: Data interpretation

Figure 26







Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	A. 1:500 B. NTS (insets 1:750,000 & 1:10,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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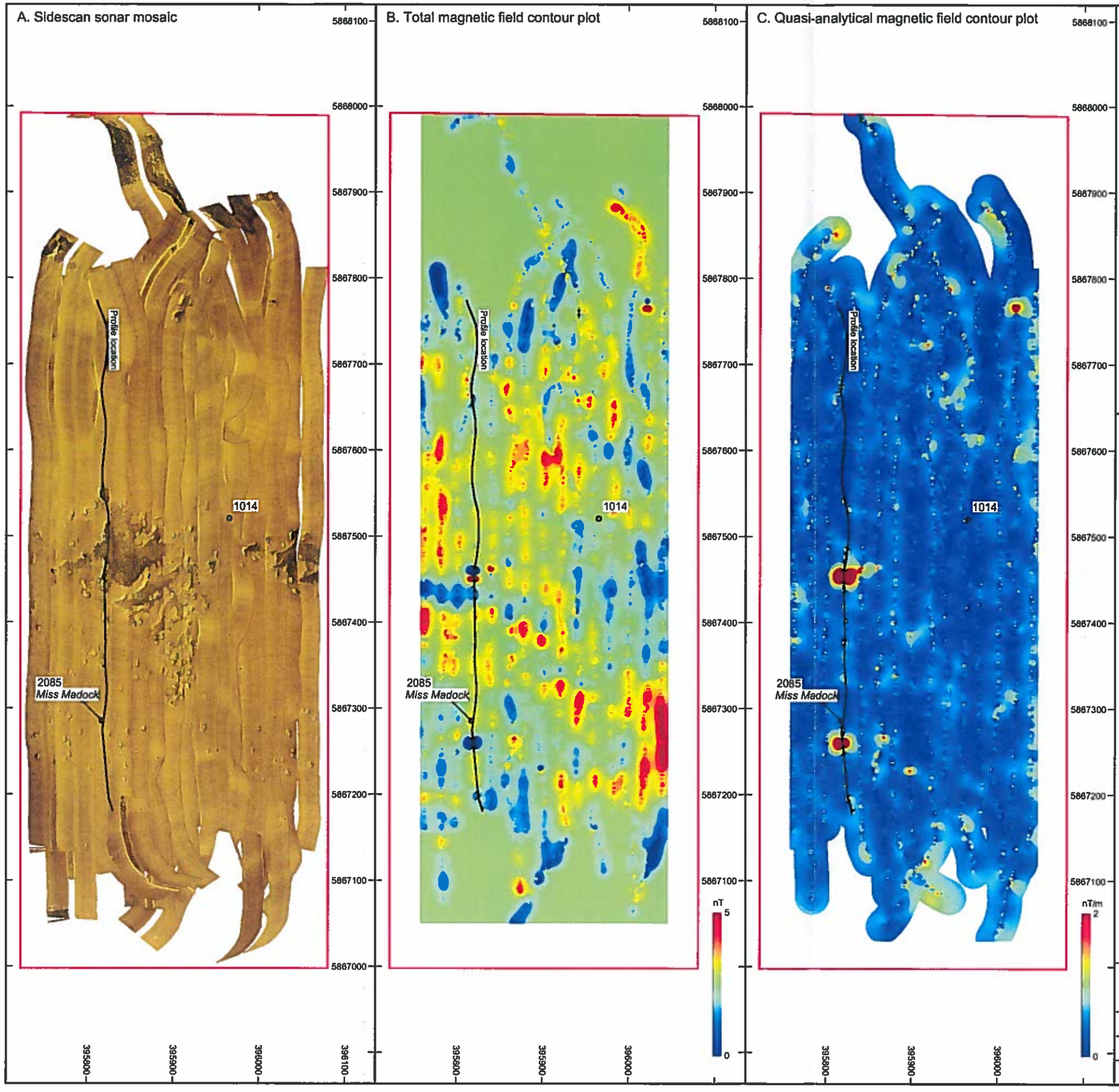
GSA XI: Data samples

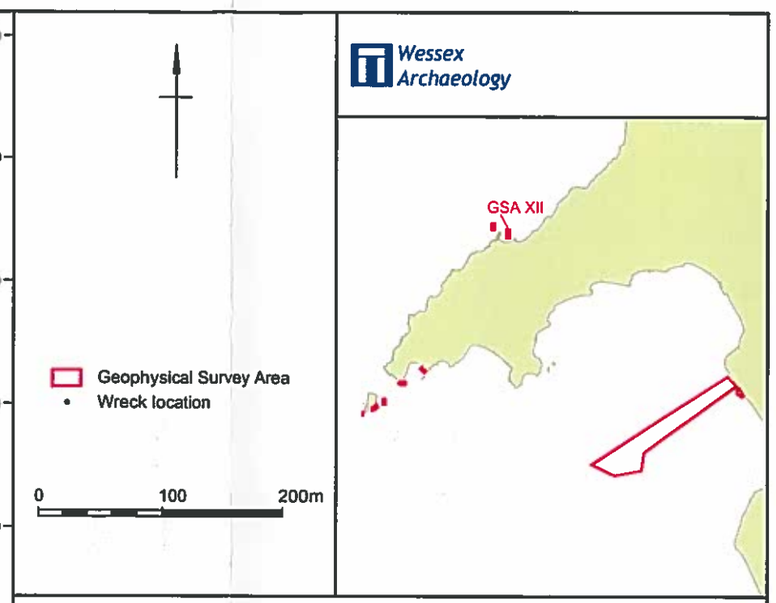
Figure 27

A. Sidescan sonar mosaic

B. Total magnetic field contour plot

C. Quasi-analytical magnetic field contour plot





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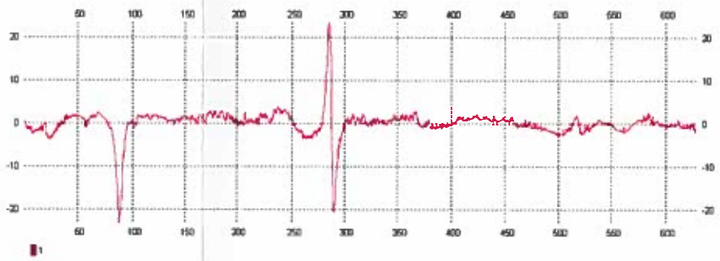
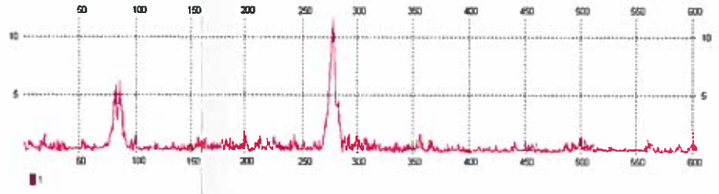
D. Total magnetic field profile



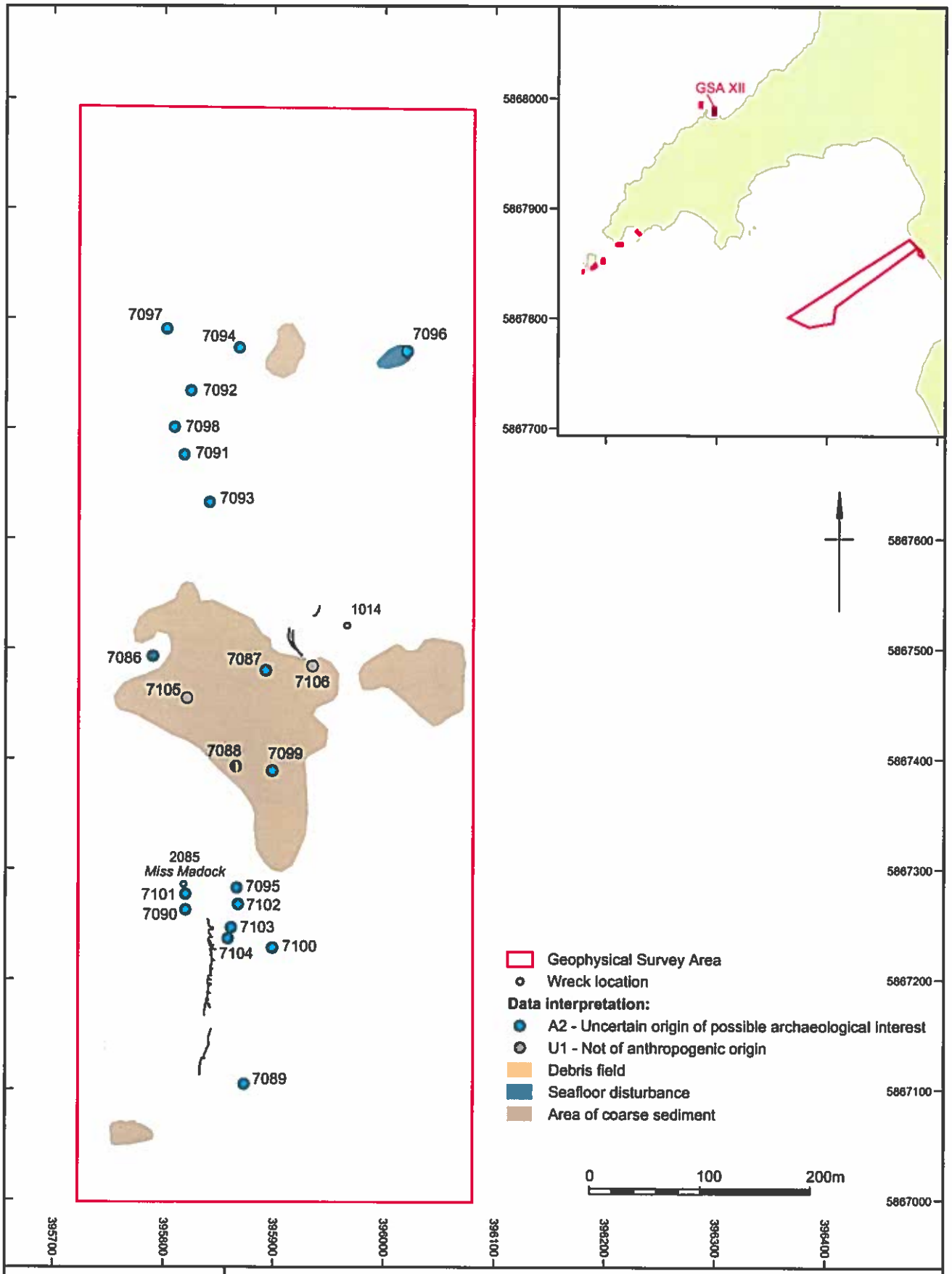
E. Quasi-analytical magnetic field profile



Date:	23/08/10	Revision Number:	0
Scale:	1:5000 (inset 1:750,000) @A3	Illustrator:	KJB
Path:	U:\Projects\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

GSA XII: Sidescan sonar mosaic and magnetometer plots

Figure 28



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:5000 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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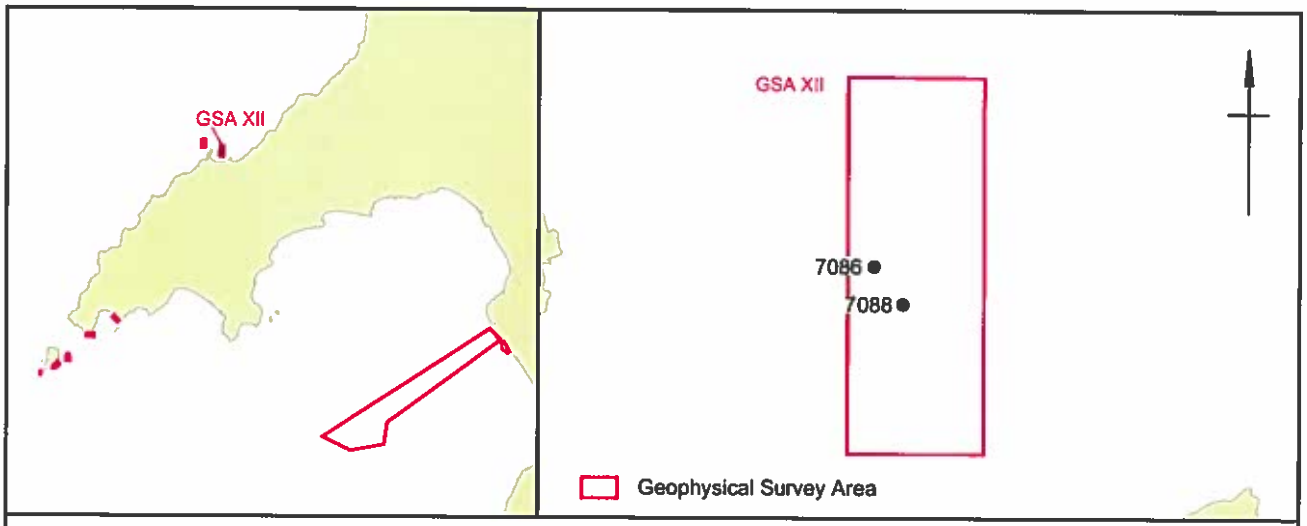
GSA XII: Data interpretation

