LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Third Draft

WA Ref: 61209.5100.03
January 2008

Site ID: 5100
Site Name: *SS Dynamo*
PLA Wreck No.: 200/5 – WA have not received PLA reports for this site
Mitigation Group: 2.2.3. Site of possible archaeological interest, seaward of SR1
Loss of Life: 3 lives lost
Vessel Type: Commercial cargo vessel
Cause of Loss: Mined
Current Recording Status: Level 2a

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the sites discovery and includes all forms of investigation to date:

1943	*SS Dynamo* lost due to mine (17/4/1943);
1959	Sunk at 51° 50'11" N 01° 34'15" E with least depth 14.6 metres in general depth of 18.3-18.9 metres (15/4/1959);
1959	Wreck reported clear at 12.8 metres, foul at 13.4 metres (15/4/1959);
1959	Examined at 51° 50'06" N 01° 34'18" E (using Decca). Swept clear at 14.3 metres, foul at 14.6metres. Least depth E/S 15 metres in a general depth of 18.9 metres. Seabed sand and stone. Wreck appears to be in an upright position and to have sunk slightly since the 1943 report. There is no scour and sand appears to be building up on either side. (15/4/1959);
1960	Wreck located in 7 fathoms 5 ft (5/5/1960);
1967	Least E/S depth 15 metres in a general depth 18.3 - 19.2 metres. Scour 19.2 metres runs NE/SW (19/10/1967);
1968	Amend to SW 7 fathoms 5 ft. (7/3/1968);
1968	Amend to SW 8 fathoms (? Change to datum);
1969	Amend to SW 7 fathoms 4 ft (datum change to LAT) (12/61969);
1970	Wreck examined on the 29/7/1969 at 51° 50'08" N 01° 34'16" E (using HIFIX). Wreck swept clear at 13.3 metres, fouled at 13.7 metres. Least depth E/S 14.8 metres in a general depth of 17 to 18 metres. Scour 19.2 metres (*HMS Egeria*) (26/2/1970);
1973	Amend to SW 13,3 metres (9/1/1973);
1975	Wreck examined on the 4/3/1975 at 51° 50'07" N 01° 34'15" E (OBG using HIFIX). Clear at 14.8 metres, foul at 15.2 metres. Least E/S depth 15.2 metres in general depth of 18 metres. No apparent scour (22/9/1975);
1980	Wreck examined on the 25/3/1980 at 51° 50'07" N 01° 34'15" E (OGB using HIFIX). Clear at 14.8 metres, foul at 15.2 metres. Least E/S depth 15.2metres. No scour. 4 metres proud, length 45.7 metres, beam 12.2 metres (28/04/1980);
1984	Wreck examined on the 4/7/1984 at 51° 50'07"N 01° 34'17"E (OGB using HIFIX). Least E/S depth 15.2 metres in a general depth 18-19 metres. No scour visible. Upstanding 0.7 metres. Lying 060/240 degrees (18/10/1984);
1987	Wreck swept clear at 13.2 metres, foul at 13.6 metres. Least E/S depth 13.8 metres (2/10/1987);
1988	Wreck examined on the 24/8/1987 at 51° 50'70" N 01° 34'17" E (OGB using trisponder). Swept clear at 13.2 metres, foul at 13.6 metres. Least E/S depth 13.8 metres in a general depth of 18 metres. No scour. Upstanding 1.7 metres. Wreck virtually buried, extending

	over area 80 x 40 metres, orientated 080/260 degrees. Large magnetic anomaly. 1980 examination appears to have been inaccurate (10/2/1988);
1990	Wreck examined on the 29/7/1990 at 51° 5007.5 N 01° 3416.5 E (OGB using trisponder). Least E/S depth 15 metres in general depth of 18.5 metres. No scour. No DCS3 shadow obtained. Sonar length 60 metres, beam 20 metres. Wreck broken up, partially buried and lying 080/260 degrees. A significant mag anomaly observed (22/8/1990);
1993	Wreck located but not examined (30/9/1993);
1996	Wreck located but not examined (20/5/1996);
1998	Wreck examined on the 7/7/1998 at 51° 5007.3 N 01° 3416.2 E (OGB using DGPS). Least E/S depth 15.0 metres in general depth of 18.5 metres. Confirmed length as 70 metres, width 30 metres. Lies 080/260 degrees. No scour. Small isolated piece of debris located 25 metres SW of main area. To be swept (16/7/1998);
1998	Wreck swept clear at 14.5 metres, foul 15.2 metres (25/8/1998);
1999	Wreck located but not examined (6/7/1999);
2000	Wreck located but not examined. Wreck appears as a small, distinct structure surrounded by a 40 metre debris field. Wreck appears to be breaking up and is well buried. General seabed depth 18 metres (24/5/2000);
2001	Wreck located but not examined (20/6/2001);
2002	Wreck located but not examined. No magnetic anomaly present. General seabed depth 18 metres (1/7/2002);
2005	Wreck examined on the 6/6/2004 at 51° 50.152 N 01° 34.164 E (WGD using DGPS). Wreck swept clear at 14.7 metres, foul at 14.9 metres. Least M/B depth 14.29 metres in general depth of 18.5 metres. No scour. Length 70 metres, width 30 metres, upstanding 3.5 metres. Lies 080/260 degs. Wreck broken up surrounded by a debris field (15/12/05);
2006	PLA site investigation using Reson 8125 multibeam system (9/5/2006);
2007	PLA site investigation using sidescan sonar (EG&G 272 dual frequency towfish), with WA in attendance (7-8/8/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2005	UKHO (14530)
2005	NMR (908122)
2006	http://72.14.207.104/search?q=cache:Us3_QqYcvg4J:www.bpears.org.uk/NEDiary/Inc/ISeq_32.html+SS+Dynamo+1943&hl=en&ct=clnk&cd=1
2006	http://72.14.207.104/search?q=cache:8MTZoKlstRMJ:www.theshipslist.com/ships/lines/wilson.html+SS+Dynamo+1943&hl=en&ct=clnk&cd=7
2007	Wessex Archaeology, Geophysical Analysis of 2006 multibeam (inclusive of 1 geo tiff and seven tiff images) and 2007 sidescan sonar data (inclusive of one geo tiff and five tiff images)

3. SITE DESCRIPTION

Position (UTM) obtained from 2006 multibeam data: 401446 E 5743758 N
Position (UTM) obtained from 2007 sidescan data: 401476.9 E 5743770 N
Location: The site is located in the outer Thames Estuary, 50 metres inside the eastern edge of the dredged channel in an area where the channel runs north–south (**Figure 1**).
Bed Depth: 18.6 metres
Minimum Target Depth: 14.7 metres
Extent: 56 metres x 21 metres, 4.1 metres upstanding
UKHO Status – LIVE

2001 WA sidescan sonar interpretation:

Site **5100** was not located inside the 2001 survey area.

2002 WA sidescan sonar interpretation:

Site **5100** was not located inside the 2002 survey area.

2007 WA multibeam interpretation:

In 2006 a multibeam survey was undertaken by the PLA over the site of the *Dynamo*. The site lies in north-east by south-west orientation (*c.* 070/250 degrees) and is oval in shape (**Figure 1A-C**).

The wreck is *c.* 56 metres long, *c.* 21 metres wide and *c.* 4.1 metres upstanding. The highest point is an approximate square object near the south-west end of the wreck (**Figure 1C**). It measures 4.8 metres north to south by 5.6 metres east to west. Apart from this object the wreck has a maximum height of *c.* 2 metres. It appears to be quite broken up.

There is a small scour at the western corner of the wreck, which is 7.5 metres long from east to west, 4 metres wide from north to south and approximately 0.2 metres deep. There is no object in it. At the north-east end of the wreck are two more small scours. The western one measures 8 metres south-west to north-east, is 5 metres wide and 0.3 metres deep. The eastern one measures 6 metres south-west to north-east, is 4 metres wide and 0.2 metres deep. Both these scours appear to be around objects. The object in the western scour measures 3 metres by 1 metre and is 0.1 metres high. The object in the eastern scour measures 2 metres by 1.5 metres and is 0.15 metres high.

Approximately 31 metres south-west from the south-west end of the wreck is a smallish object in a scour (**Figure 1D**). The scour is on the north-east side of the object. The object is *c.* 0.4 metres high from the base of the scour, which is *c.* 0.2 metres below the surrounding seabed. The object measures *c.* 2.7 metres south-west to north-east and *c.* 3.6 metres south-east to north-west. The scour measures *c.* 4.5 metres north-west to south-east and *c.* 5.5 metres north-east to south-west.

2007 WA sidescan sonar interpretation:

In 2007 a sidescan sonar survey was conducted by the PLA over the site of the *Dynamo*. This confirmed the information gathered from the multibeam data and and provided additional detail (**Figure 2**). The data show a distinct wreck site with many upstanding features, the tallest being near the south-west end of the wreck. According to these data, the wreck is 62.7 metres long, 20.6 metres wide and 4.2 metres high. The seabed appears to comprise sandwaves to the north-west. These are not visible on the other side of the wreck but this may be an effect of increased distance from the sidescan sonar fish.

4. SITE HISTORY

Build

The steam coaster *Dynamo* was built for Ellerman's Wilson Line Ltd. by R. Williamson and Son, Workington, in 1920 (launched in May). R. Williamson and Son built steam coasters mainly for their own fleet. They preferred coasters with two hatches and this is reflected in the design of their vessels. The hatches were built with curved sides and ends which was

expensive to produce, but had the advantage of being much stronger and allowed for the trimming of bulk cargoes (Waine and Fenton 1994).

The steam coasters *Stepney*, 1916, and *Ardshean*, 1921 are typical examples of the vessels designed and built by R. Williamson and Son. The company built nine hulls between 1920 and 1930, and closed down in 1938 with the death of Mr Williamson, the founder's son.

The Wilson Line was founded in 1843 by Thomas Wilson of Hull and was originally Beckington and Wilson. It then became Thos. Wilson, Sons and Co. Ltd upon the retirement of Mr. Beckington. The company became Ellerman's Wilson Line Ltd. in 1917 when it was bought by John Ellerman (Harrower 1998 and Talbot-Booth 1940). A detailed history of the Line and brief description of all Wilson Line vessels is contained within the Ship List website (Kohli and Swiggum 2006):

Dynamo is listed in Lloyds Register of 1920with the following specifications (Lloyds of London 1774-):

Steamer's Name, Material, Rig, &c.	*Dynamo* Machinery fitted aft, well deck, cargo battens not fitted 1 deck of steel
Registered Tonnage **Gross:** **Under deck:** **Net:**	 809 548 377
Build Date	1920
By	R. Williamson & Son
Where	Workington
Owners	Ellerman's Wilson Line Ltd.
Registered Dimensions, Deck Erections &c. **Length** **Breadth** **Depth (in feet and tenths of a foot)** **Quarter Deck (length)** **Bridge deck (length)** **Forecastle (length)**	 186.3ft (56.78m) 29.4ft (8.96m) 12.4ft (3.77m) 116ft (35.5m) (raised quarter deck) 9ft (2.74m) 23ft (7m)
Port of Registry	Hull, British
Engines	Triple expansion 3 cylinder steam engine Cylinder diameter and length of stroke in inches: 14, 24 & 39 – 27
Horsepower	76 RHP (nominal horse power as recorded in the Official Register of the vessel
Boilers	1 single ended boiler, 3 plain furnaces Grate surface area of 58sqft Heating surface of 1809sqft
Engines built by	McKie & Baxter, Glasgow
Ballast	Cellular construction of double bottom Forward tanks 112ft long with a capacity of 162 tonnes Forward peak tank has a capacity of 40 tonnes
Anchors and chains	Proved at a machine recognised by the committee of Lloyd's registers

Further detail is given in the Lloyd's Survey Report of 1920, which also contains a number of plans:

Plan No	Scale	Content
LSR/230/W/29/1	1:48	Profile and deck, 1918 (constructional)
LSR/230/W/29/2		Midship section, 1918
LSR/230/W/29/3		Rudder and stern frame, 1918 (blueprint)
LSR/230/W/29/4		Main boiler, standard C2 coasters (blueprint)
LSR/230/W/29/5		Donkey boiler, steel vertical, 1918 (blueprint)

Plans of the fore end and steel vertical boiler are included in **Figure 3**. A profile plan and deck arrangement of an almost identical steam coaster, *Copsewood*, can be found in Waine and Fenton (1994) (**Figure 4**), and a plan of a standard "C2" coaster boiler is attached in **Figure 5**.

The National Maritime Museum also holds a contemporary photograph of the *Dynamo*, details listed below:

Photograph reference number	Content
(Br) 50.3	Distance shot of *Dynamo* at sea

Further details can be found in Talbot – Booth's Steam Coasters, which lists the vessels, giving details, owned by Ellerman's Wilson Line Ltd (Talbot-Booth 1940). The main distinguishing features for ships within the line can be summarised as:

Hulls: Rather bright green
Boot-topping: Red
Venilators: Some white, some brown
Inside of cowls: Red
Names: With one exception, all end in "O"

Use
Vessels of the Ellerman's Wilson Line Ltd. were used on a number of different routes, and carried cargo to and from: Hull, London, Liverpool, Manchester, Middlesbrough, Newcastle, Aberdeen, Swansea, Antwerp, Dunkirk, etc. to Norway, Sweden, Denmark, Baltic States, Portugal, Mediterranean, Adriatic and Levant, Egypt, India and the U.S.A. (Talbot-Booth 1940).

While the coasters would not have travelled across the Atlantic, some journeys typical for the routes *Dynamo* served are listed below (Lloyds of London 1734-):

7th May 1920 – Dynamo leaves Glasgow for London (presumably having just been sold to Ellerman's Wilson Line Ltd.).
10th May 1920 – Dynamo is at Gravesend and is bound for Tilbury Dock.
17th May 1920 – Dynamo arrives at Shields from London.
25th May 1920 – Dynamo leaves Shields and is bound for Rouen.