Figure 29



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	NTS (insets 1:750,000 & 1:20,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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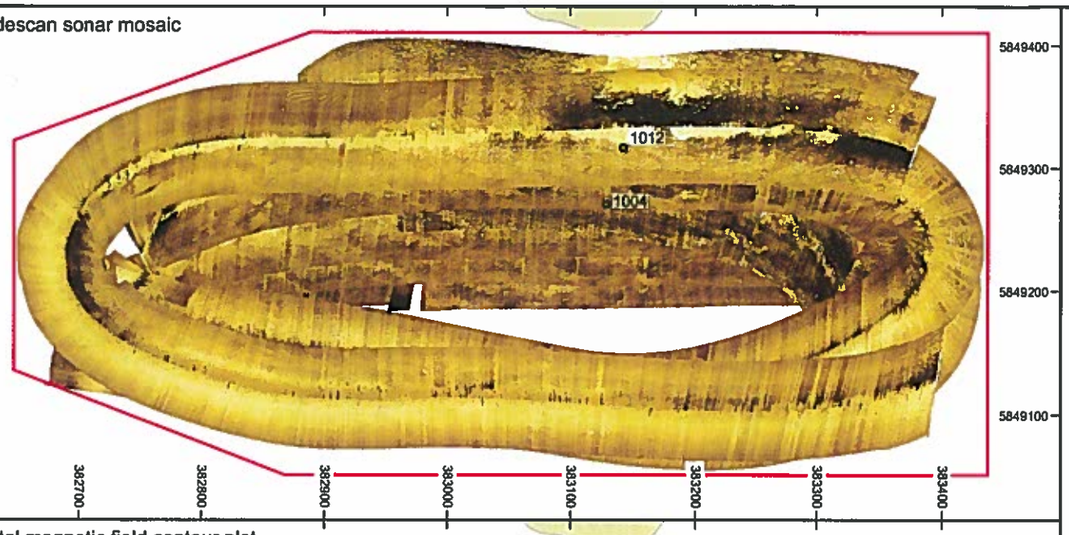
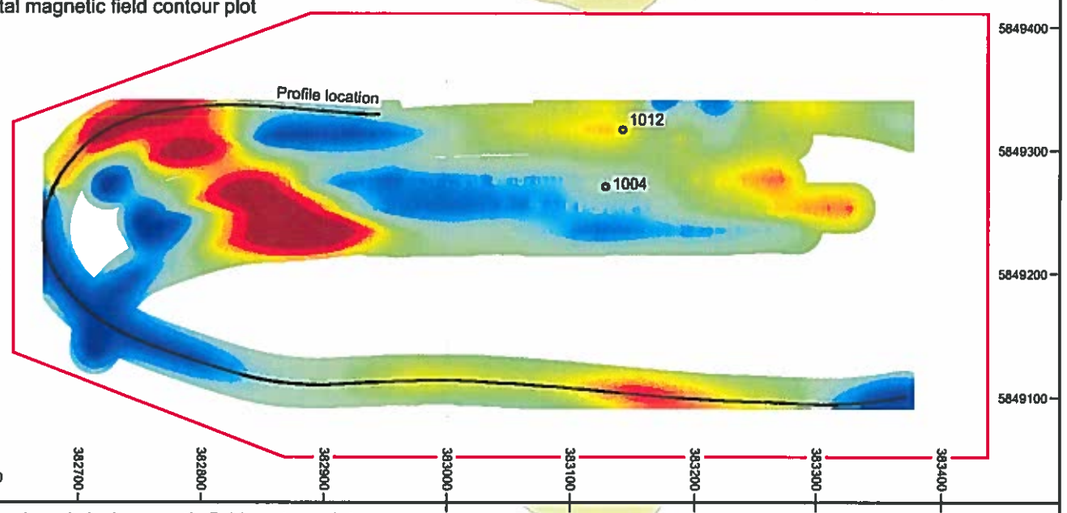
GSA XII: Data samples

Figure 30

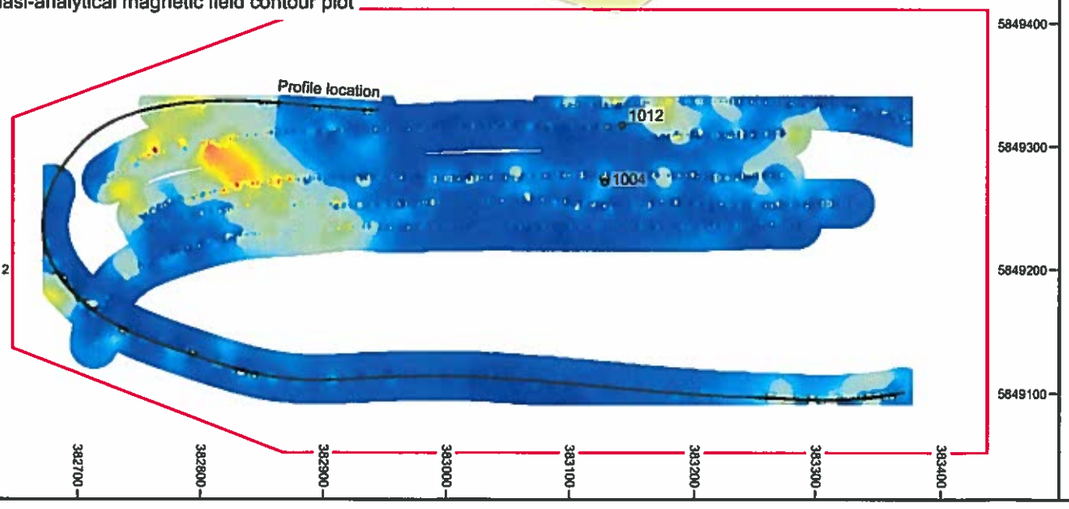
A. Sidescan sonar mosaic



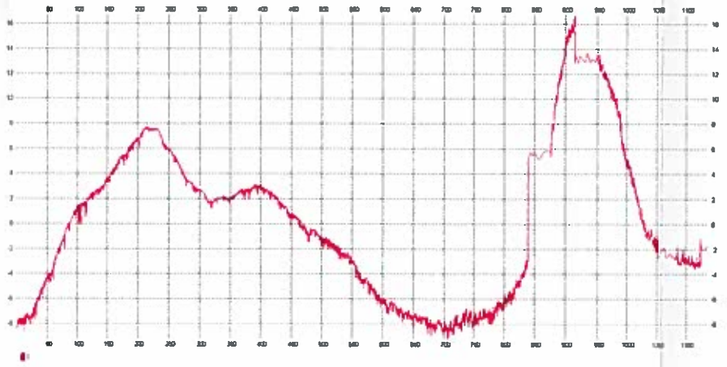
B. Total magnetic field contour plot



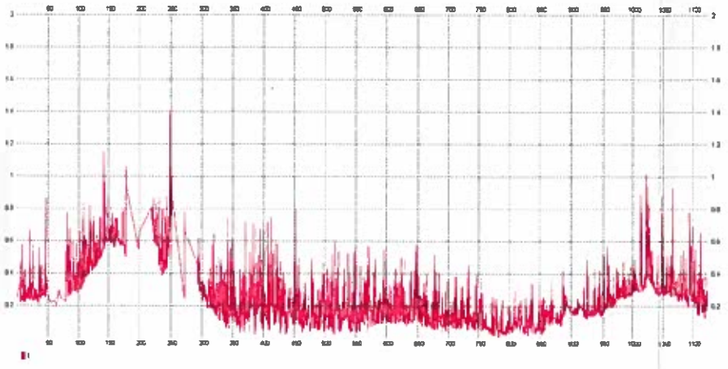
C. Quasi-analytical magnetic field contour plot



D. Total magnetic field profile



E. Quasi-analytical magnetic field profile



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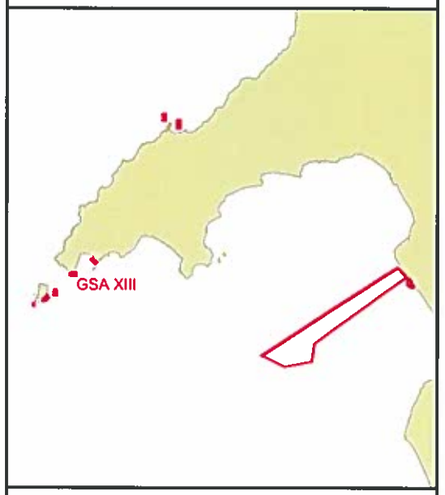


Geophysical Survey Area
Wreck location

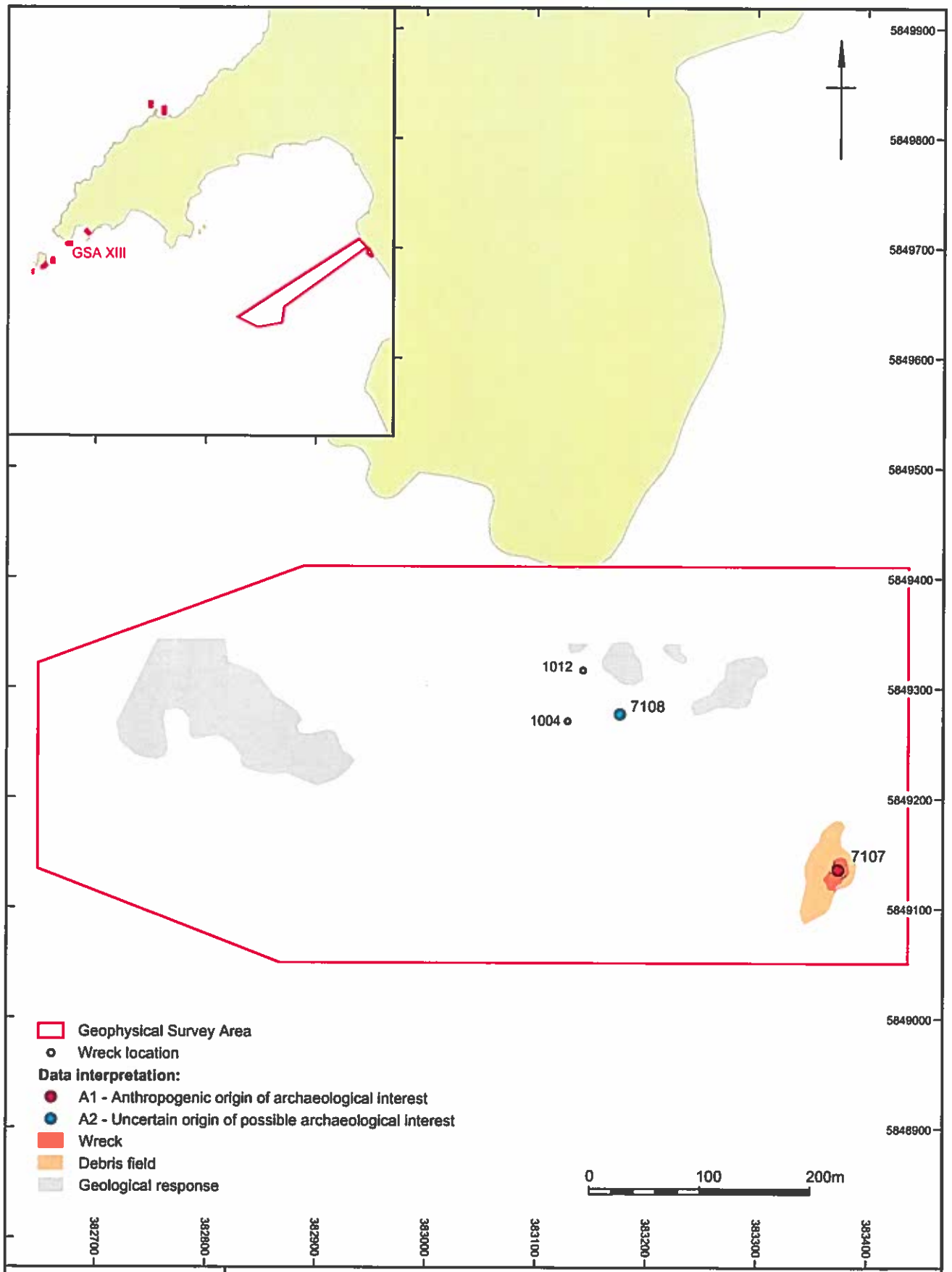
0 100 200m

Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	A-C 1:5000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA XIII: Sidescan sonar mosaic and magnetometer plots

Figure 31



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:5000 (Inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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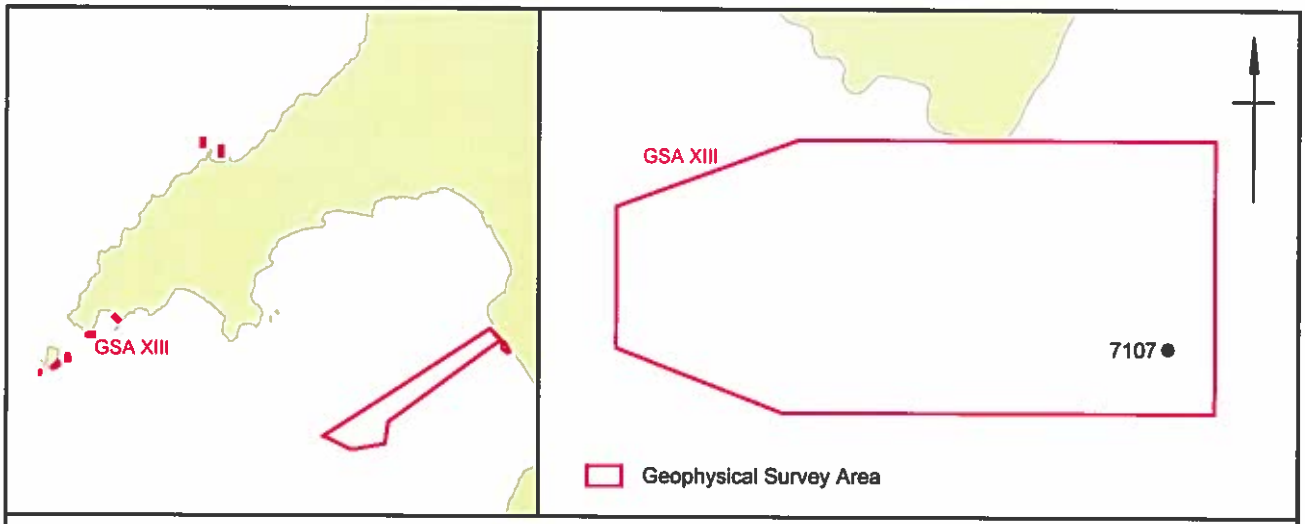
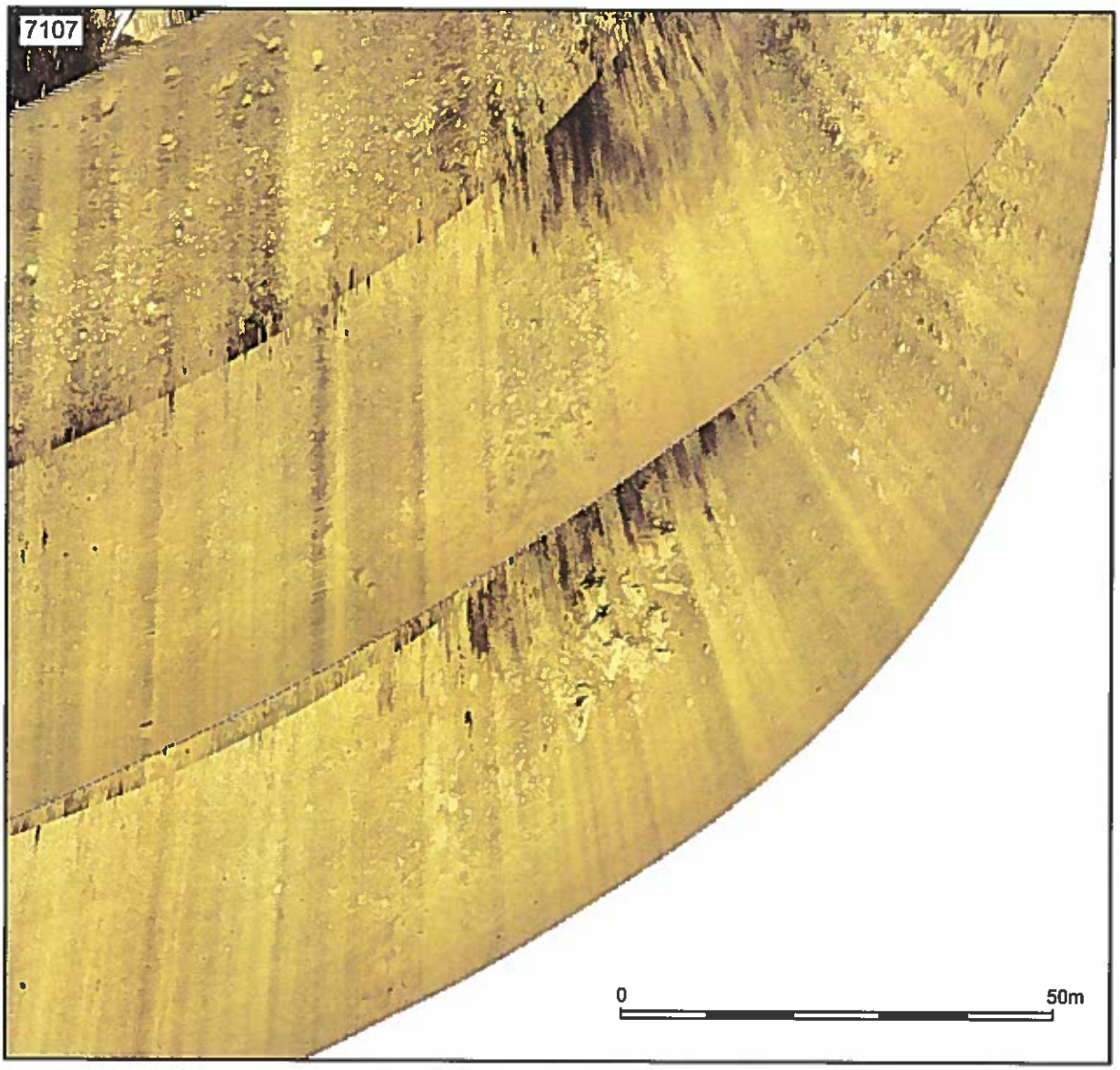
GSA XIII: Data interpretation

Figure 32





Drawing projection: UTM WGS84 Z30N

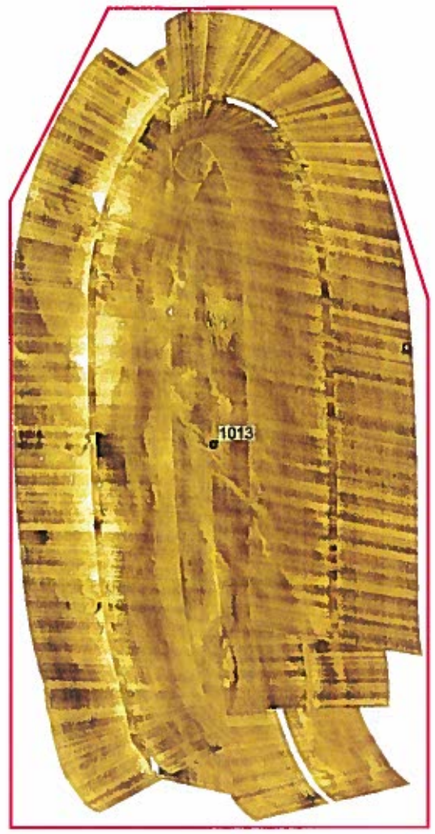
Date:	22/10/10	Revision Number:	0
Scale:	1:800 (insets 1:750,000 & 1:10,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

Wessex Archaeology

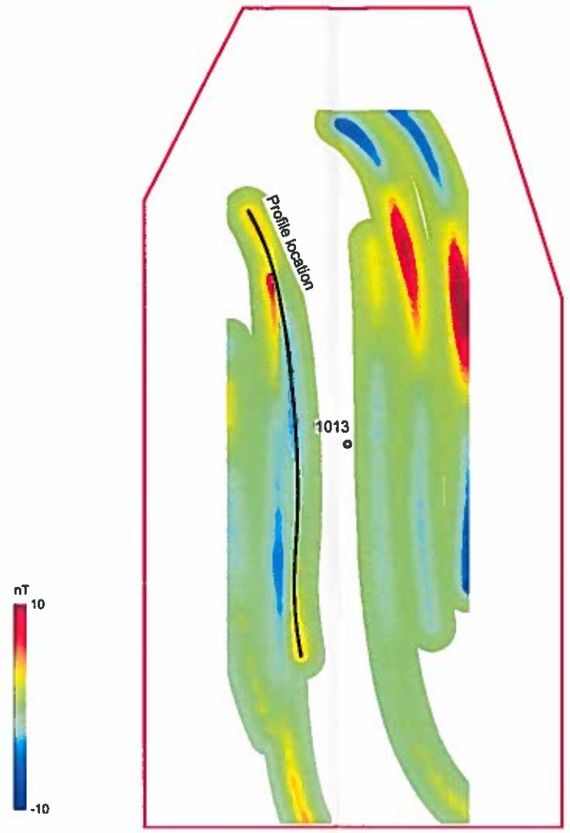
GSA XIII: Data sample

Figure 33

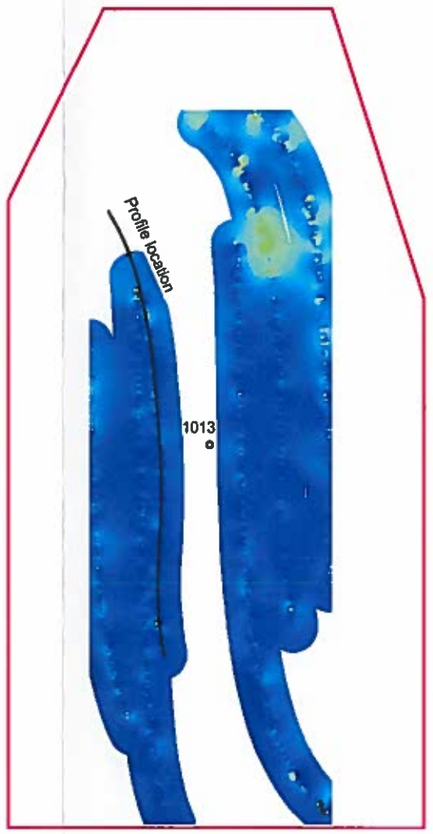
A. Sidescan sonar mosaic



B. Total magnetic field contour plot



C. Quasi-analytical magnetic field contour plot



5847300
5847200
5847100
5847000
5846900
5846800
5846700

380600 380700 380800 380900 381000 381100

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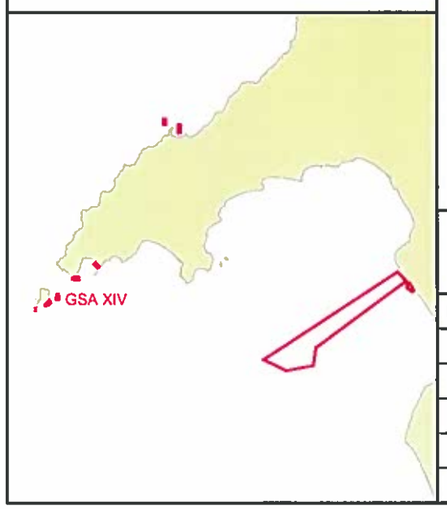


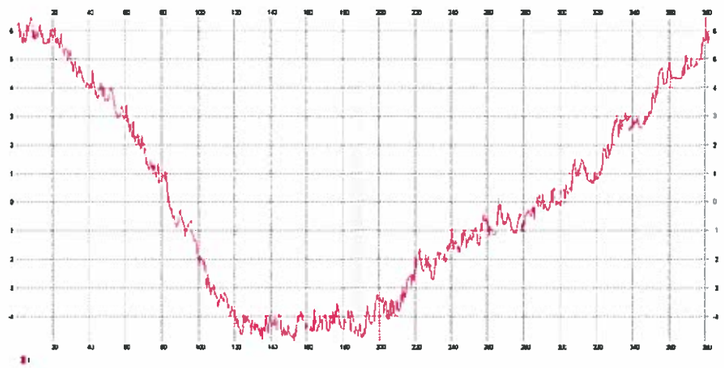
Geophysical Survey Area
Wreck location

0 100 200m

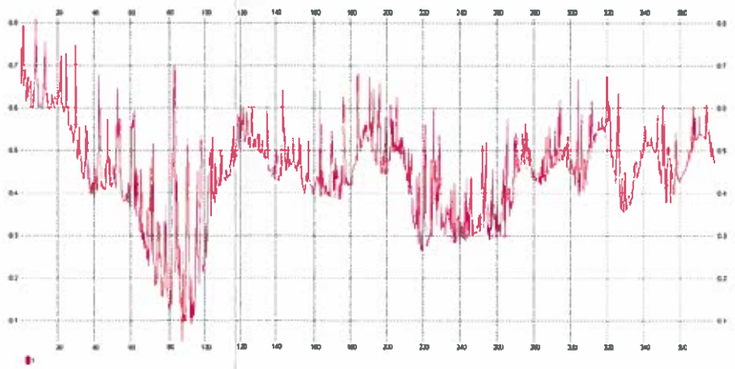
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:5000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 DO Report Figures\2010\Welsh Geophys