Loss
There is a limited amount of information pertaining to the loss of the vessel. According to the Lloyd's List of 1943 the *Dynamo* was mined on the 17th of April, 1943 in the Thames Estuary, though no further positional information is listed (Lloyds of London 1734-).

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of 'possible' archaeological interest. The key aspects of the site that have lead to the above rating are:

- Despite dispersal activity there are still scattered debris and upstanding features, indicating substantial remains on the seabed;
- It is not known whether there are any surviving examples of this vessel type;
- The wreck may contain evidence of life on board the vessel at the time of loss.

6. CONSTRAINTS

Due to the location of the site within the Thames and because it is a vessel sunk by enemy action during World War II the potential for ordnance in the area should not ignored as the ship may have been armed. The possibility of human remains is also equally as likely as it is known that three people died during the sinking.

The site is upstanding by at least 4.1 metres (multibeam interpretation) and therefore entanglement maybe an issue when investigating the site with divers.

7. SCOPE OF FURTHER STAGE I MITIGATION

Stage 1 Mitigation is intended to achieve a Level 2 record of the site, which is a record that provides sufficient data to establish the extent, character, date and importance of the site.

Build

- Construction (material, fastenings, methods)
- Propulsion
- Diagnostic features (machinery, fittings, armament)

Use

- Artefact/Cargo (dating objects)

Survival

- General survival of the site

Investigation

Traces of any previous work on the site (salvage, dispersal, excavation etc).

Level 2a recording has been achieved for this site through geophysical surveys and documentary research. The extent of the site, as far as visible above the seabed, has been established through multibeam and sidescan sonar survey. Character, date and importance of the site are evident from the documentary research.

8. OUTLINE OF STAGE II MITIGATION

The wreck lies 50 metres inside the dredged channel. The wreck will be subject to resettlement. There is no planned archaeological mitigation during resettlement operations.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

The site will have been resettled.

ARCHIVE

RECOVERED MATERIAL

No material has currently been recovered from the site.

DIGITAL ARCHIVE

Material	Location
2006 multibeam data	WA
2007 sidescan sonar data	WA

PAPER ARCHIVE

Material	Location
UKHO (14530)	WA
NMR (908122)	WA
Port of London Authority, 2005, *Wreck and Obstruction Categorisation Report*, includes PLA multibeam and pseudo side scan screen captures	WA
14 printed images of the 2006 multibeam data and 2007 sidescan sonar data	WA

REFERENCES

Harrower, J. (1998). *Wilson Line: the history and fleet of Thos. Wilson, Sons Co. and Ellerman's Wilson Line Ltd.* Gravesend: World Ship Society.

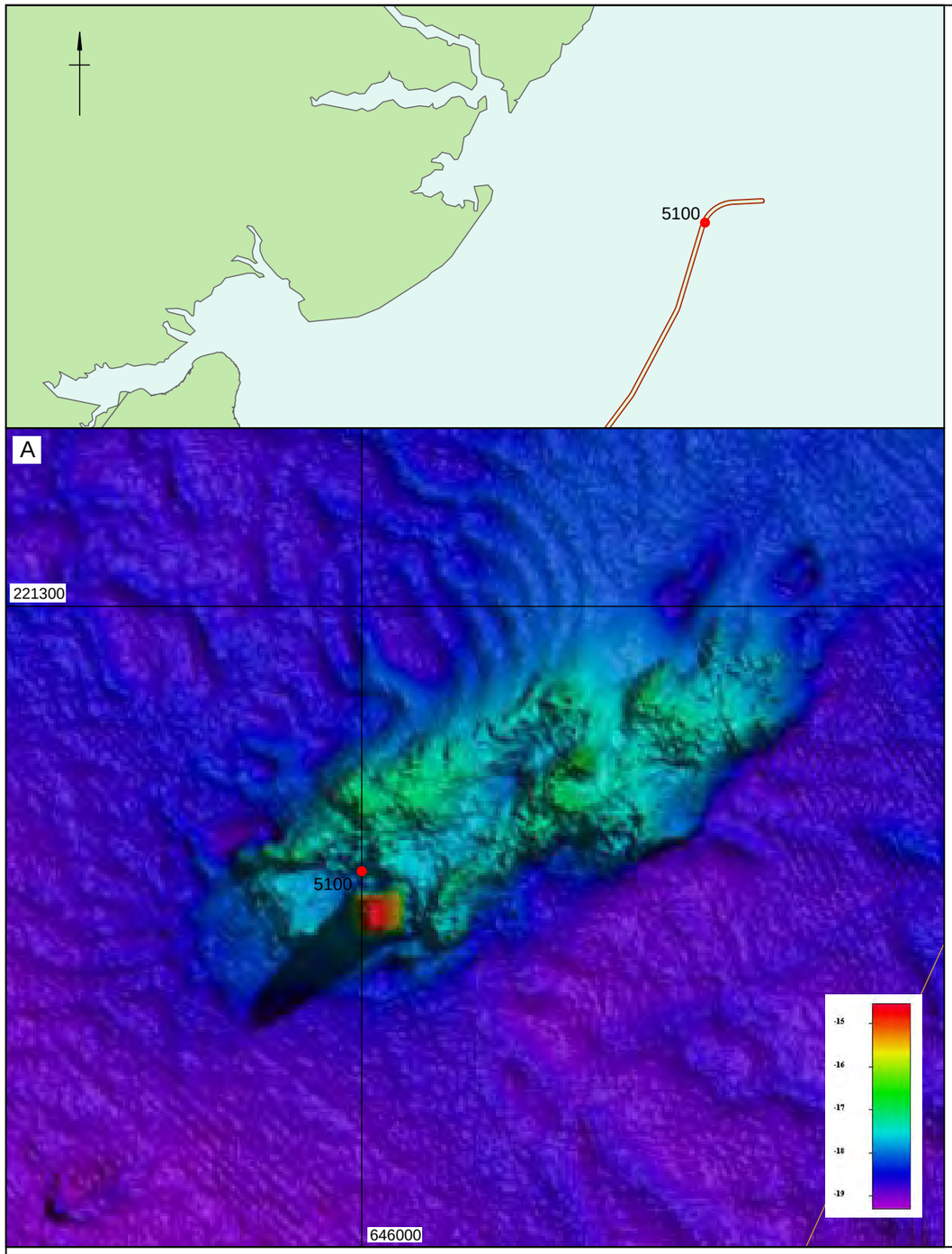
Kohli, M. & Swiggum, S. (2006), http://www.theshipslist.com/ships/lines/wilson.html.

Lloyds of London (1734-). *Lloyds List.* London.

Lloyds of London (1774-). *Lloyds Register of British and Foreign Shipping.* London.

Talbot-Booth, E. C. (1940). *Merchant ships.* London: Marston & Co Ltd.

Waine, C. V. & Fenton, R. S. (1994). *Steam coasters and short sea traders.* Albrighton: Waine Research Publications.



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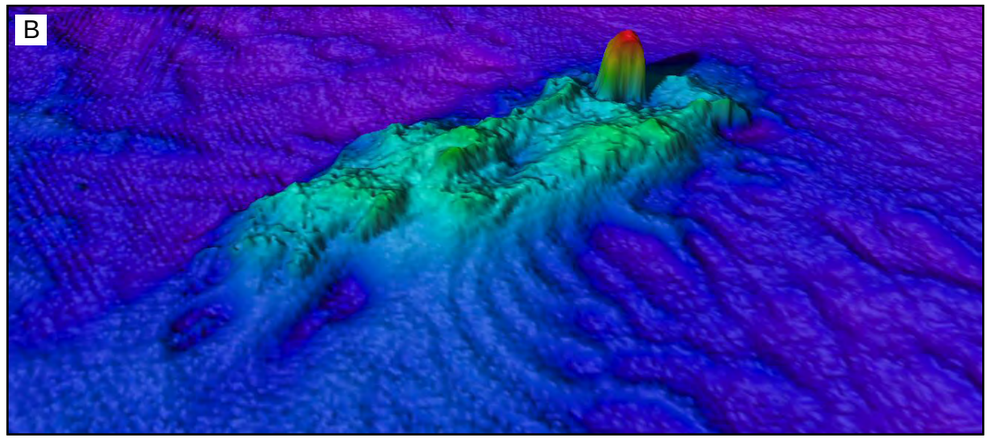
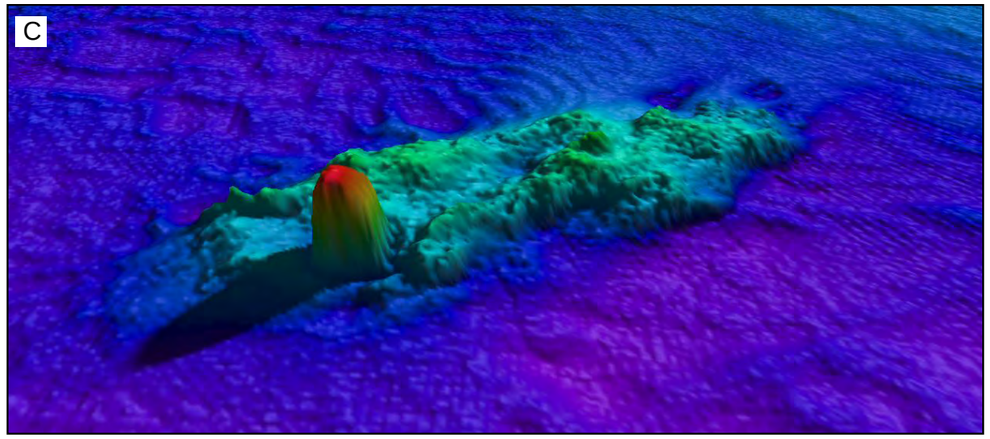
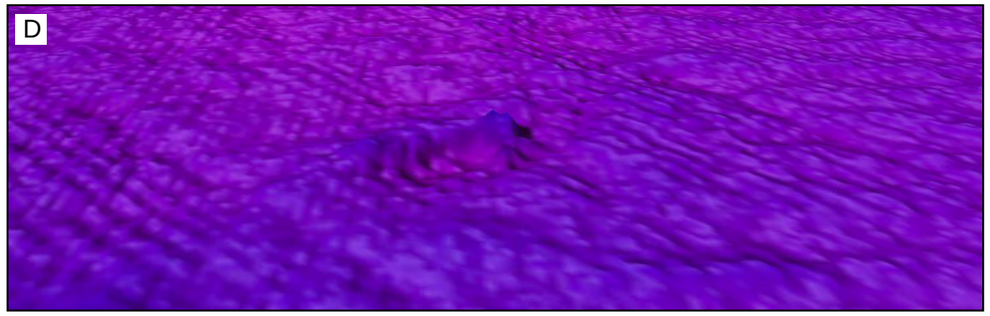


Oblique view from north.



Oblique view from south.



Object to south-west of Dynamo, oblique view from north.

- Site location
- Dredging limits
- 50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

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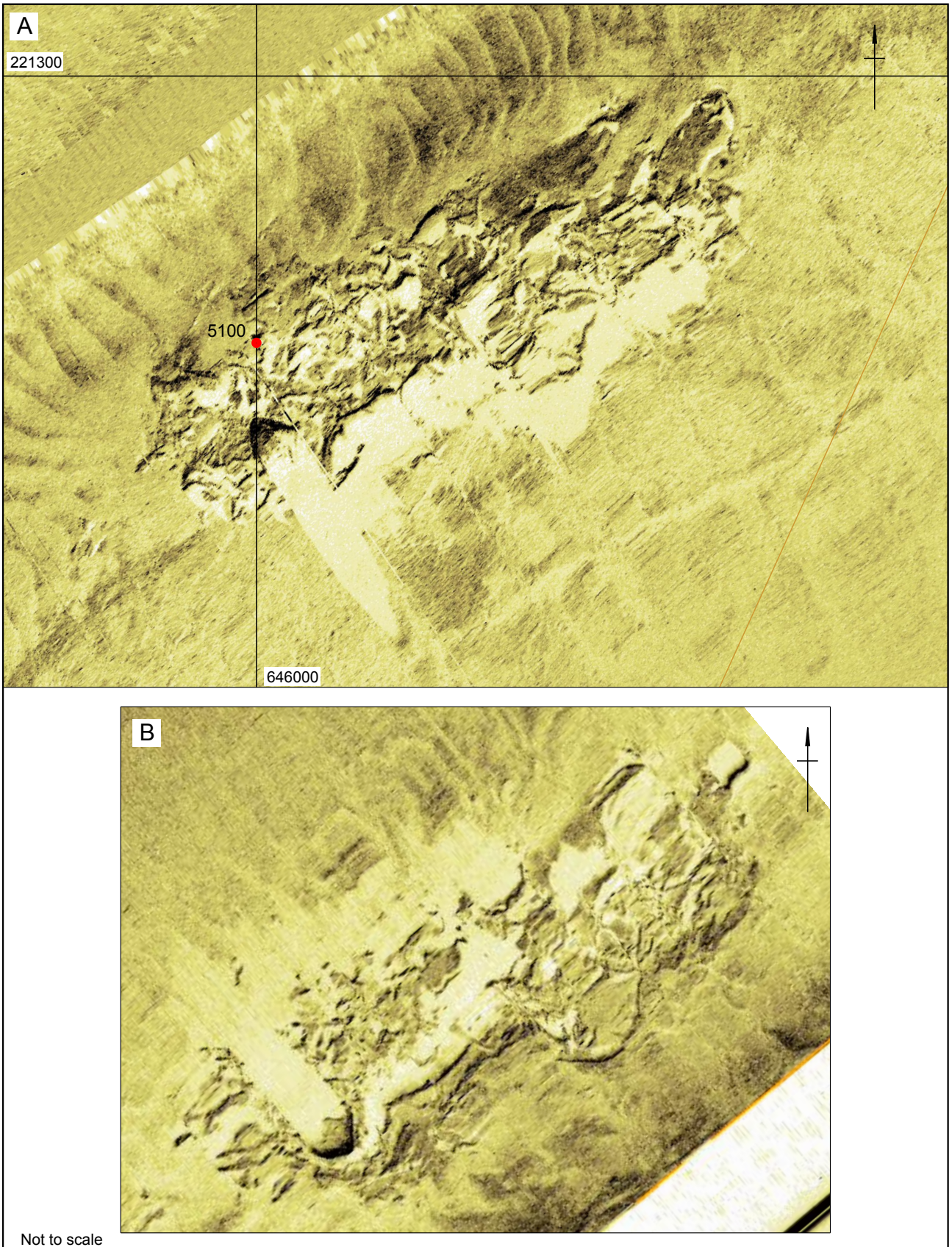
Location and Multibeam data for Site 5100.