D. Total magnetic field profile

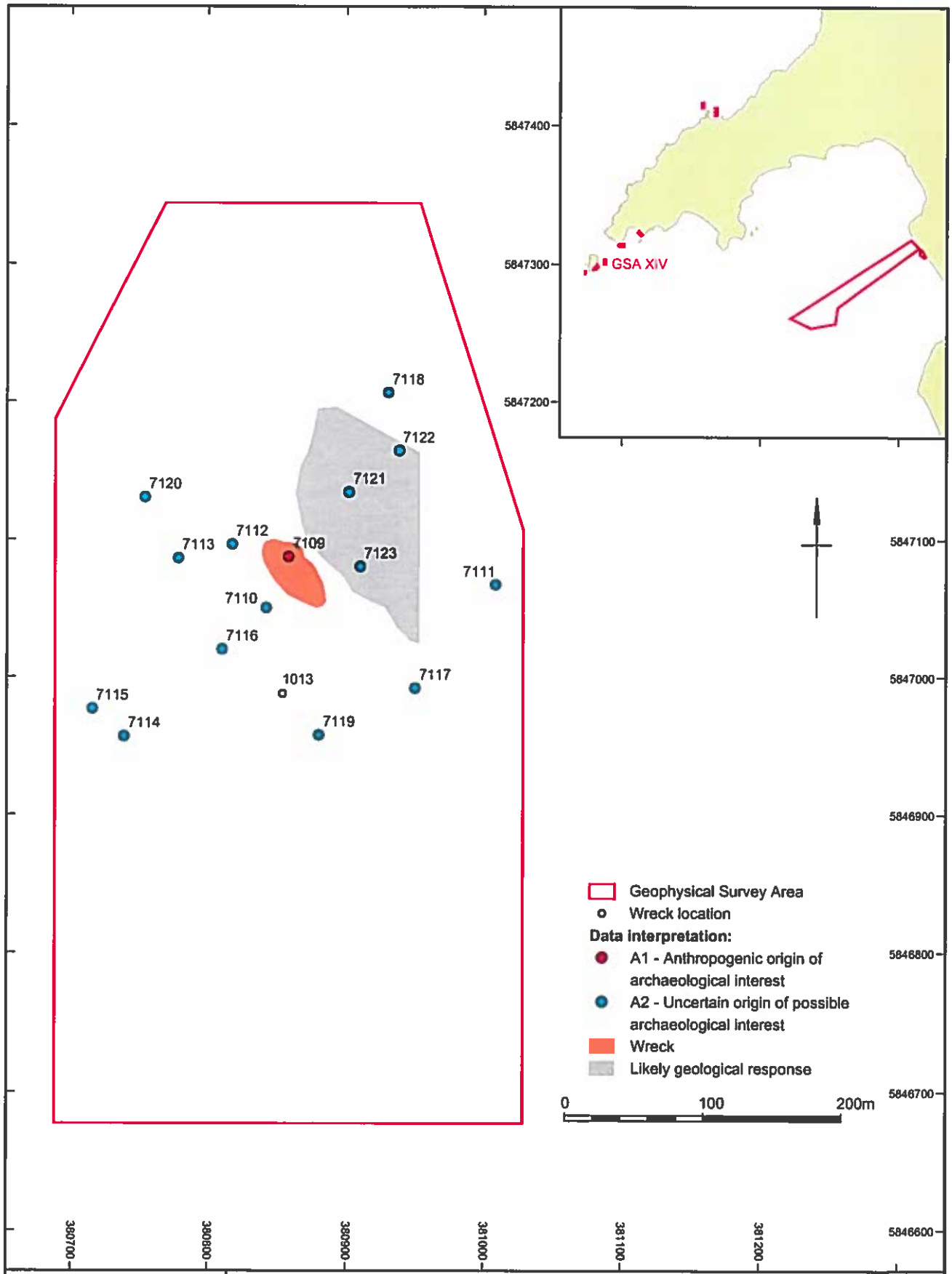


E. Quasi-analytical magnetic field profile



GSA XIV: Sidescan sonar mosaic and magnetometer plots

Figure 34



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:4000 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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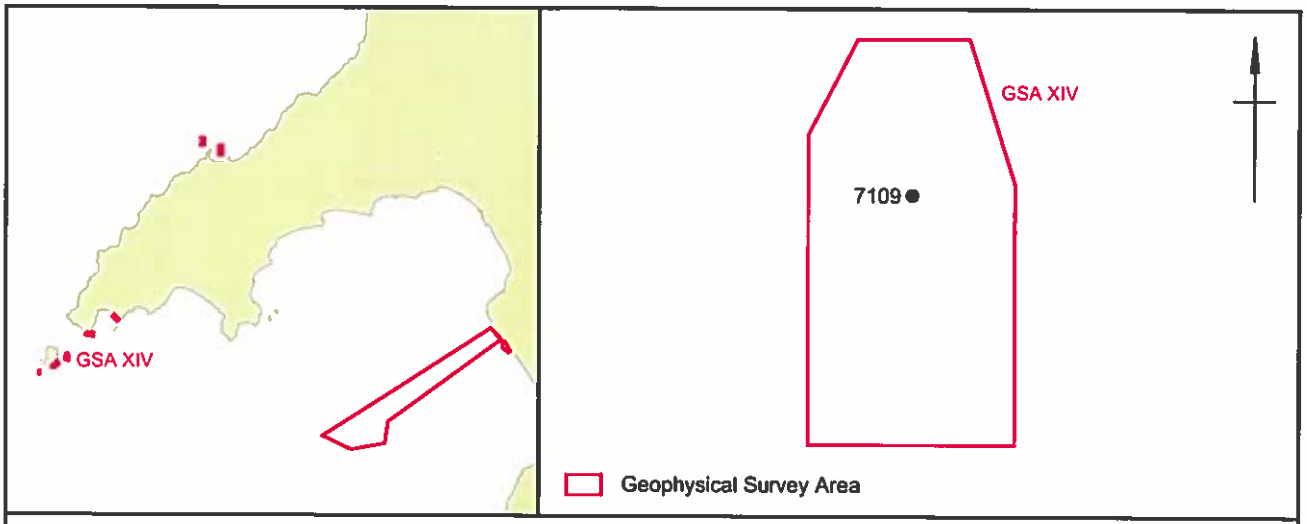
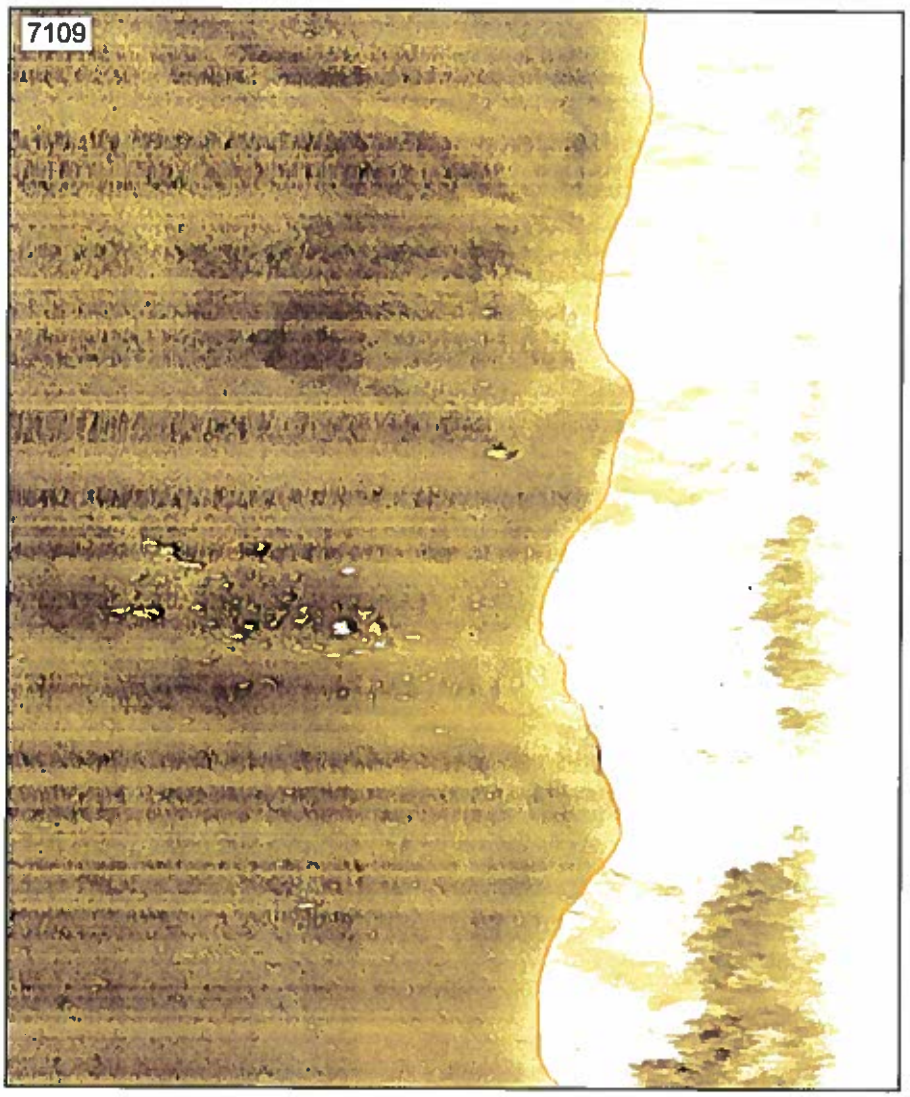
GSA XIV: Data interpretation

Figure 35





Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	NTS (insets 1:750,000 & 1:1250) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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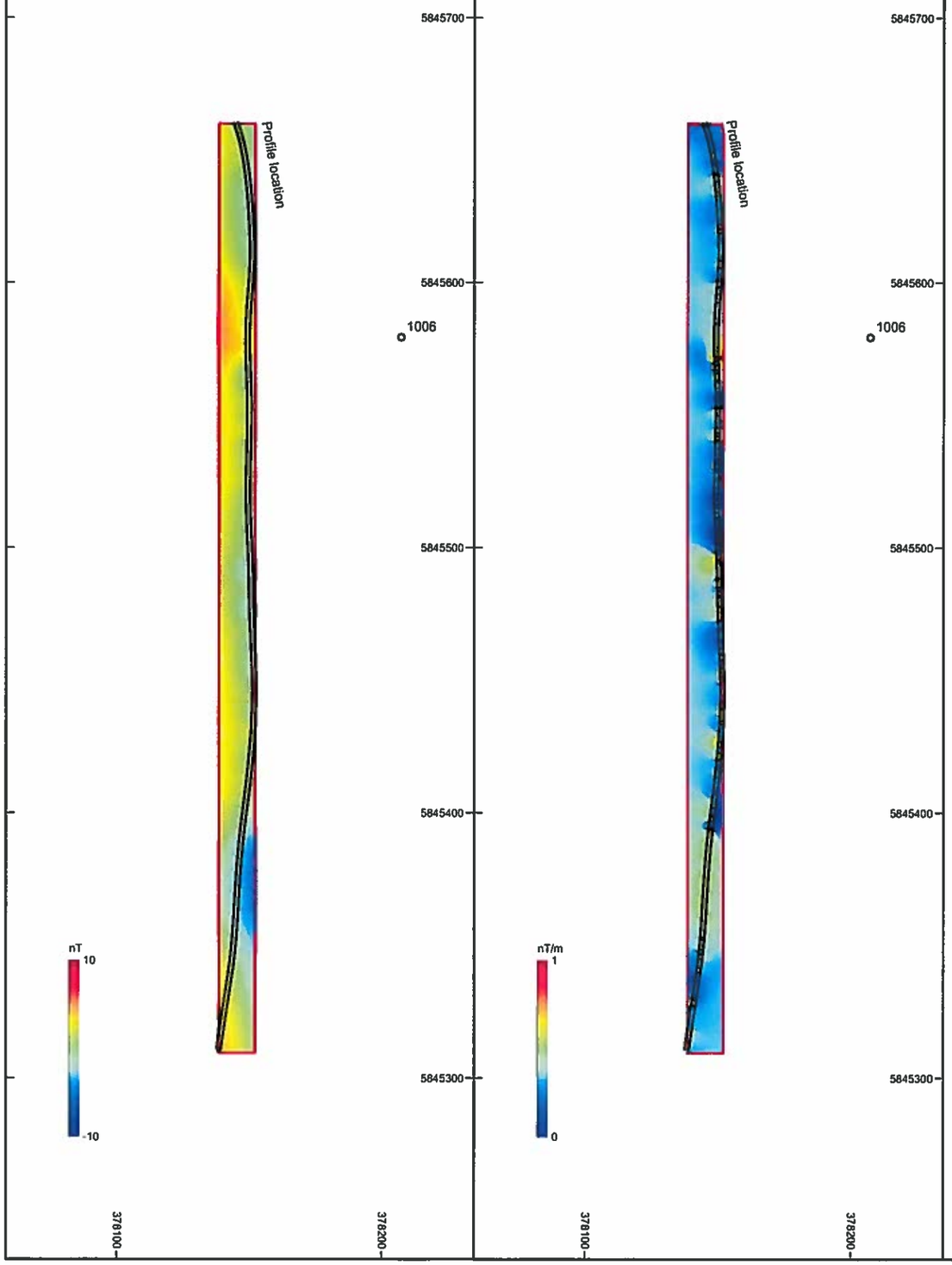
GSA XIV: Data sample

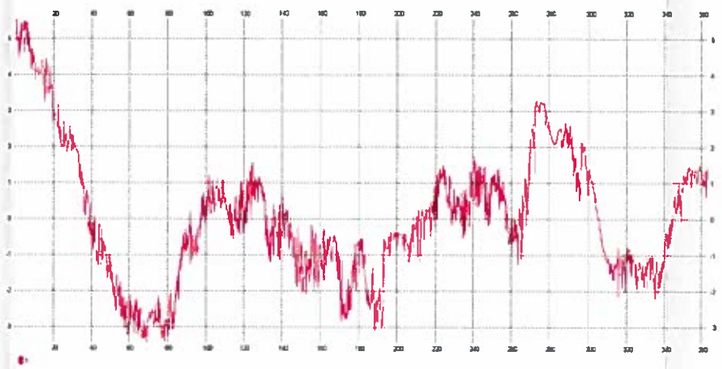
Figure 36

A. Total magnetic field contour plot

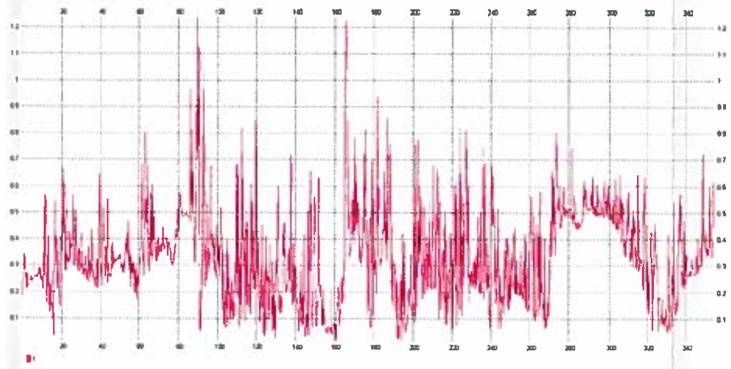


B. Quasi-analytical magnetic field contour plot

C. Total magnetic field profile



D. Quasi-analytical magnetic field profile



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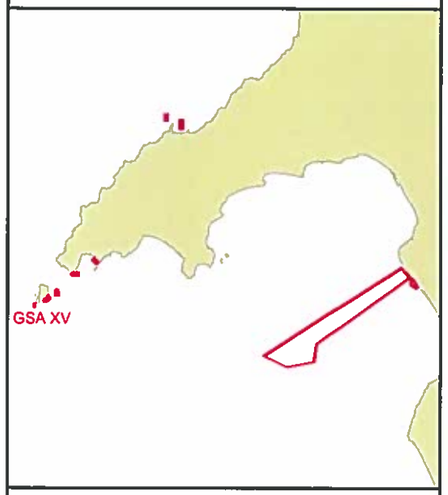


Geophysical Survey Area
Wreck location

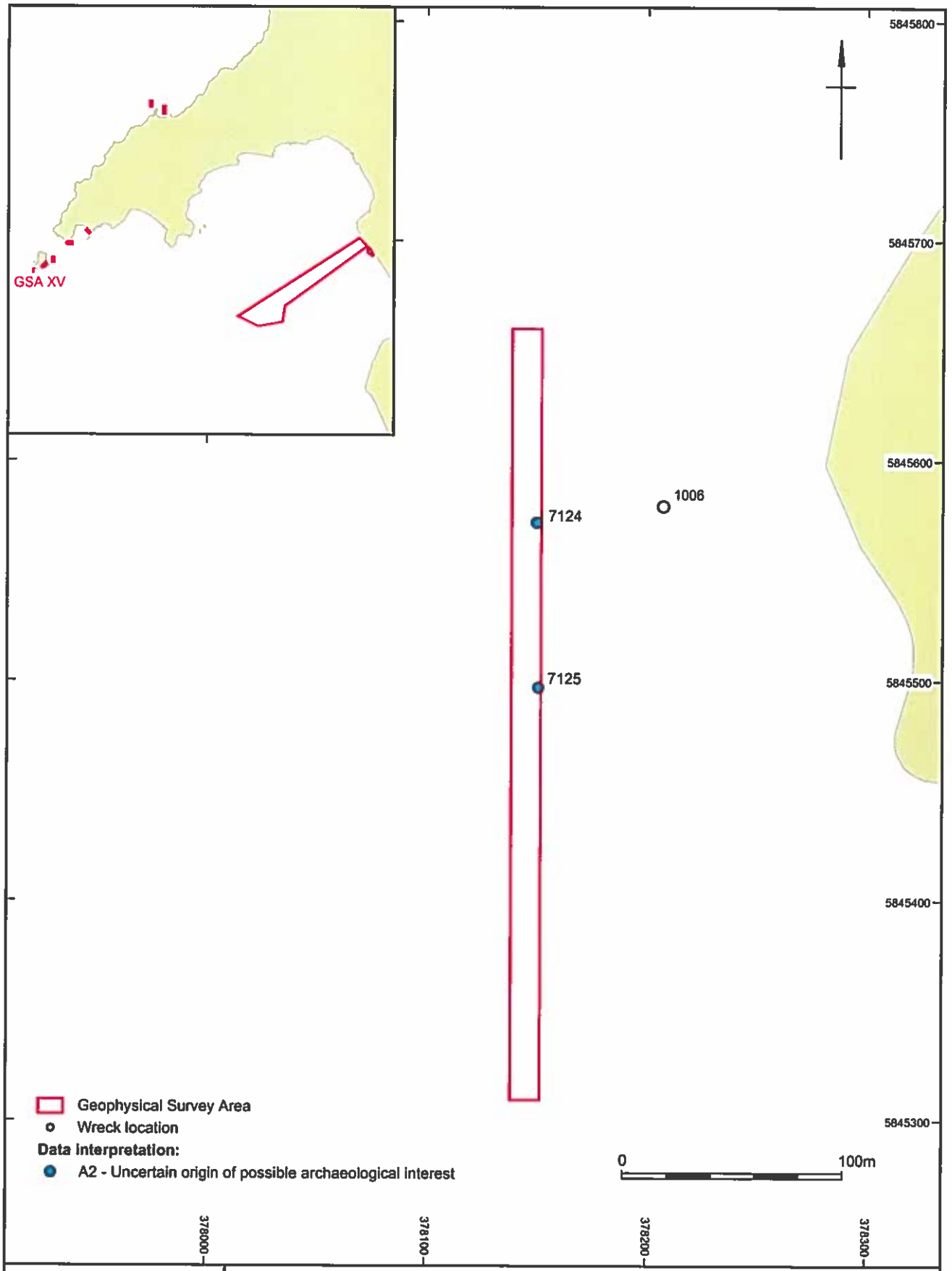
0 100m

Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:2000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA XV: Magnetometer plots

Figure 37



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:2500 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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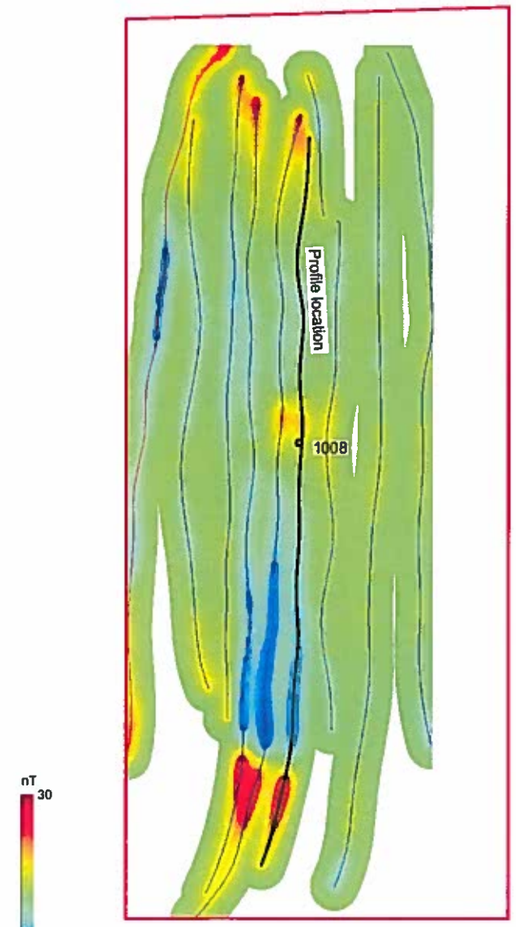
GSA XV: Data interpretation

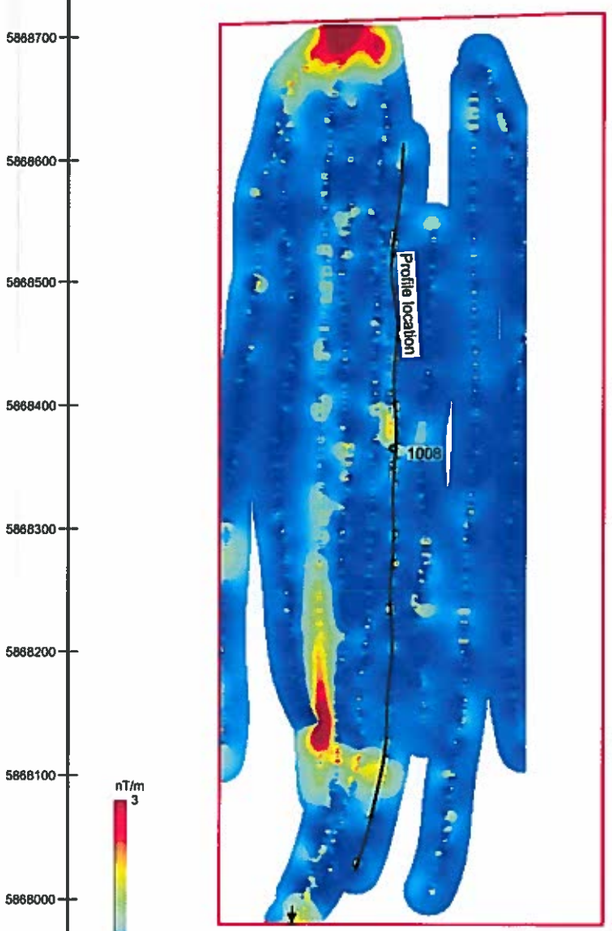
Figure 38

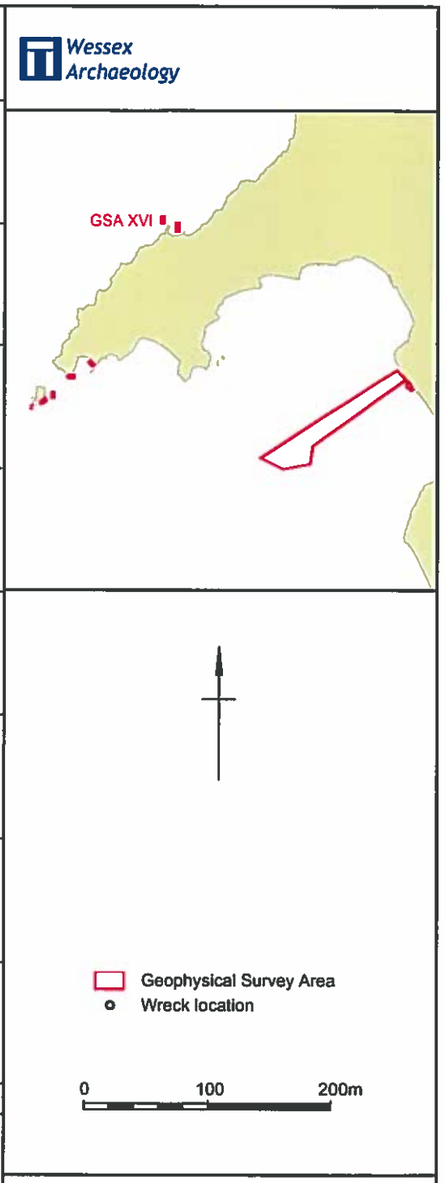
A. Sidescan sonar mosaic

B. Total magnetic field contour plot

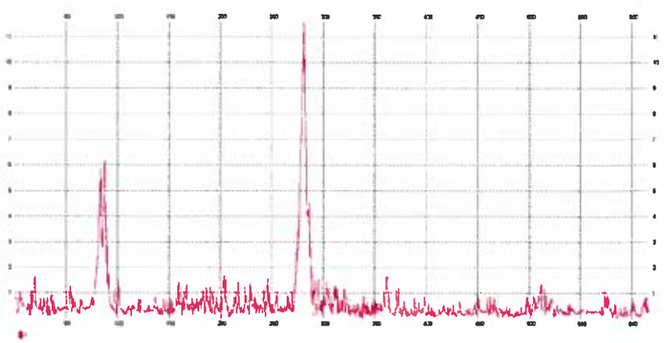


C. Quasi-analytical magnetic field contour plot

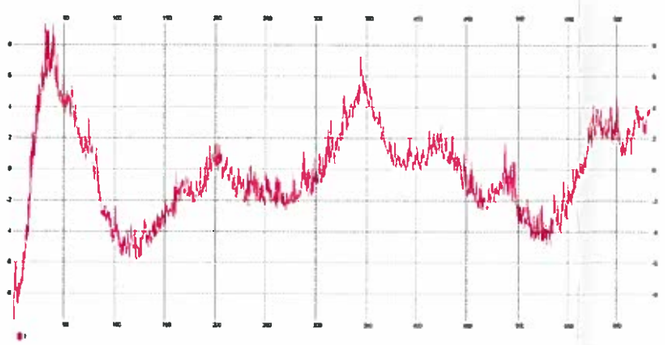




D. Total magnetic field profile



E. Quasi-analytical magnetic field profile

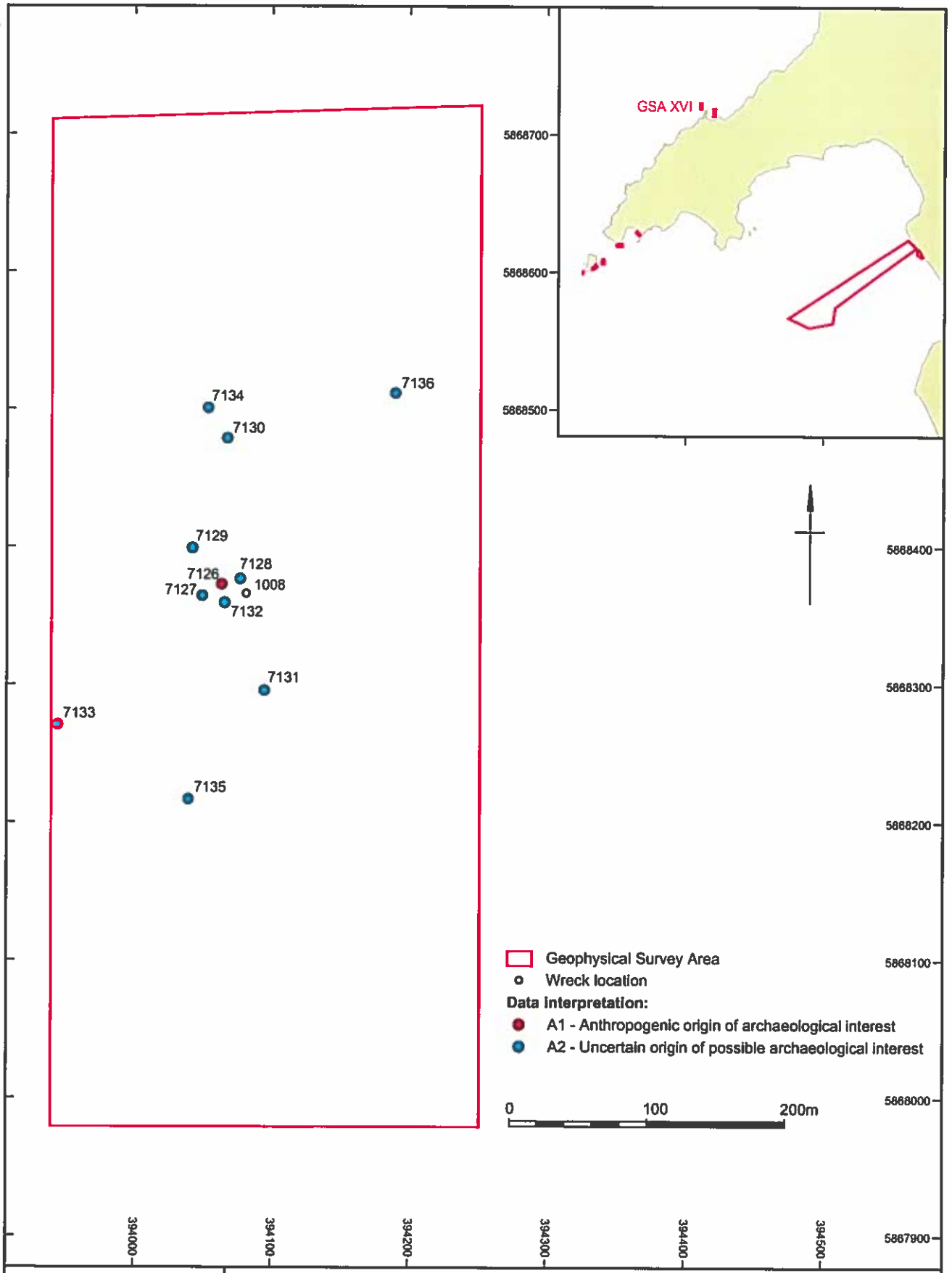


Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	21/10/10
Scale:	1:5000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA XVI: Sidescan sonar mosaic and magnetometer plots

Figure 39



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:4000 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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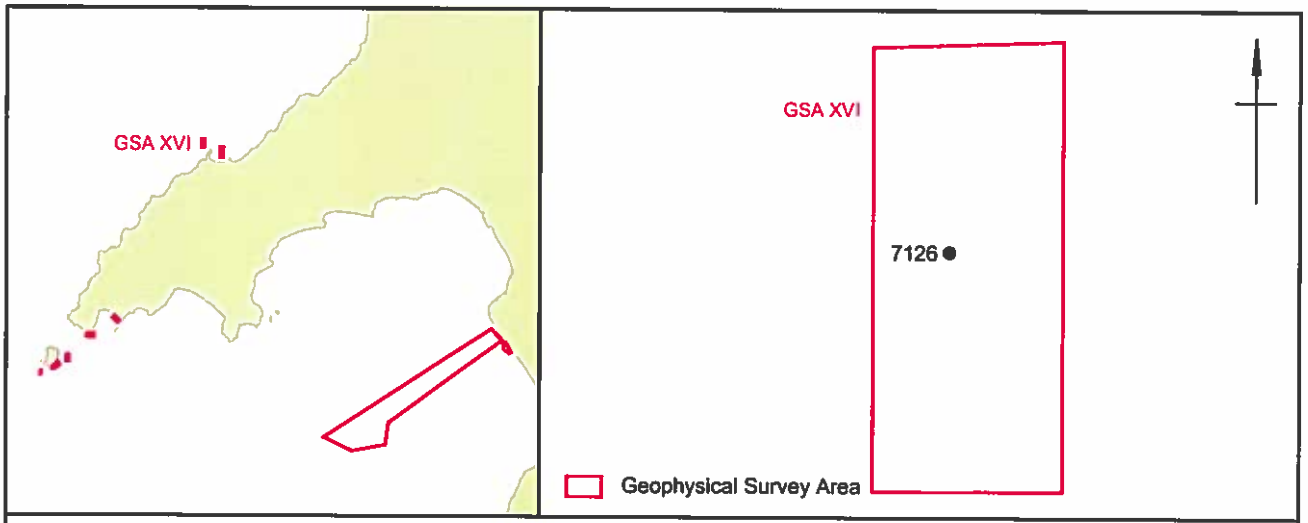
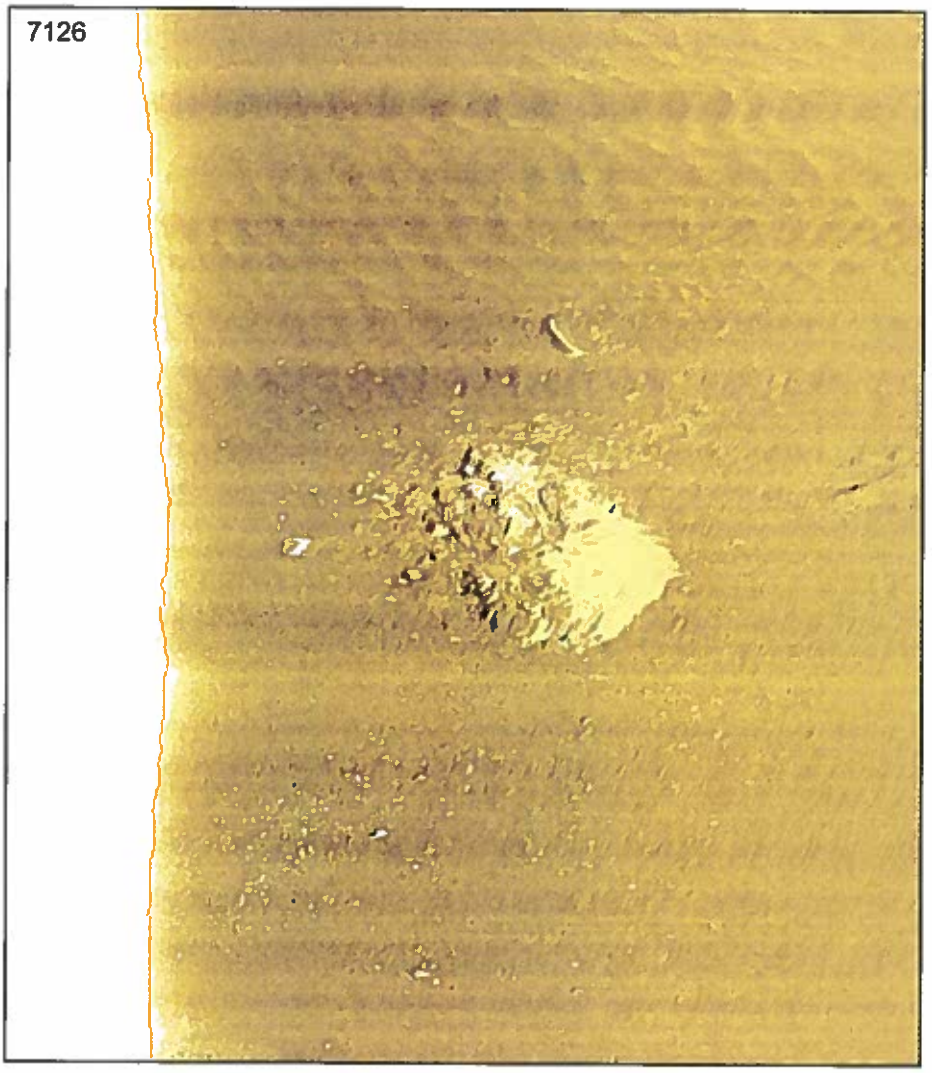
GSA XVI: Data interpretation