Figure 1



Site location
Dredging limits

Projection OSGB

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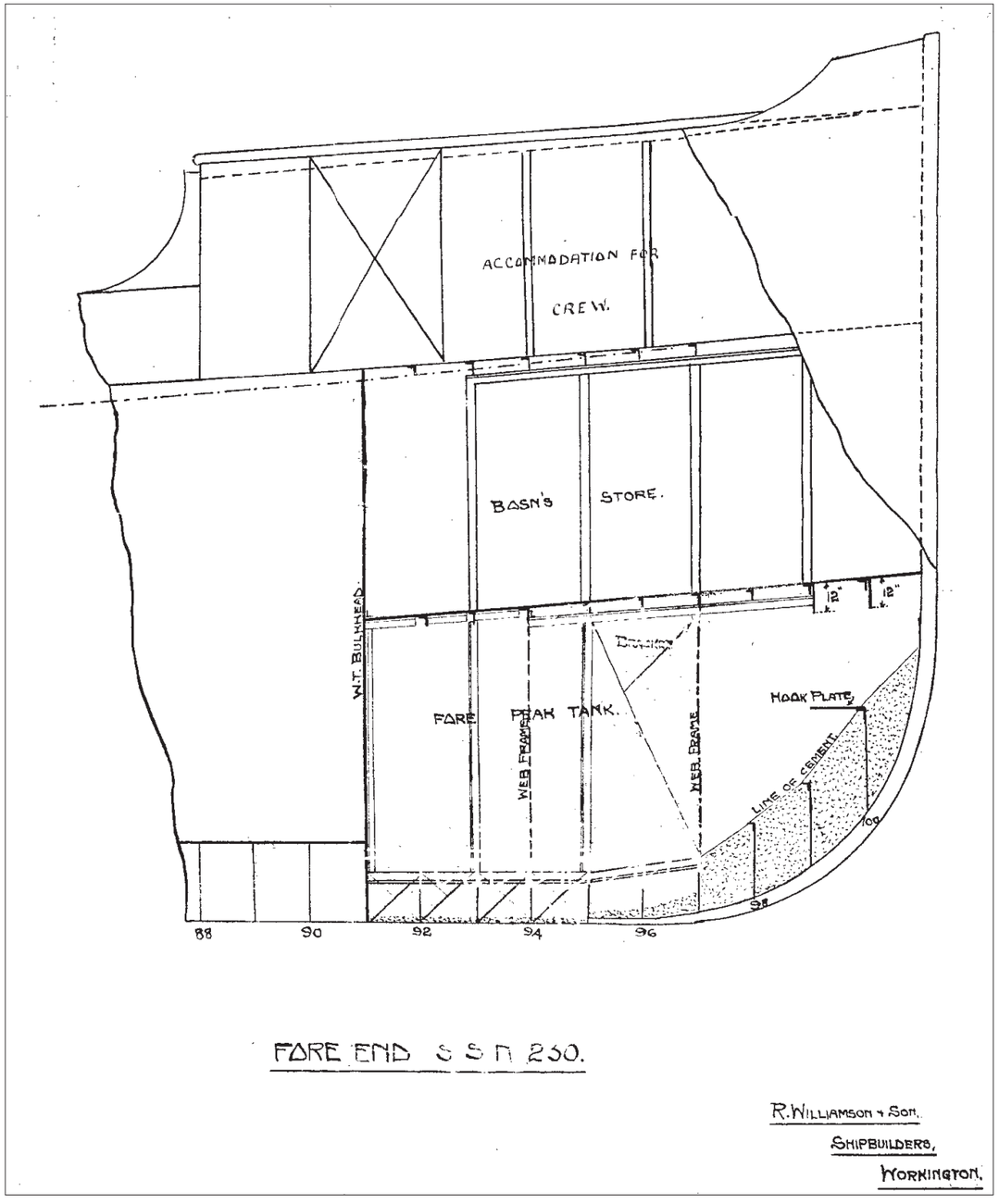
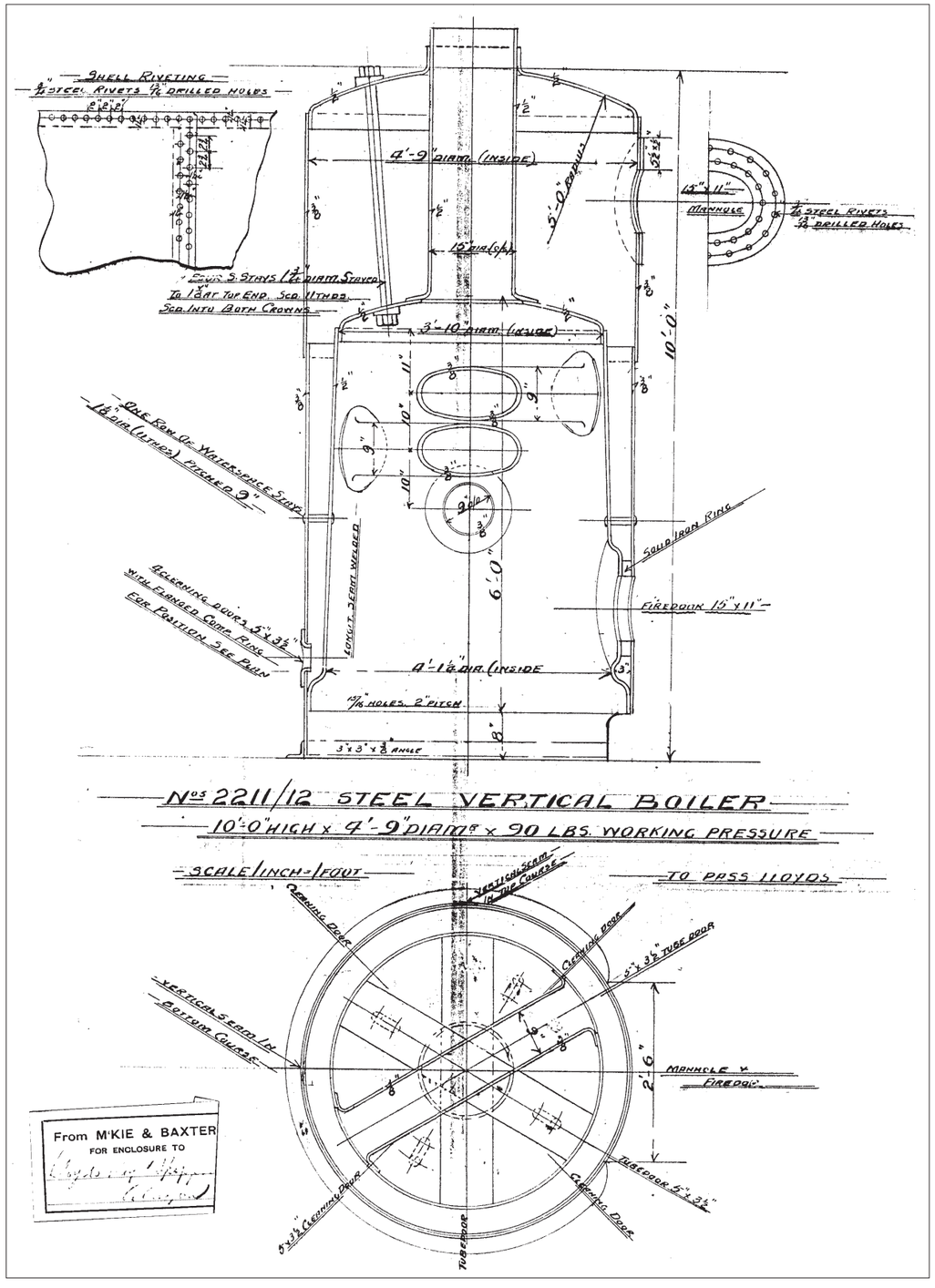
Wessex Archaeology

Sidescan Sonar image of Site 5100. Figure 2



FORE END S S DYNAMO.

R. WILLIAMSON & SON.
SHIPBUILDERS.
WORKINGTON.



From McKIE & BAXTER
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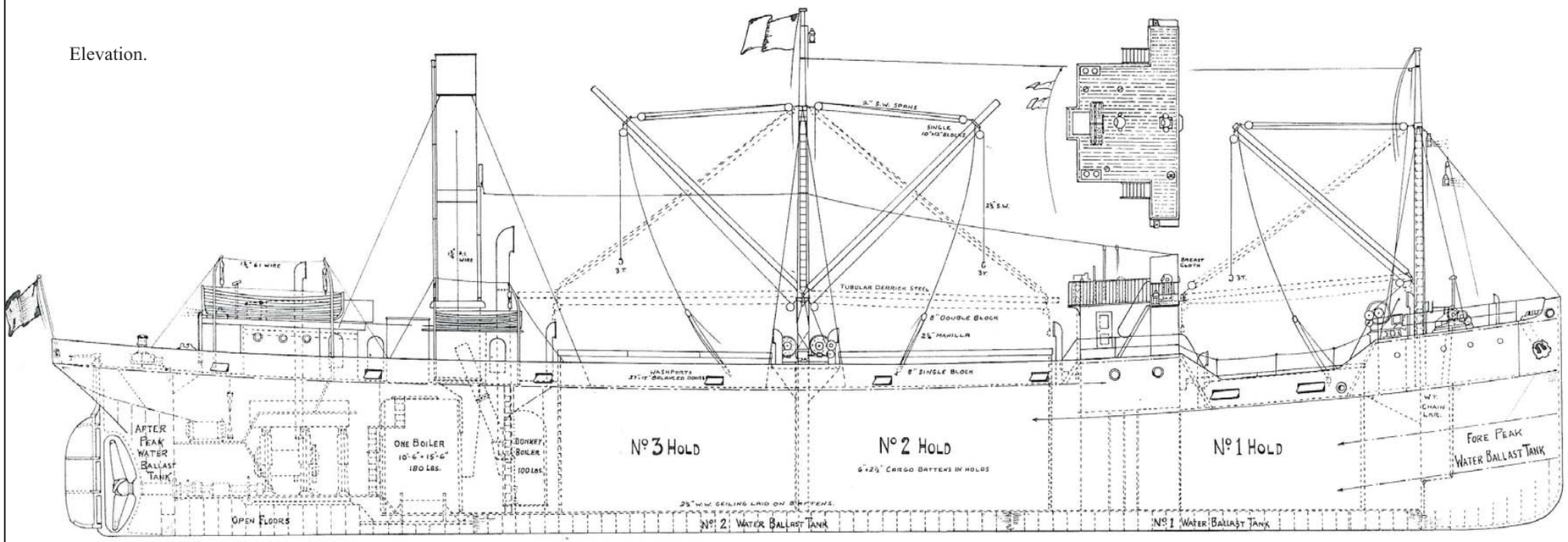
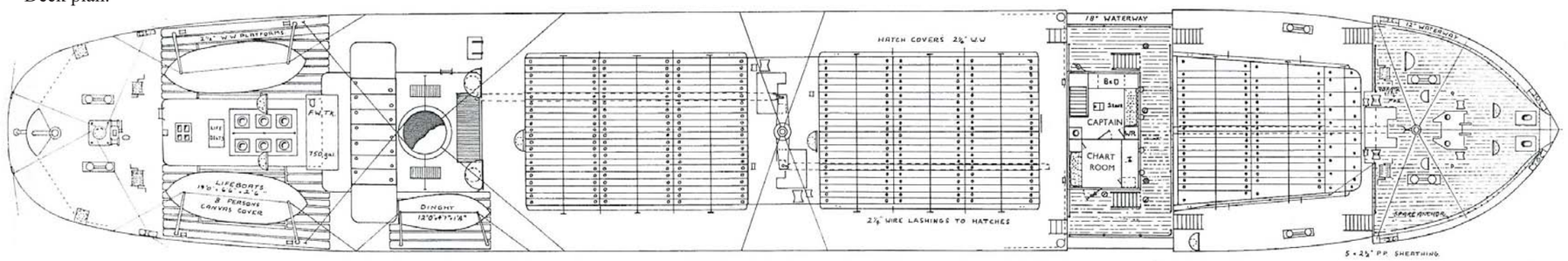
Plan of fore end and steel vertical boiler of *SS Dynamo*

Figure 3

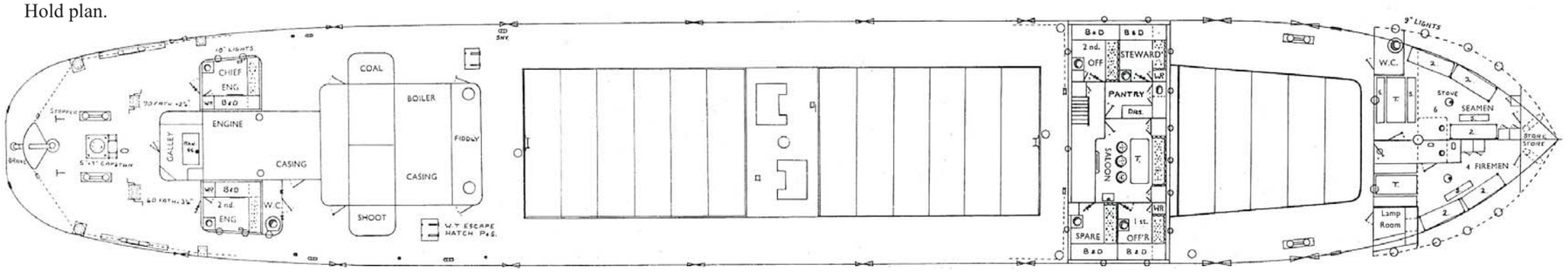
Elevation.