Figure 40





Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	NTS (insets 1:750,000 & 1:1250) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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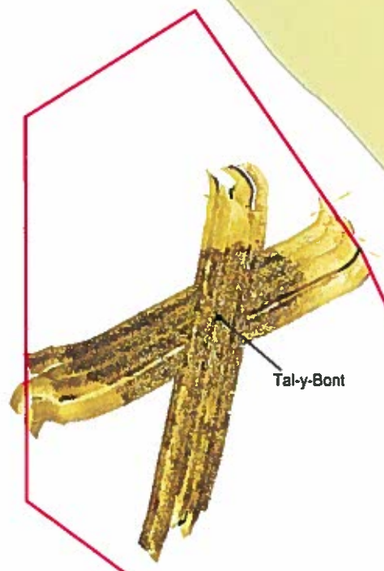
GSA XVI: Data sample

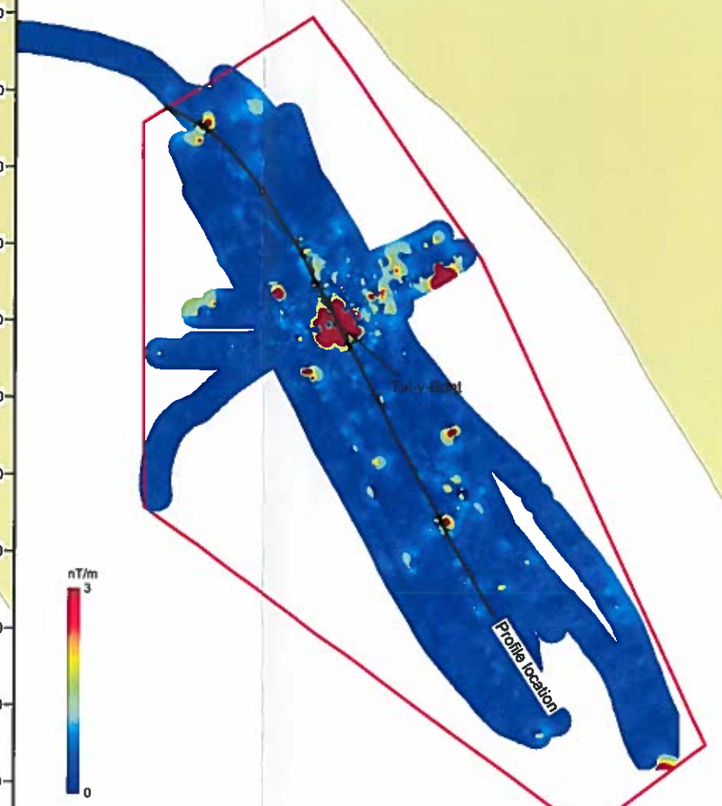
Figure 41

A. Sidescan sonar mosaic



B. Total magnetic field contour plot

C. Quasi-analytical magnetic field contour plot



5848700 5848600 5848500 5848400 5848300 5848200 5848100 5848000 5847900 5847800 5847700 5847600

423600 423700 423800 423900 424000 424100 424200 424300 424400

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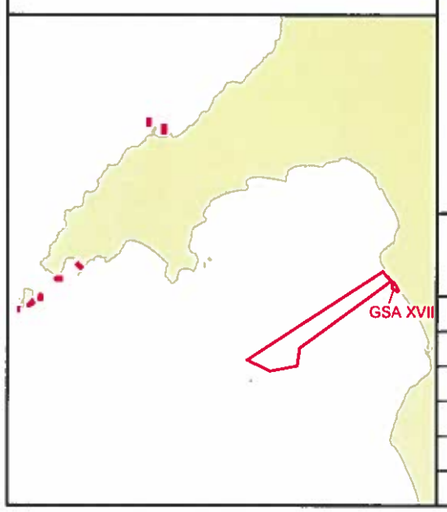


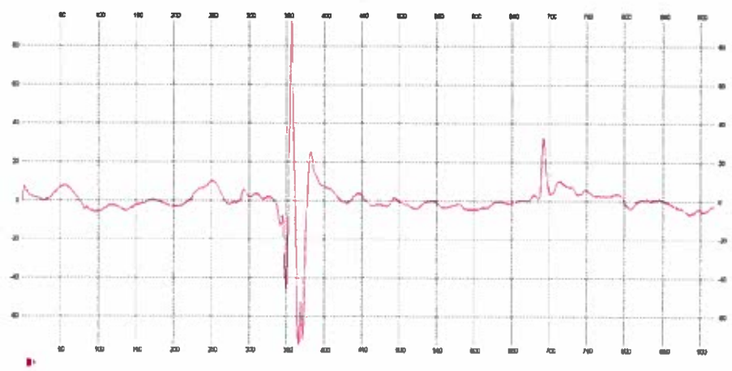
Geophysical Survey Area
Wreck location

0 200m

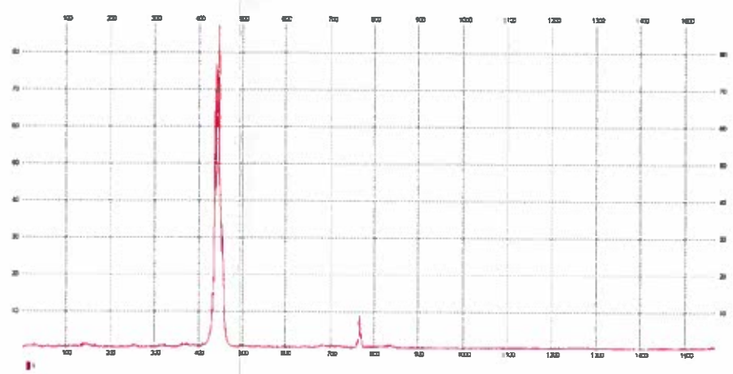
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	1:8000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 DO Report Figures\2010\Welsh Geophys