Deck plan.



Hold plan.



Plan of similar vessel *SS Copsewood.*

Figure 4

Wessex Archaeology

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STANDARD "C2" COASTERS.

BOILER.

ONE OFF THUS.

TO LLOYDS REQUIREMENTS.

FOR WORKING PRESSURE OF 180 LBS. PER SQ. IN.

APPROVED BY LLOYDS 10/5/18.

BOILER Nº 2013.

REPEAT FOR 2014.

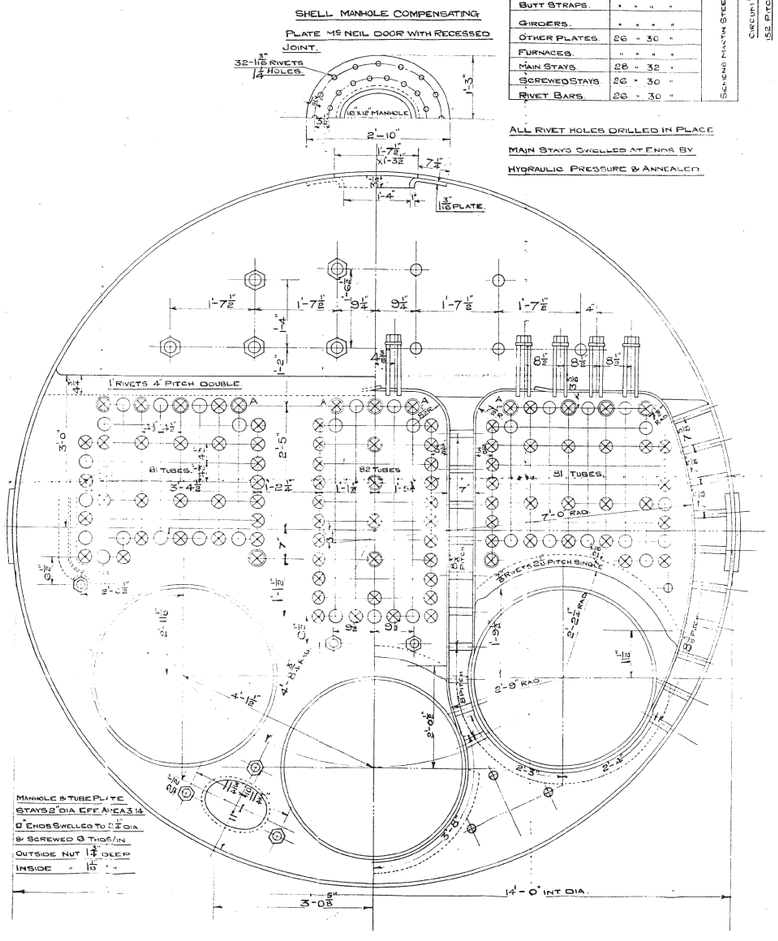
RIVETTING.		
	LONGITUDINAL	CIRCUM.L
DIA RIVET.	1 1/16"	1 1/16"
" " HOLE.	1 1/16"	1 1/16"
PITCH	8 1/2"	3 1/2"
	LLOYDS	LLOYDS
PLATE PERCENTAGE	85.3	64.4
RIVET. "	93.	51.5

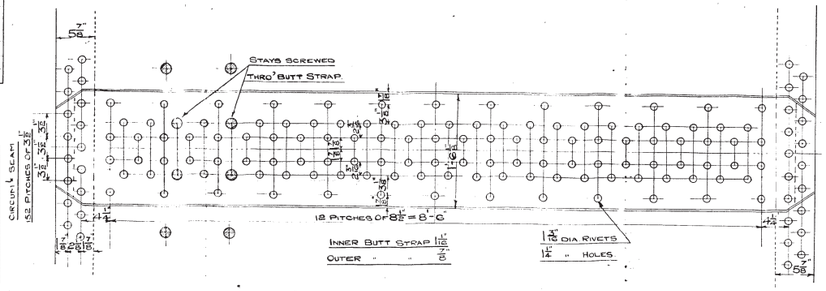
LIMITS OF TENSILE STRENGTH & MATERIAL.		
SHELL.	28 TO 32 TONS/□"	SIEMENS MARTIN STEEL
BUTT STRAPS.	" " "	
GIRDERS.	" " "	
OTHER PLATES.	26 - 30 "	
FURNACES.	" " "	
MAIN STAYS.	28 " 32 "	
SCREWED STAYS	26 " 30 "	
RIVET BARS.	26 - 30 "	

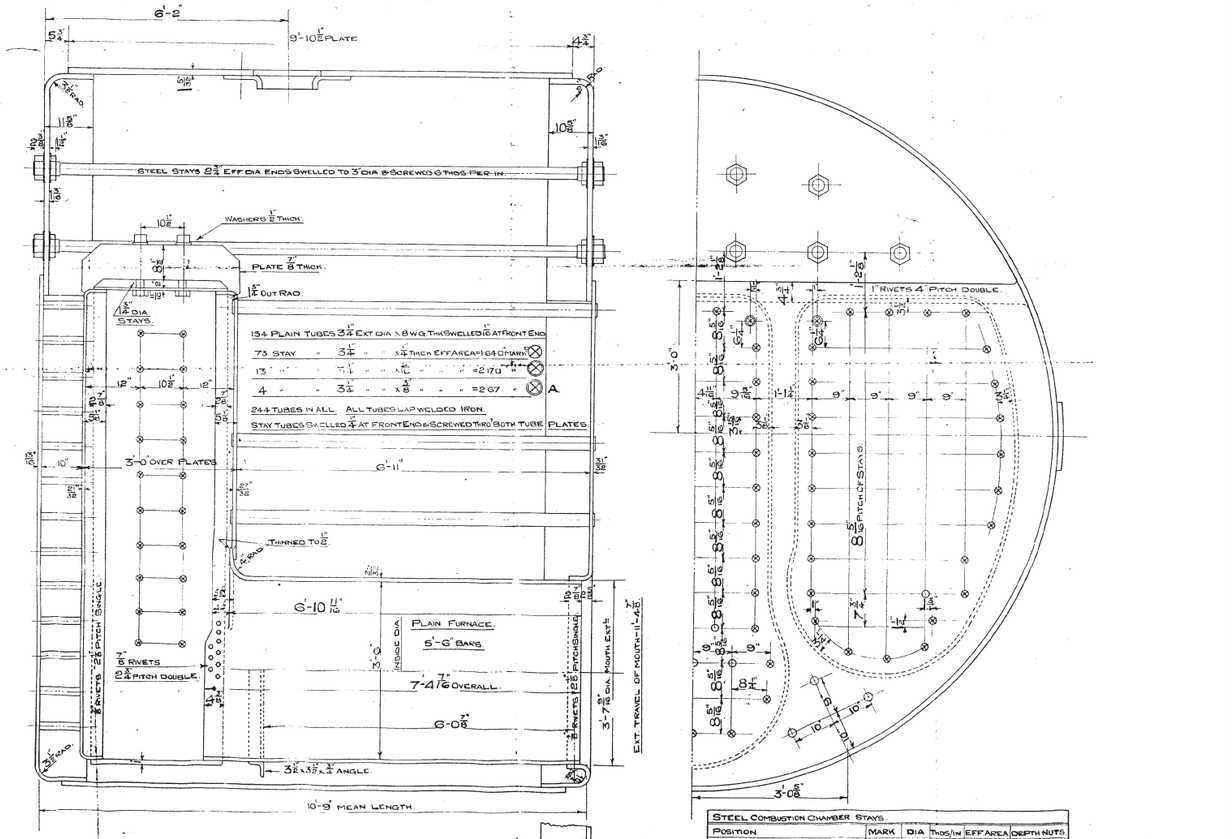
ALL RIVET HOLES DRILLED IN PLACE

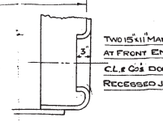
MAIN STAYS SWELLED AT ENDS BY HYDRAULIC PRESSURE & ANNEALED

PARTICULARS	
HEATING SURFACE IN 244 TUBES	1436.84 FT.
" " " 3 COMB.CH.	246 " "
" " " 3 FURNACES.	127 " "
TOTAL HEATING SURFACE.	1809 " "
GRATE AREA 5'-0" BARS.	57.75 " "
AREA THRO' TUBES.	10.82 " "
RATIO GRATE TO HEATING SURFACE.	1:31.3 " "
" " " AREA THRO' TUBES.	5.34:1 " "
STEAM SPACE CUBIC FEET.	340
WEIGHT OF WATER AT WORKING LEVEL & TEMPERATURE.	









STEEL COMBUSTION CHAMBER STAYS.					
POSITION	MARK	DIA	THDS/IN	EFF AREA	DEPTH NUTS
BACK TOP CORNERS.	⊗	2"	9	2.71 □"	1 1/2"
" MARGINAL TOP & SIDES.	⊗	1 1/4"	9	2.03 "	1"
BACK.	○	1 1/8"	9	1.73 "	1"

GIRDER TOP NUTS 1/4" DEEP (OUTER)

ALL COMB. CH. STAYS SCREWED THRO' BOTH PLATES & FITTED WITH NUTS EACH END.

EXCEPT STAYS THRO' SHELL WHICH PROJECT 3/8" & ARE TO BE RIVETTED & CAULKED.

SCALES 1" & 1 1/2" = 1 FOOT.

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Plan of standard "C2" coasters boiler

Figure 5

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Fourth Draft

WA Ref: 61209.5124.04
August 2008

Site ID: 5124
Site Name: Unknown (possibly a wreck with associated debris scatter)
PLA Wreck No.: 208/1 and 208/27 – WA have not received the PLA reports for these sites
Mitigation Group: 2.2.2 Site of probable archaeological interest, seaward of SR1
No. of Casualties: Unknown
Cause of Loss: Unknown
Vessel Type: Unknown
Current Recording Status: Below Level 1b

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the sites; the summary begins with the sites discovery and includes all forms of investigation to date:

1984	Wreck swept clear at 15.8 metres. Shown in 51° 33'47"N, 01° 12'22"E on PLA 208(5) (10/12/1984);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005);
2007	PLA site investigation using sidescan sonar (EG&G 272 dual frequency towfish), with WA in attendance (7-8/8/2007);
2007	WA diving investigation (29/11/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2005	UKHO (14862);
2005	NMR (831932);
2005	Wessex Archaeology, Geophysical Analysis of 2005 multibeam data (inclusive of: one geo tiff and seven tiff images);
2007	Wessex Archaeology, Geophysical Analysis of 2007 sidescan sonar data (inclusive of one geo tiff and four tiff images);
2007	Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report.*

3. SITE DESCRIPTION

Position (UTM) obtained from multibeam data: 375524.173 E 5714061.124 N
Location: Site **5124** is located seaward of SR1 30 metres outside the main dredging channel (**Figure 1**).
Bed Depth: 16.8 metres
Minimum Target Depth: 15.8 metres

Extent: 45 metres x 25 metres x 0.9 metres
UKHO Status – LIVE

2001 WA sidescan sonar interpretation:

The extents of the 2001 sidescan sonar survey did not include the location of site **5124**.

2002 WA sidescan sonar interpretation:

The extents of the 2002 sidescan sonar survey did not include the location of site **5124**.

2005 WA interpretation of PLA multibeam data:

Site **5124** is in two sections and covers a total area of 45 metres by 25 metres (**Figures 1A-B**). The north-east section is 8 metres by 4.5 metres (**Figure 1D**). The western section is approximately 20 metres by 25 metres (**Figure 1C**).

The distance between the two areas is approximately 17 metres. The multibeam image of the north-eastern section shows a wreck shaped feature within the crest of a sandwave. The feature has a distinct high point along its southern edge that stands *c.* 0.9 metres high (**Figure 1D**). The general bed level is 16.8 metres.

The multibeam image of the western section shows a scatter indicative of debris. The maximum height above the seabed of these anomalies is c. 0.5 metres (**Figure 1C**).

2007 WA sidescan sonar interpretation:

The sidescan sonar data confirmed the information gathered from the multibeam data and provided additional detail. Site **5124** is observed as two distinct sections of broken wreck/debris situated in an area of sandwaves. The entire site covers an area of approximately 40 metres by 20 metres (**Figure 2**).

The western section is the larger of the two and covers an area of 22 metres by 20 metres. It consists of a series of individual dark reflectors interpreted as debris scatter measuring up to 3 metres long. Shadows indicating both depressions and heights are observed within the area. The maximum recorded height on the sidescan sonar data was calculated to be 0.4 metres.

The north-eastern section of the site is situated approximately 12 metres from the debris scatter and covers an area of 8 metres by 9 metres. The sidescan sonar data indicates that the wreck is broken up but not as dispersed as the debris scatter. The maximum measured height of this feature is 0.4 metres. Approximately 4 metres to the north-east of this section of the site a small (1 x 1.5 metres) feature is observed on the data. This feature probably represents associated debris.

2007 WA diving investigation:

The objective of the initial dive was to investigate the north-east section of the site. The diver made bottom approximately 5 metres north-east of that section and was directed to what appeared to be its northern edge. The diver then moved across the north-east section from north to south, locating the southern edge of the exposed features approximately 10 metres further south.

The diver described the north-east section of the site as lying in a large shallow scour in a firm sandy seabed. The diver observed the scour on the northern and southern edges of the exposed site. A layer of silt was observed within the scour, suggesting that the scour is fairly stable. Smaller and deeper scours were observed immediately around some of the features described below.

The diver located and examined the following site features as they moved across the site. All of the features were within the large scour. The diver described the relative positioning of the features as being a 'scatter' and no coherent pattern was observed. Limited probing along the southern edge of the scour failed to detect buried material. All dimensions for concretions should be regarded as approximate:

- Several ferrous concretions identified as ferrous bars of variable diameter. One concretion was made of two parallel bars, each of approximately 20-30mm diameter, and over 1 metre long. A number of smaller section (30mm diameter) bars were curved. Most of these bars appeared to be part-buried.

- Two more substantial concretions were observed. One of them was a section of a larger buried ring-like ferrous concretion. Upstanding by approximately 1 metre, the ring was approximately 50mm diameter in section. If this feature is a complete ring then the outside diameter may be up to 2 metres. Another large concretion was located south of this, and it appeared to be largely buried. It was approximately 2 metres in length and 0.2 metres in diameter. These concretions were not identified.

- A part-buried tube-like concretion upstanding 0.5 metres from the seabed was also examined. It was approximately 50mm in diameter and had a roughly circular opening in the exposed end of approximately 20mm diameter. On the underside of this concretion was a ring-like attachment which appeared to be part of the original object. The ring diameter was approximately 0.1 metres. This concretion was not identified.

- Three boulder sized (coarse component size range 200mm+) stone or concrete features were located. One had the form of a rectangular block and was largely buried. A second, although largely buried, appeared to be roughly circular with a possibly concave side. The exposed side was approximately 0.4 metres wide. None of these features were identifiable.

2008 WA diving investigation:

The diving operation identified sections that appear to be dumps of reinforced concrete and other construction material, possible originating from the demolition of an unidentified modern coastal structure or Second World War defence structures including the Knock John Tower at a distance of 2.9km from the site. Both sections are very probably associated and the remains of the same structure.

No evidence of a wreck was located.

4. SITE HISTORY

Site **5124** was first located in 1984 and was swept to a depth of 15.8 metres. The multibeam survey of 2005 and the sidescan sonar survey of 2007 showed that the site consists of two

sections. The north-eastern section is wreck-shaped, whereas the western section is interpreted as debris scatter. The name of the vessel and date of sinking are unknown.

Although the 2007 diving investigation has located the north-east section of the site and confirmed that it consists of material of anthropogenic origin, insufficient evidence is available so far to identify the site further.

Since its discovery WA has received no reports of salvage or clearance works carried out on the site.

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of 'probable' archaeological interest. The key aspects of the site that have lead to the above rating are:

- Its scattered debris and upstanding features;
- Its semi-oval shape with associated debris field, similar in characteristic to known wreck sites;
- The diving investigation so far does not rule out the possibility that the site is a wreck, but the alternative possibility that it represents a dump of material also cannot be ruled out. Further investigation, notably of the other section of the site will be required, although intrusive work may be necessary in both parts in order to confirm or rule out the wreck theory.

6. CONSTRAINTS

The identity and type of vessel is not currently known, it is therefore not possible to state whether there will be issues with ordnance or human remains.

7. SCOPE OF FURTHER STAGE MITIGATION

The aim of the Stage I Mitigation is a Level 2 record of the site. The Level 2 objective is the production of a record that provides sufficient data to establish the extent, character, date and importance of the site. The following elements of the wreck will be considered, at the different evaluation stages, to meet these objectives:

Build

- Construction (material, fastenings, methods)
- Propulsion (sail, steam, diesel or and combination)
- Diagnostic features (machinery, fittings, armament)

Use

- Artefact / Cargo (dating objects)

Survival

- General survival of the site

Investigation

- Traces of any previous work on the site (salvage, excavation etc).

The current recording status is below Level 1b, as presence and position of the site are known, but the site type still needs to be confirmed. Further archaeological diving will be necessary to establish site type, extent, character, date and importance.

ARCHAEOLOGICAL DIVING INSPECTION (STAGE I, MITIGATION 1B)

The site has undergone Stage I diving inspection and a Level 2 record has been achieved for this site.

The sections appear to be dumps of reinforced concrete and other construction material, possible originating from the demolition of an unidentified modern coastal structure. Both sections are very probably associated and the remains of the same structure.

No evidence of a wreck was located.

8. OUTLINE OF STAGE II MITIGATION

The wreck lies inside the dredged channel. The wreck will be cleared no further archaeological work is recommended for this site.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

The site will be cleared by grabbing.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

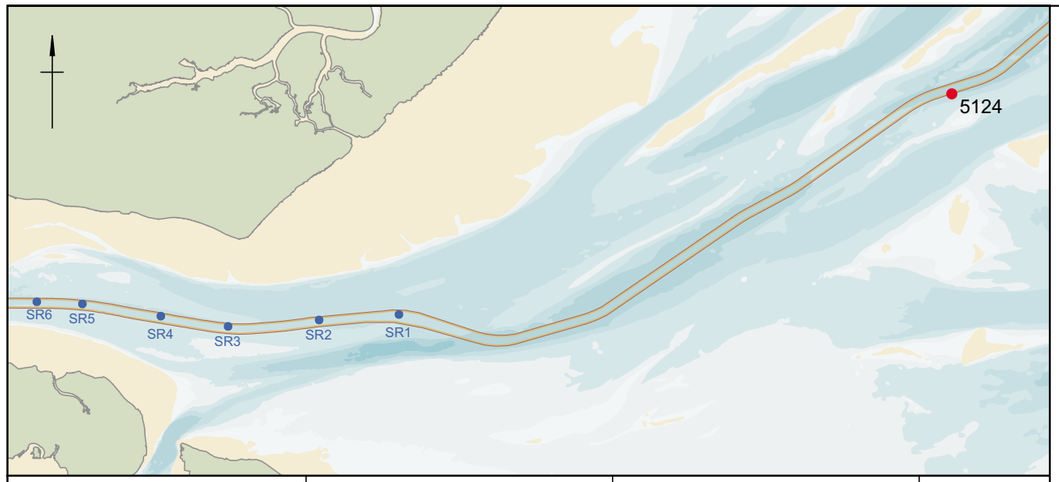
No material has currently been recovered from the site.

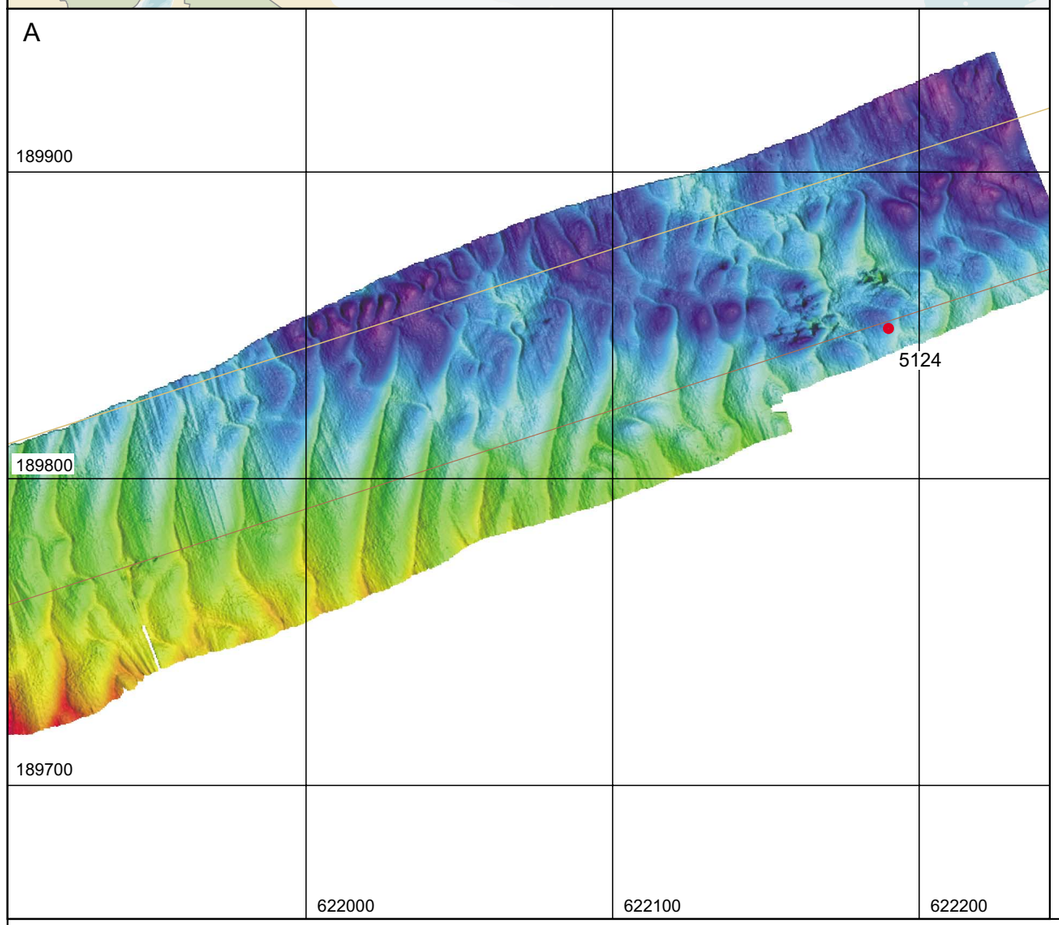
DIGITAL ARCHIVE

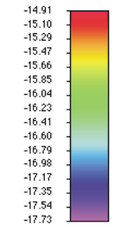
Material	Location
2005 multibeam data	WA
2007 sidescan sonar data	WA
2007 dive recordings	WA

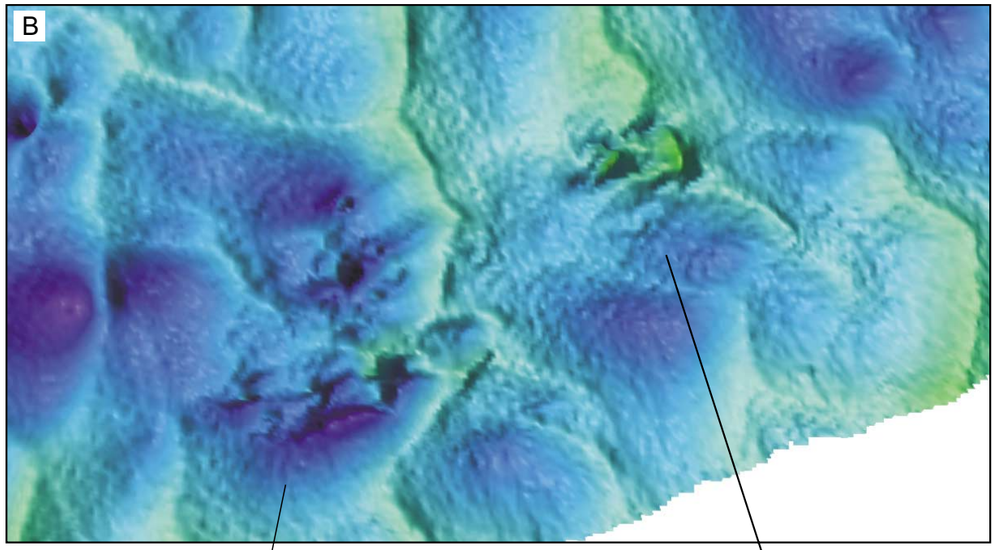
PAPER ARCHIVE

Material	Location
UKHO Report (14862)	WA
NMR Report (831932)	WA
UKHO Report (14957)	UKHO
NMR Report (831931)	NMR
Seven printed images of the 2005 multibeam data	WA
Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report*	WA

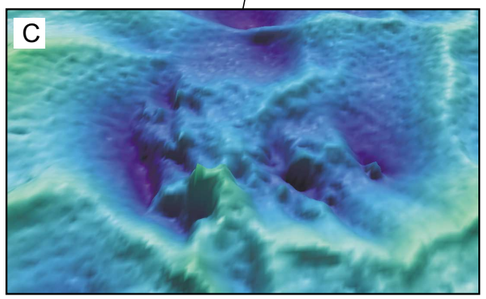




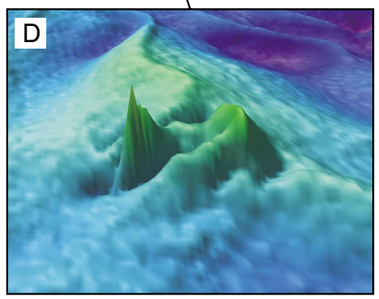




Site 5124.



Oblique view from east of Site 5124.



Oblique view from south of Site 5124.