D. Total magnetic field profile

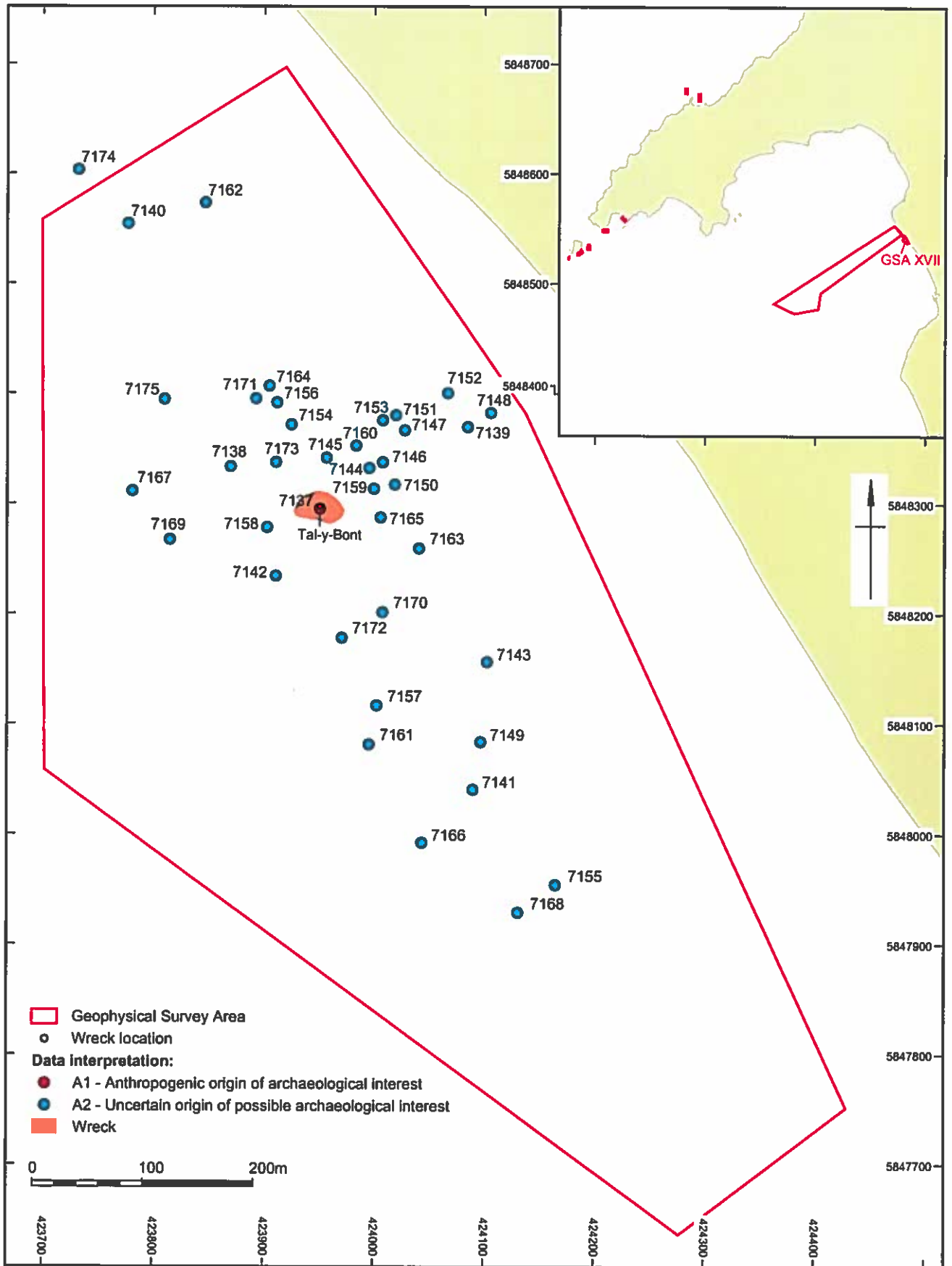


E. Quasi-analytical magnetic field profile



GSA XVII: Sidescan sonar mosaic and magnetometer plots

Figure 42



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:5000 (inset 1:750,000 @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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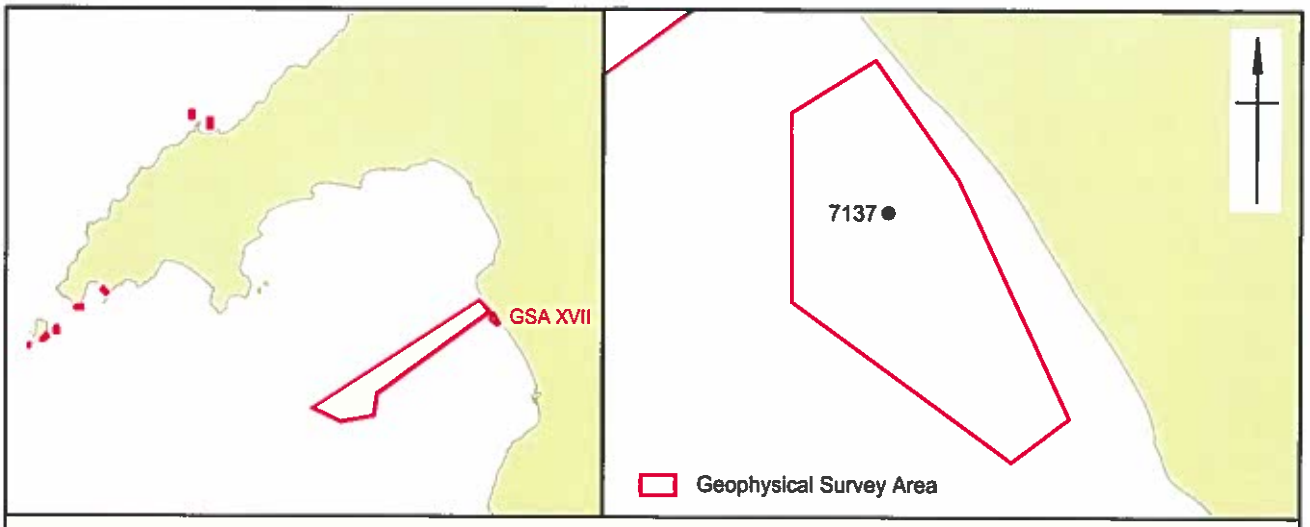
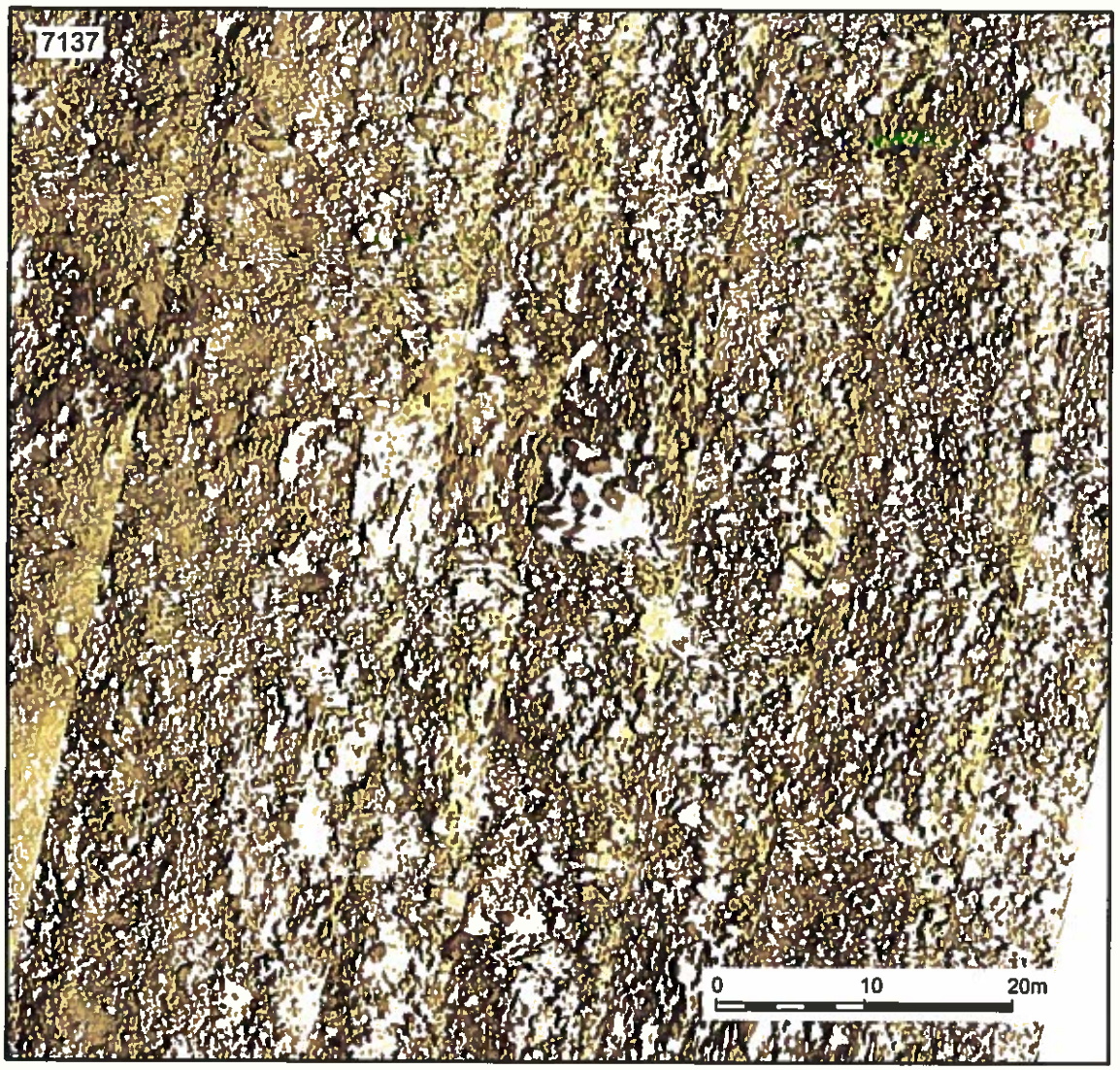
GSA XVII: Data interpretation

Figure 43





Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:500 (insets 1:750,000 & 1:2000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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GSA XVII: Data sample

Figure 44

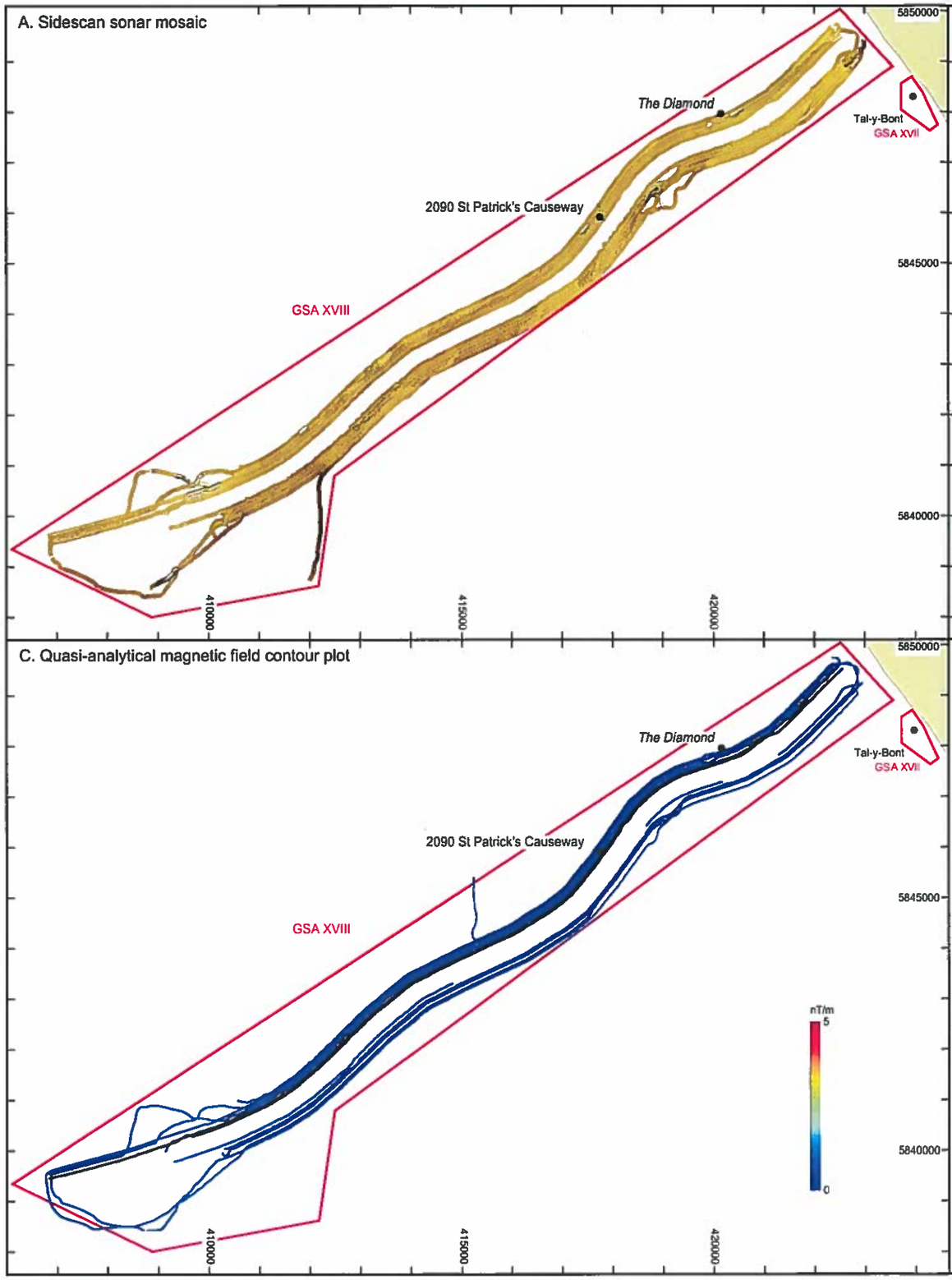
A. Sidescan sonar mosaic

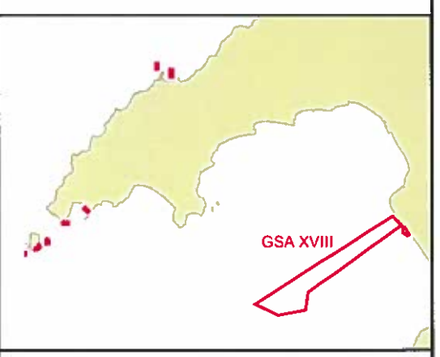
B. Total magnetic field contour plot

C. Quasi-analytical magnetic field contour plot

D. Total magnetic field profile

E. Quasi-analytical magnetic field profile





Geophysical Survey Area
Wreck location

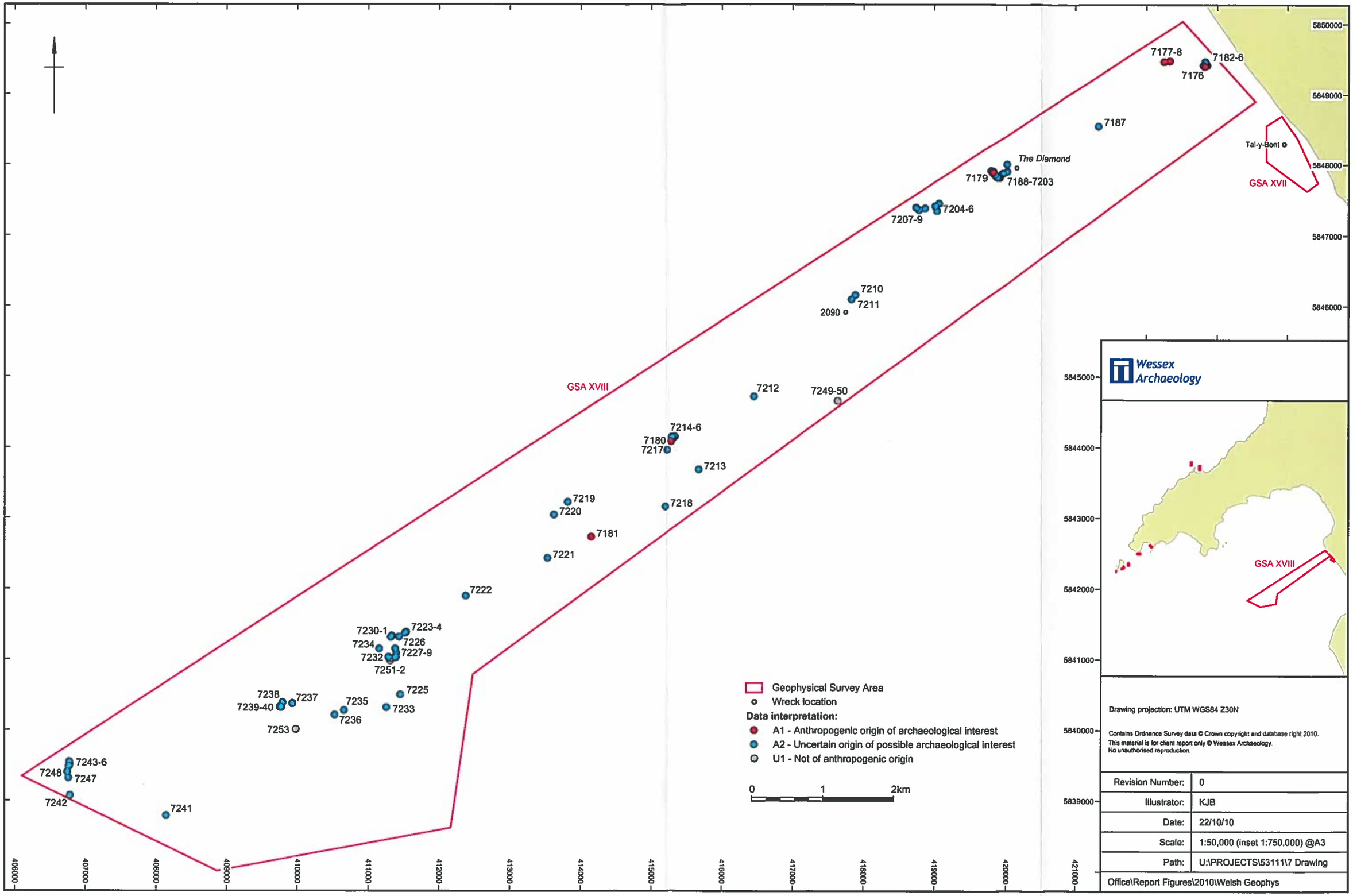
0 5km

Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	23/08/10
Scale:	A 1:100,000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA XVIII: Sidescan sonar mosaic and magnetometer plots

Figure 45

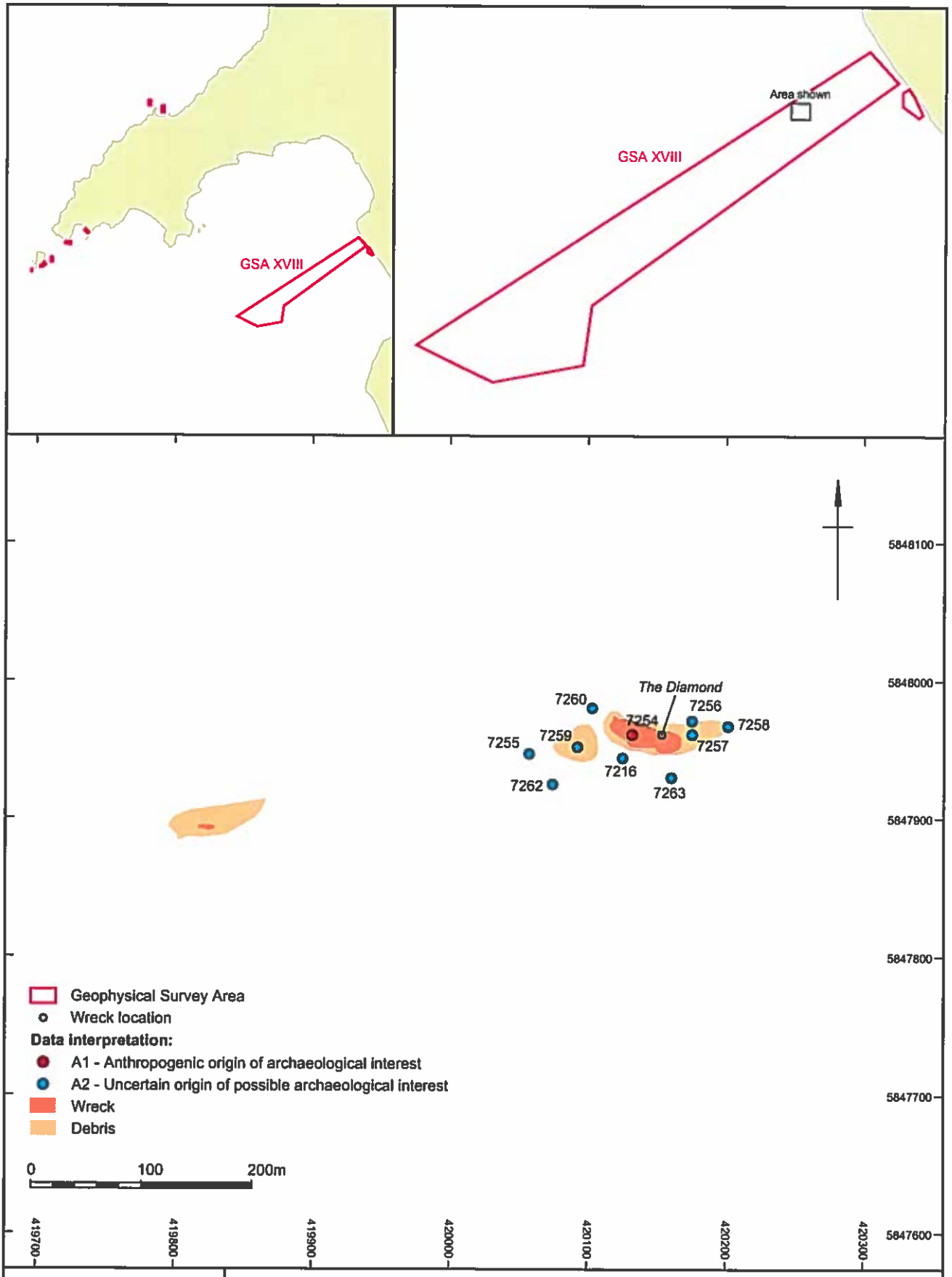


Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	22/10/10
Scale:	1:50,000 (inset 1:750,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA XVIII: Data interpretation