Not to scale

- Site location
- Channel marker buoy
- Dredging limits
- 50m buffer on dredging limits

Wessex Archaeology

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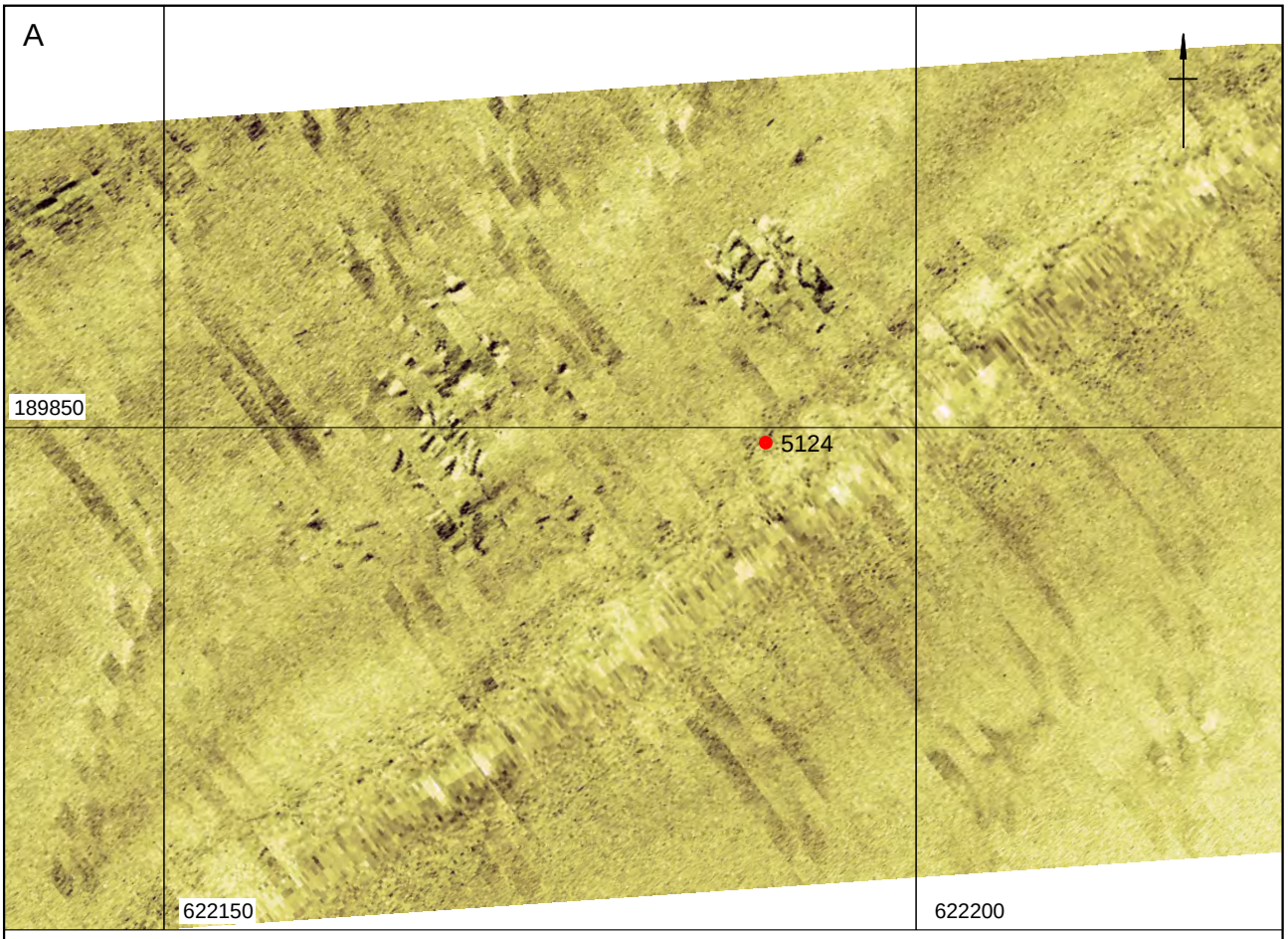
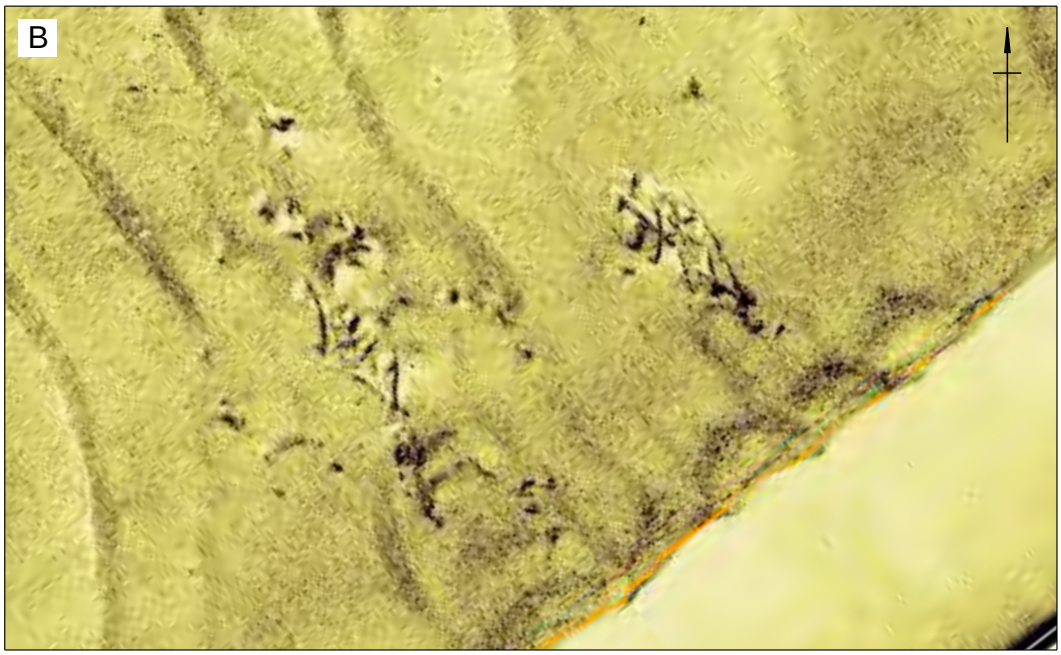
Location and Multibeam data for Sites 5124 .

Figure 1





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Site location

Projection OSGB

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Wessex Archaeology

Sidescan Sonar image of Site 5124. Figure 2

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Third Draft

WA Ref: 61209.5185.03
January 2008

Site ID: 5185, 7609
Site Name: Probably natural in origin (previously: Unknown ('Ancient Wreck'))
PLA Wreck No.: 341/19
Mitigation Group: 2.1.2. Site of probable archaeological interest, above SR1
No. of Casualties: n/a
Vessel Type: n/a
Cause of Loss: n/a
Current Recording Status: Level 1b

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the sites discovery and includes all forms of investigation to date:

SITE **5185**

1968	Remains of ancient vessel grabbed clear to seabed level;
1977	Site close sounded by PLA; no evidence of scour or wreckage were located (04/02/1977);
2001	Emu sidescan sonar survey (29/03/2001);
2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	A multibeam echosounder survey was undertaken by the PLA for P&O as part of an archaeological appraisal prior to dredging; no wreckage was located (18/01/2005);
2006	PLA site investigation using Reson 8125 multibeam system (09/03/2006);
2007	PLA site investigation using sidescan sonar (EG&G 272 dual frequency towfish), with WA in attendance (7-8/8/2007).

SITE **7609**

2001	Emu sidescan sonar survey (29/03/2001);
2002	Emu sidescan and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2006	PLA site investigation using Reson 8125 multibeam system (09/03/2006);
2007	PLA site investigation using sidescan sonar (EG&G 272 dual frequency towfish), with WA in attendance (7-8/8/2007);
2007	WA diving investigation (24/11/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2001	Wessex Archaeology, Assessment of Effects on the Archaeological Heritage: Inter-tidal and Marine, in respect of the proposed development of London Gateway;
2002	Wessex Archaeology, sidescan sonar data and magnetometer data;

2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification*;
2005	UKHO (12923)
2005	Port of London Authority, *Wreck and Obstruction Categorisation;*
2006	Wessex Archaeology, Geophysical Analysis of 2006 of multibeam and 2001& 2002 sidescan sonar data (inclusive of one geo tiff for **5185;** one geo tiff and two tiff images for **7609**).
2007	Wessex Archaeology, Geophysical Analysis of 2007 sidescan sonar data (inclusive of one geo tiff and three tiff images for **7609**);
2007	Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report.*

3. SITE DESCRIPTION

The site is located approximately 200 metres north-east of the West Blyth Buoy, 140 metres (**5185**) and 128 metres (**7609**) respectively inside the southern edge of the dredged channel (**Figure 1**). Site **7609** lies approximately 100 metres to the east of site **5185** and could be associated with it.

Site	Position (UTM)	Position derived from	Bed depth	Minimum target depth	Site extent	UKHO status
5185	325432.848 E 5708208.269 N	2006 multibeam	9.75m	Unknown	Unknown	Dead
7609	325521.905 E 5708217.404 N	2006 multibeam	9.65m	10.3m	14 x 10 x 0.15 m	Not recorded with the UKHO

SITE 5185

2001 WA sidescan sonar interpretation:

The site consists of a linear cable like reflector. The anomaly is 30 metres long and 1 metre wide, no length of shadow was recorded (**Figure 2**).

2002 WA sidescan sonar interpretation:

The area identified in the 2001 survey had no distinct objects visible in the 2002 survey. However, the scour scars from the 2001 survey were visible in the 2002 survey (**Figure 2**).

2006 WA interpretation of PLA multibeam data:

The survey area is dominated by a series of north-east by south-west trending sandwaves. At the position of site **5185** no obvious features were noted (**Figure 1**).

2007 WA sidescan sonar interpretation:

No evidence of any feature was observed on the 2007 sidescan sonar data at the given position for site **5185**.

SITE 7609

2001 WA sidescan sonar interpretation:

The site consists of a strong reflector with associated plume. The anomaly is 1 metre long and 7 metres wide, no length of shadow was recorded (**Figure 2**).

2002 WA sidescan sonar interpretation:

The original analysis of the 2002 survey data did not identify the 2001 anomaly. Further analysis of the 2002 data in 2006 revealed two parallel dark linear reflectors (**Figure 2**). The southern feature is 9 metres north of the 2001 side scan position (given above). The southern feature is 13 metres long, 0.8 metres wide. The northern feature is 16.5 metres long and 0.8 metres wide. The features are 12 metres apart.

2006 WA interpretation of PLA multibeam data:

The 2006 multibeam survey identifies two linear parallel features (**Figure 1**). The southern linear feature is 14 metres long, 4.5 metres wide and 0.15 metres upstanding. The northern linear feature is located 5 metes to the north and is 15 metres long, 3 metes wide and 0.2 metres upstanding.

It is possible that the northern feature in the multibeam data corresponds to the southern feature in the 2002 sidescan data. The 2006 multibeam data clearly illustrates the edge of the channel, this coincides with the northern feature identified in the 2002 sidescan data thus suggesting the 2002 feature was part of the channel edge and therefore natural in origin.

2007 WA sidescan sonar interpretation:

The 2007 data indicates a faint anomalous reflector measuring 18.2 x 3.8 metres, orientated north-east by south-west (**Figure 3**). The feature exhibits no height. Two faint linear reflectors are observed to the north of this feature situated 8 metres and 13 metres from the bigger feature respectively. Both linear reflectors are around 20 metres long. Site **7069** is situated on the southern edge of an area of sandwaves, at position (UTM) 325532 E 5708203 N.

2007 WA diving investigation:

The diver made bottom *c.* 7 metres south of the target and headed towards the target. When no evidence of a feature was encountered, the diver started to conduct systematic semicircular searches of the area north of the shot line at 5, 10 and 15 metres intervals.

No archaeological features or artefacts were observed. A very small loose fragment of worked soft wood (*c.* 50x15x3mm) was found lying on top of the silty seabed; it was clearly only recently waterlogged.

Systematic probing was conducted along with the search. The diver reported the seabed to be soft or very soft silt over a gravelly surface. According to the probe, the depth of the silt varied from 0.1 to 0.4 metres. No significant slope or height variation was detected; accordingly, the diver's pneumo consistently indicated a depth of 10 metres. However, the variable depth of silt probably indicates very slight waves of silt over a flat gravel surface, or slight gravel ridges under a level surface of silt.

4. SITE HISTORY

Site **5185** was first reported in 1968, when an 'Ancient Wreck' (PLA files) was cleared from the seabed. The identity of the wreck is not currently known. In 2001 a sidescan sonar anomaly was observed on the site, and the scour scars from the 2001 survey were visible in the 2002 survey. However, no features were observed during the 2006 and 2007 geophysical surveys. Since 1968 WA have received no reports of salvage or clearance works carried out on the site.

Site **7609** was first reported in 2001 when it was located during the sidescan sonar survey. A diving investigation in 2007 showed that the feature is very probably natural in origin. It is located approximately 100 metres to the east of site **5185** and was previously thought to possibly be associated with it. The site was located again in 2006 during the multibeam survey and in 2007 during the sidescan sonar survey of the same area. Since 2001 WA have received no reports of salvage or clearance works carried out on the site.

5. ARCHAEOLOGICAL INTEREST

Site **5185** has been rated as of 'probable' archaeological interest. As no archaeological or documentary research has been carried out on the site, little can be surmised of the site's importance. However, the name associated with the site 'Ancient Wreck' implies an interesting and possibly older date to the site.

Site **7609** has been rated as of 'probable' archaeological interest. The anomaly was located 100 metres to the east of the site known as the 'Ancient Wreck', and it was previously thought that this may be associated material. However, systematic semicircular diver searches combined with probing suggested that the linear features seen in the geophysical data are very probably natural in origin.

6. CONSTRAINTS

The identity of the 'Ancient Wreck' is not currently known, it is therefore not possible to state whether there might be issues with ordnance or human remains.

7. SCOPE OF FURTHER STAGE MITIGATION

Site **5185** has not been located during the 2006 and 2007 geophysical surveys. Therefore, diving work is considered unlikely to be productive on this site.

Archaeological inspection by diver proved site **7609** to be very probably natural in origin. No further mitigation is required.

8. OUTLINE OF STAGE II MITIGATION

The site lies 128 - 140 metres inside the dredged channel. The site will be cleared. No further mitigation is necessary.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

It is anticipated that the site will be cleared.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

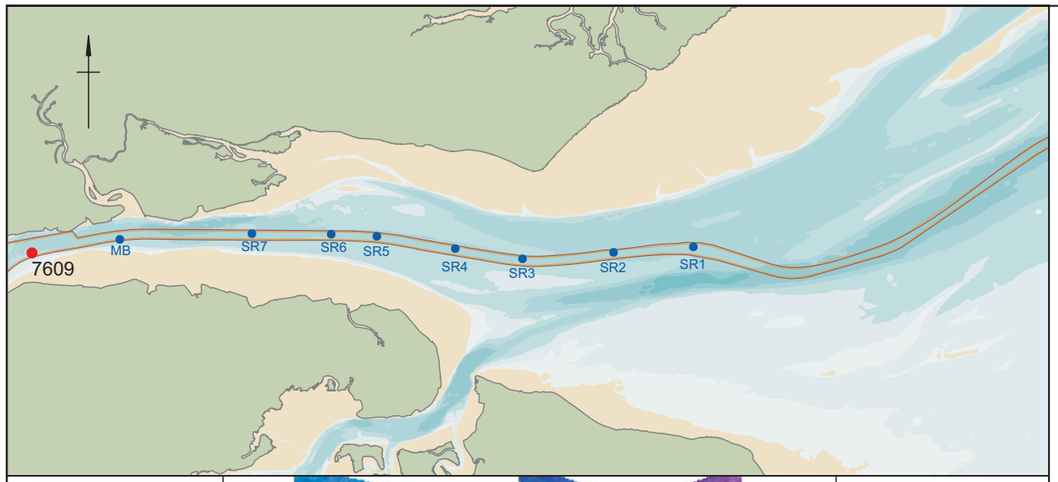
An 'Ancient Wreck' has been recovered from the site in 1968. The wreck has not been preserved.

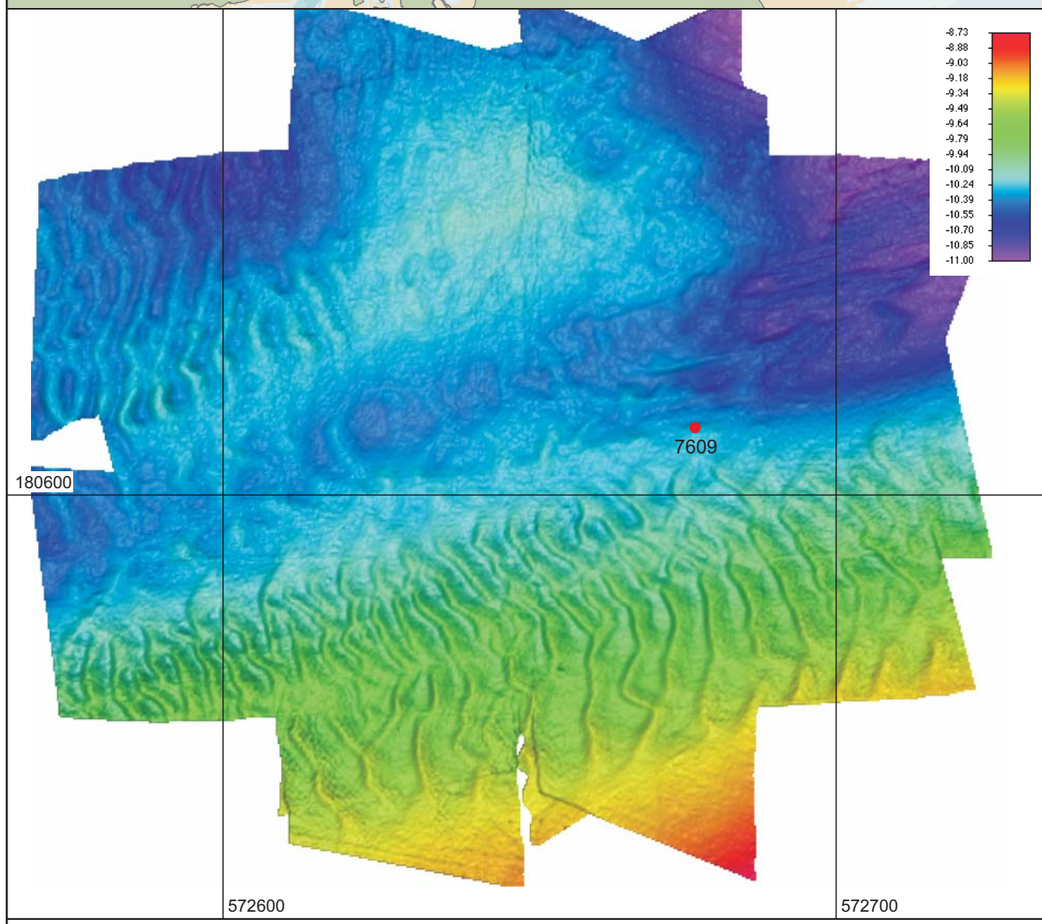
DIGITAL ARCHIVE

Material	Location
2001 sidescan sonar data	WA
2002 sidescan sonar and magnetometer data	WA
2006 multibeam data	WA
2007 sidescan sonar data	WA
2007 dive recordings	WA

PAPER ARCHIVE

Material	Location
UKHO Report (12923) (**5185**)	WA
Port of London Authority, 2005, *Wreck and Obstruction Categorisation Report*	WA
Wessex Archaeology, 2001 Assessment of Effects Archaeological Heritage: Inter-tidal and Marine in respect of the proposed development of London Gateway	WA
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report	WA
Five printed images of the 2006 multibeam data (**7609**)	WA
Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report*	WA





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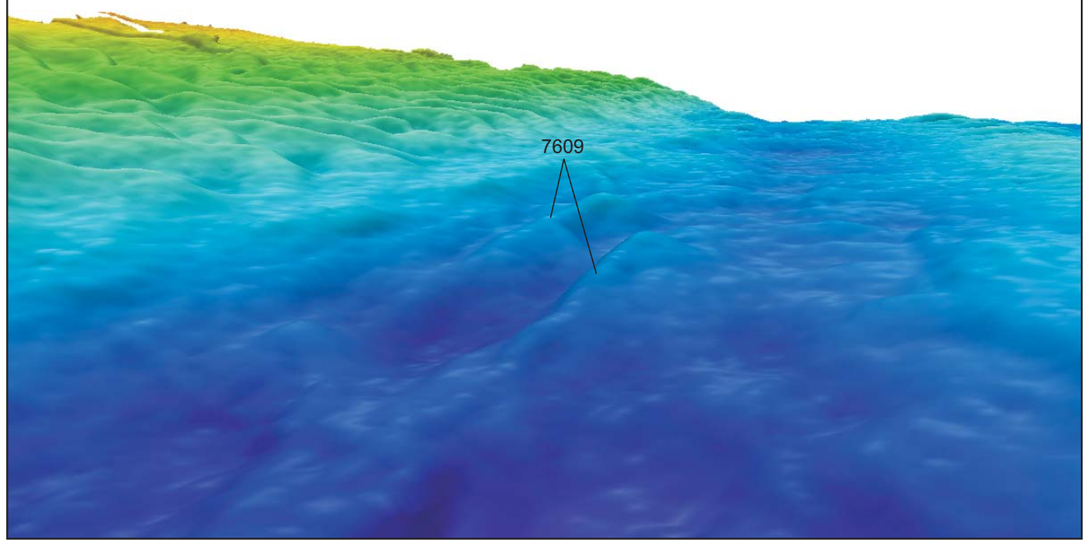

Oblique view from east.

Not to scale

Site location
Channel marker buoy
Dredging limits
50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

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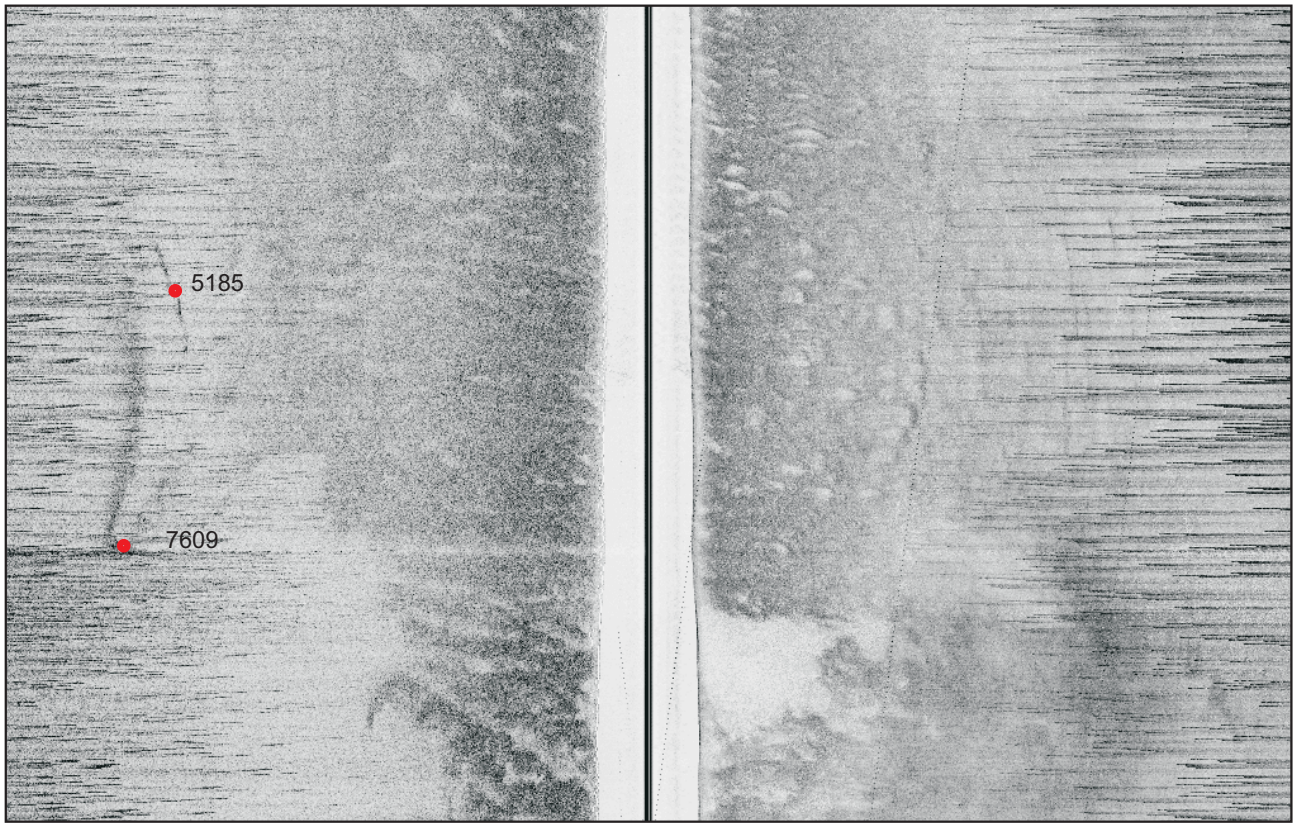
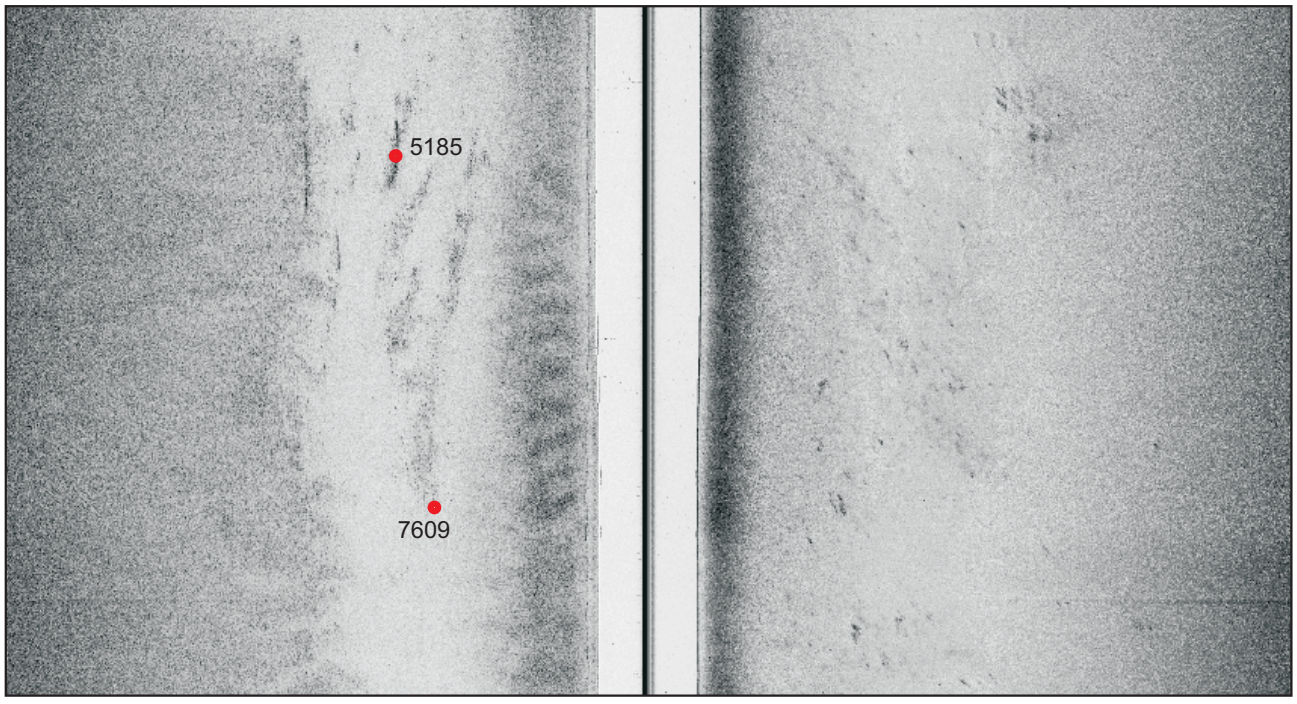
Location and Multibeam data for Site 7609.