Figure 46



Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:5000 (insets 1:750,000 and 1:200,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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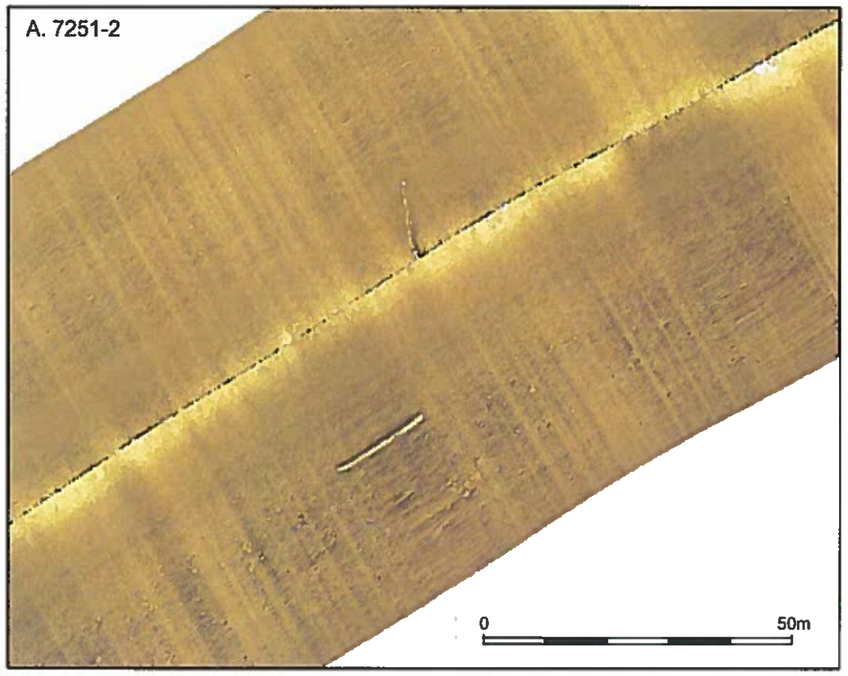
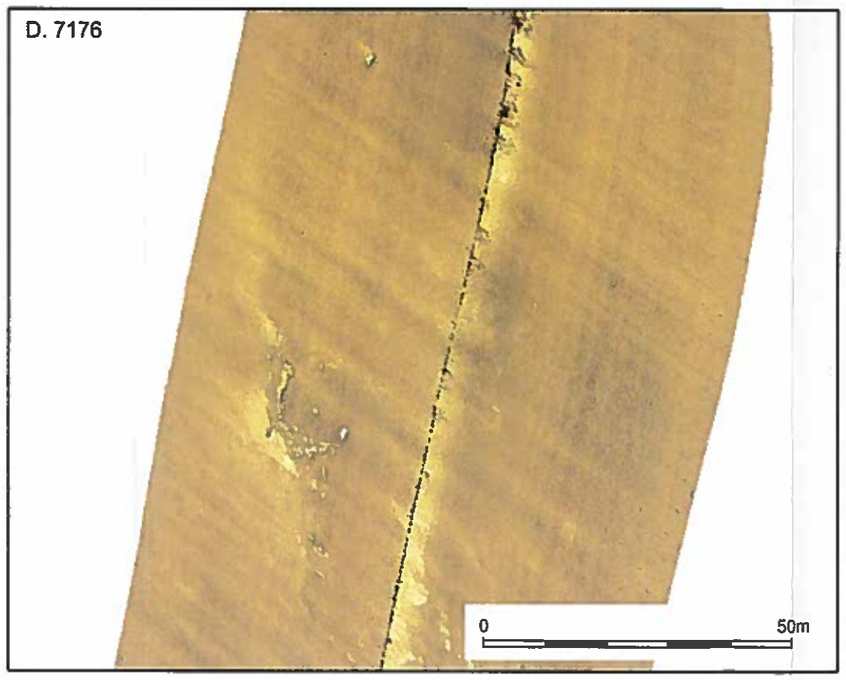
GSA XVIII: Data interpretation - Designated wreck site *Diamond*

Figure 47





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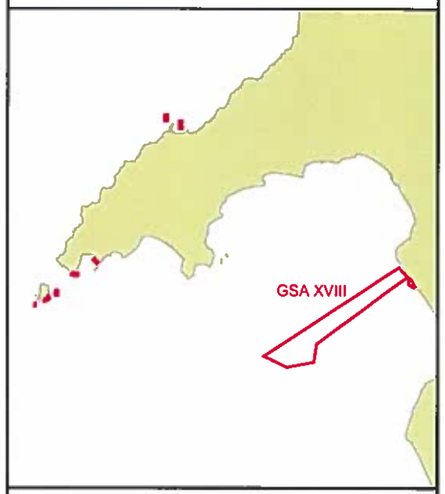
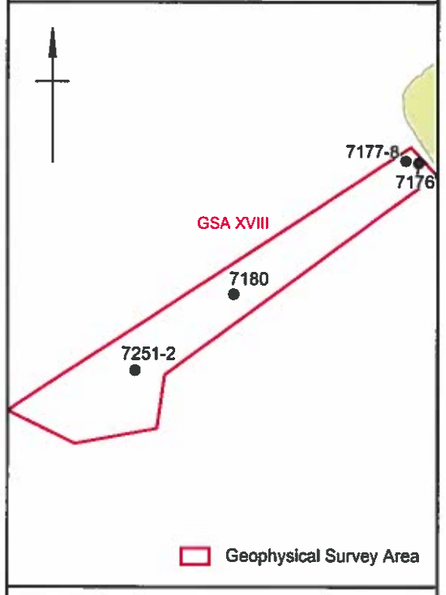


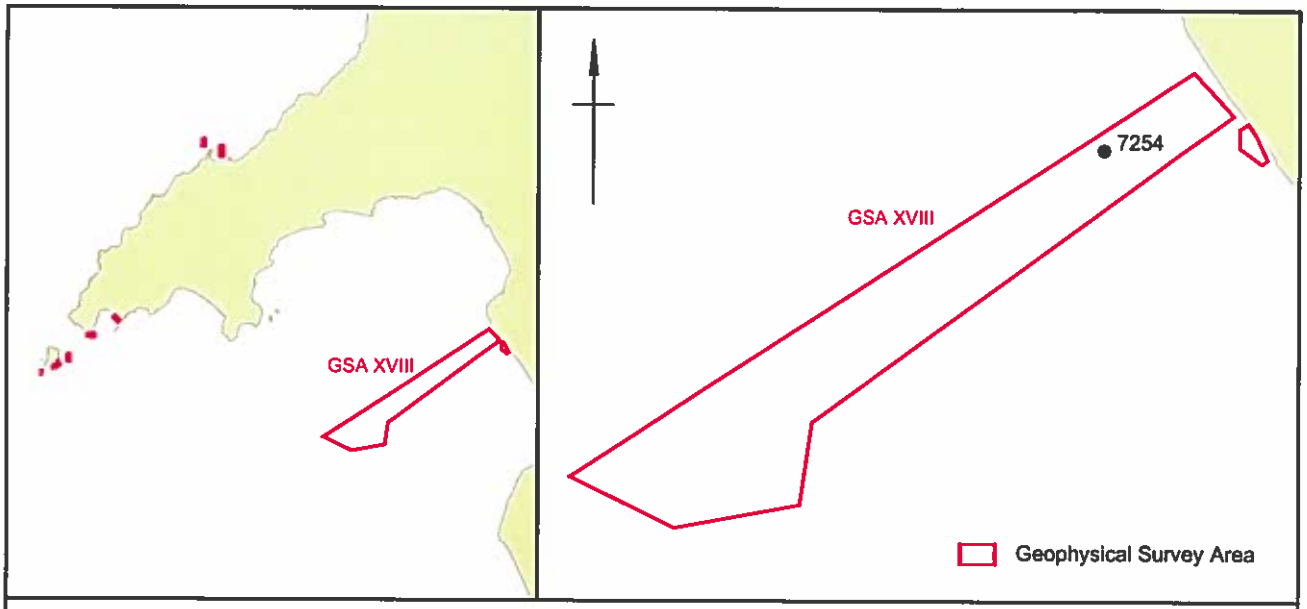


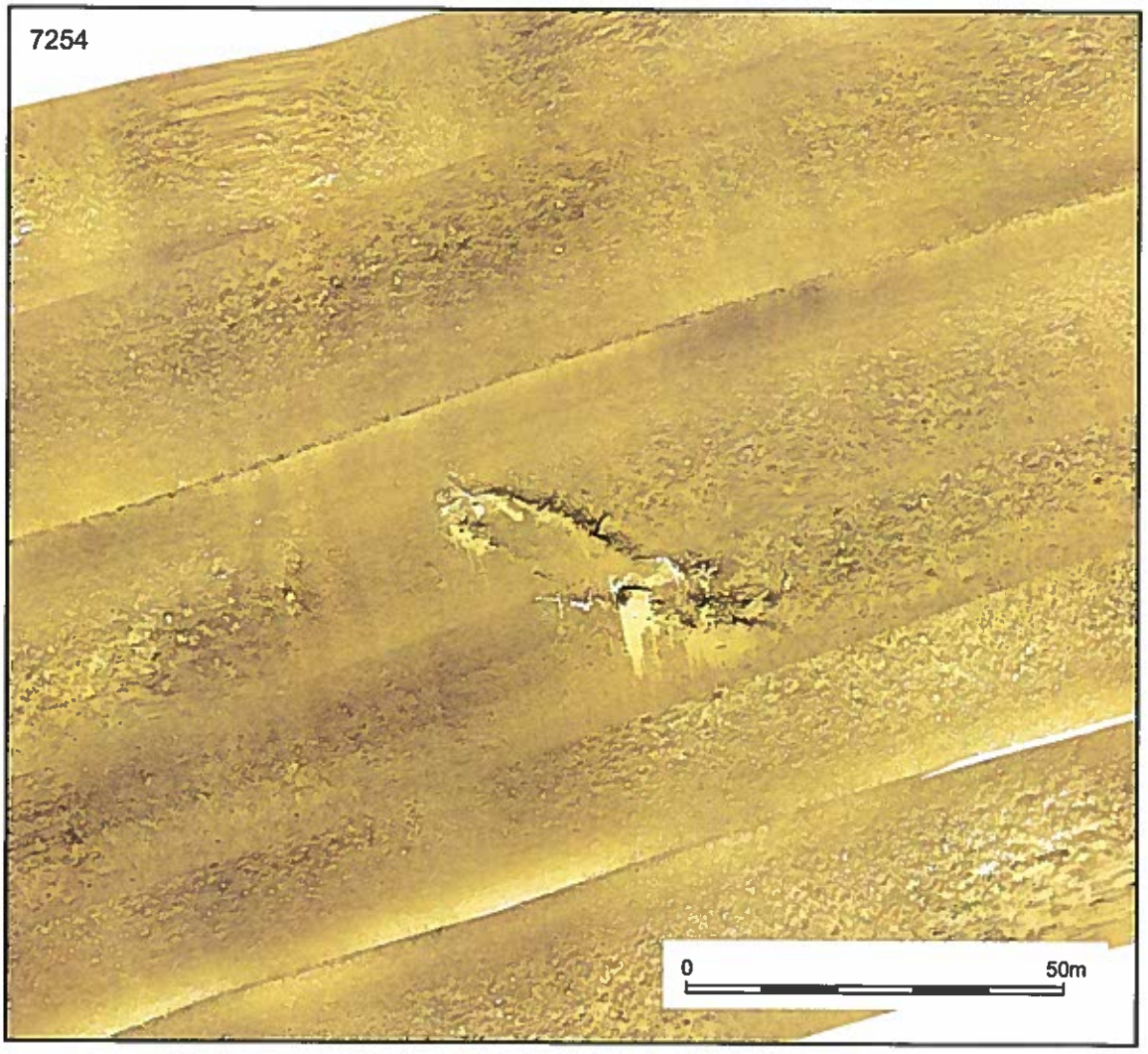
Drawing projection: UTM WGS84 Z30N

Revision Number:	0
Illustrator:	KJB
Date:	22/10/10
Scale:	1:1000 (insets 1:750,000 & 1:250,000) @A3
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys

GSA XVIII: Data samples

Figure 48





Drawing projection: UTM WGS84 Z30N

Date:	22/10/10	Revision Number:	0
Scale:	1:1000 (insets 1:750,000 and 1:200,000) @A3	Illustrator:	KJB
Path:	U:\PROJECTS\53111\7 Drawing Office\Report Figures\2010\Welsh Geophys		

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GSA XVIII: Data interpretation - Designated wreck site *Diamond*

Figure 49