Figure 1



2001 Sidescan Sonar image of Sites 5185 and 7609, range 150m.



2002 Sidescan Sonar image of Sites 5185 and 7609, range 75m.

Site locations

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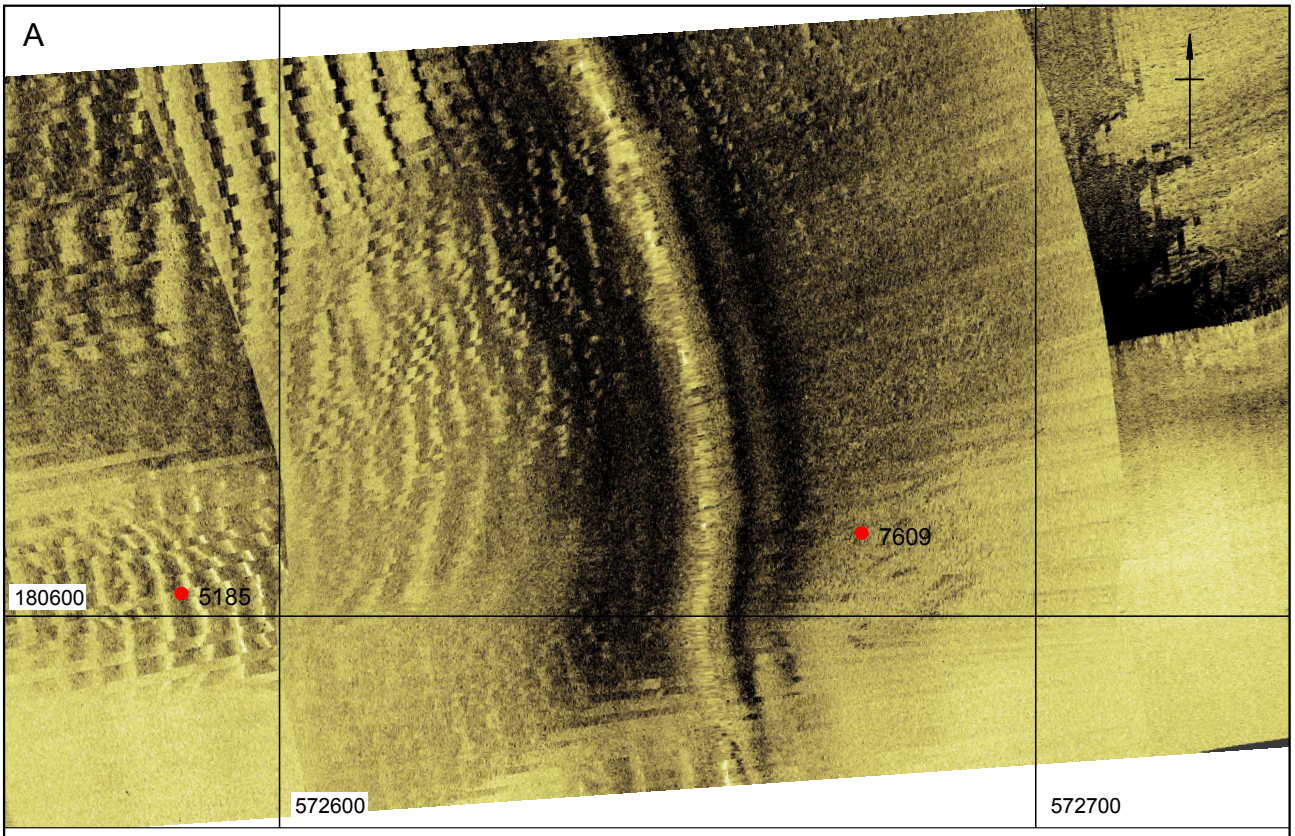
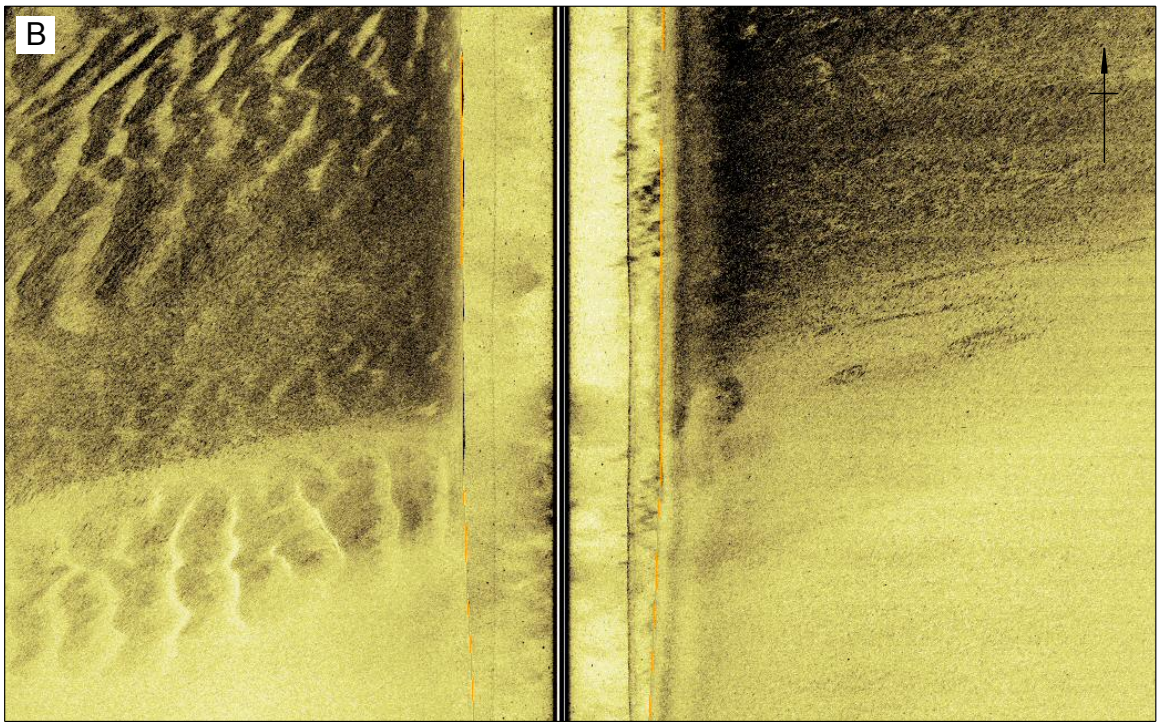
Wessex Archaeology

2001 Sidescan Sonar images of Sites 5185 and 7609 Figure 2





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● Site location

Projection OSGB

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Wessex Archaeology

2007 Sidescan Sonar image of Site 7609. Figure 3

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Second Draft

WA Ref: 61209.5195.02
January 2008

Site ID: 5195, 7544, 7476, 7477, 7478, 7546, 7547, 5026, 7711, 7712
Site Name: Unknown (probably Submarine boom?)
PLA Wreck No.: 343/7
Mitigation Group: 2.1.3. Site of possible archaeological interest, above SR1
No. of Causalities: Not applicable
Vessel Type: Not applicable
Cause of Loss: Unknown

The remains of a World War II submarine boom lie in various scattered sections across the seafloor. The UKHO have officially charted **5195** although geophysical investigations in the area have identified numerous targets. Three of these sites (**5025**, **5026** and **5193**) have already been subject to diving and recovery by the PLA, though there still appears to be material remaining at **5026**. Site **7586** has now been discounted by WA as an anomaly attributable to the sinker for Sea Reach 2. The remaining sites (listed above) are discussed in this Clearance Mitigation Statement.

It is worth noting that other debris thought to relate to submarine booms and channel defences has also been subject to diving and clearance by the PLA. In particular, sites 5027, 5150 and 5180 relate to a group of sinkers recovered off Holehaven, and site 5021 was a seabed mine recovered and destroyed from near Mid Blyth.

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the sites; the summaries begin with each site's discovery and include all forms of investigation to date:

Site 5195

1981	An obstruction was located during routine channel surveys. An attempt was made by divers but they were unable to locate the site, however they did locate and recover a section of wartime submarine defence boom;
1996	Site re-examined which confirmed previous findings. Site located at 596152 E 180552 N. The least depth is 10.8 metres in a surrounding depth of 12.1 metres. The scour hole is 12.5 metres (04/12/1996);
1999	Site located and recorded at 51° 29.251 N 00° 49.563 E (OGB using DGPS) in a least depth of 11.9 metres in a surrounding depth of 11.6 metres, the site lies in a scour which has a depth of 12.2 metres (21/12/1999);
2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA multibeam and echo sounder survey (MBES);
2005	Site not located by HMSML Gleaner during a multibeam and echo sounder survey (25/08/2005);

2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005);

Site 7544

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 7476

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 7477

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 7478

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 7546

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 7547

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 5026

1981	An obstruction was located during routine channel surveys. An attempt was made by divers but they were unable to locate the site, however they did locate and recover a section of wartime submarine defence boom;
1996	Site re-examined which confirmed previous findings. Site located at 596152 E 180552 N. The least depth is 10.8 metres in a surrounding depth of 12.1 metres. The scour hole is 12.5 metres (04/12/1996);
1999	Site re-examined prior to publishing 343 in 1999. Least depth 10.8 metres. Site found but in position 3 metres west on a line running east-west. Position 596149 E 180552 N;
2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	Site dived by PLA, identified as concrete sinker with chain (18/04/2005);
2005	PLA report site cleared and ready for dredging (26/10/2005);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

Site 7711

2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance

	(06/12/2005).

Site 7712

2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2002	Wessex Archaeology, sidescan sonar and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification;*
2005	UKHO (58374) for site **5195;**
2005	UKHO (13159) for site **5026;**
2005	NMR (800478) for site **5026;**
2005	PLA multibeam data (06/12/2005);
2005	Port of London Authority, *Wreck and Obstruction Categorisation,* includes PLA multibeam, pseudo sidescan screen captures and site plan for sites **5026;**
2005	Wessex Archaeology, Geophysical Analysis of 2005 multibeam and 2002 sidescan sonar data;
2005	Port of London Authority, *Marine Diving Services Report* for site **5026** (343/7);
2005	Wessex Archaeology photographs of PLA recovered artefacts;
2006	www.submerged.co.uk;
2006	www.anzacday.org.au;
2006	Imperial War Museum
2006	http://www.gnometech.freeserve.co.uk/html/defence_boom.html;
2006	http://www.bbc.co.uk/dna/getwriting/A1081243.

3. SITE DESCRIPTION

Introduction

The remains of a World War II submarine boom lie in various scattered sections across the seafloor. The UKHO have officially charted **5195** and **5026**, although geophysical investigations in the area have identified numerous targets. Three of these sites (**5025**, **5026** and **5193**) have already been subject to diving and recovery by the PLA (**Figure 8**), though there still appears to be material remaining at **5026** (see below). Material is still thought to be present on the seabed at 10 sites, listed below, near Sea Reach 2 (**Figure 1**).

The 2005 multibeam data is the most accurate and up-to-date survey for these sites. Therefore the co-ordinates for this report are derived from the 2005 multibeam data set. The table below summarises the site's details and position in relation to the dredged channel edge. During the multibeam analysis two new sites were identified, **7711** and **7712**, which are discussed below.

Site	Revised NGR	Position derived from;	Sites location within the channel	Dredged depth (metres)	Minimum target depth (metres)	Site Extent (metres)	UKHO Status
5195	596214.79 180379.30	2005 multibeam data	8 metres outside the southern channel edge	12m	11.85m	3.5 x 2 x 0.4m	Live

7544	596188.04 180374.96	2005 multibeam data	8 metres outside the southern channel edge	12m	11.85m	2 x 2.5 x 0.1 m	Site not listed with UKHO
7476	596187 180463	2002 side scan sonar data (Not located in 2005 data)	75 metres inside the southern channel edge	12m	12m	10m x 15m	Site not listed with UKHO
7477	**Off data set –** 596239.27 180476.01	2005 multibeam data	85 metres inside the southern channel edge	11.8-12.1m	Unknown	Unknown	Site not listed with UKHO
7478	596376.59 180525.67	2005 multibeam data	124 metres inside the southern channel edge	12.35m	12.33m	2m x 0.45m upstanding	Site not listed with UKHO
7546	596392 180441	2005 multibeam data	30 metres inside the southern channel edge	11.97 m	11.93 m	2 m x 1.5 m x 0.03 m	Site not listed with UKHO
7547	**Off data set –** 596429.30 180438.35	2005 multibeam data	20 metres inside the southern channel edge	11.7-12.1m	Unknown	Unknown	Site not listed with UKHO
5026	596149.21 180546.05	2005 multibeam data	166 metres inside the southern channel edge	12.4 m	11.93 m	30x 10x 0.5m and 15 x 6 x 0.25m	Unknown
7711	596552.90 180542.69	2005 multibeam data	116 metres inside the southern channel edge	12.5m	12.37m	5 m x 3 m x 0.4m	Site not listed with UKHO
7712	596613.72 180534.09	2005 multibeam data	103 metres inside the southern channel edge	12.5m	12.48m	1.8m x 1.5m x 0.5 m	Site not listed with UKHO

Summary Table

SITE 5195

2001 Sidescan

Site **5195** was situated within the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, site **5195** was identified during a sidescan sonar and magnetometer survey. It consisted of a confused area of anomalies with shadow and other smaller targets to the north (**Figure 2a).** The NGR recorded from this survey was 596161 E 180376N. The anomaly is 45 metres long and 10 metres wide and no length of shadow was recorded. The tiff file created was labelled 479. The magnetic hit registered a max reading of H6m to the north max 2.17nT.

2005 Multibeam

In 2005 a multibeam bathymetric survey was undertaken over site **5195**. The **5195** position provided by the UKHO is believed to be in error. The site was located 47 metres to the north-

east of the above position (**Figure 2b).** The description provided by the UKHO accurately matches the 2002 sidescan and 2005 multibeam descriptions for the site. The new site co-ordinate is set out in the Summary Table.

The feature consists of a ridge 3.5 metres long, 2 metres wide and 0.4 metres upstanding at the eastern end. The ridge has two scours associated with it, one to the south and a smaller one to the east. The southern scour is 5 metres long, 3 metres wide and 0.3 metres deep. The eastern smaller scour is 3.5 metres long, 2 metres wide and 0.1 metres deep (**Figure 2c; 2d**).

Site **5195** is located 15 metres away from another site, **7544** (discussed below). They were both identified on the same section of sidescan in 2002.

SITES 7544

2001 Sidescan

Site **7544** was situated within the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, site **7544** was identified during a sidescan sonar and magnetometer survey. It consisted of a confused area of anomalies with shadow and other smaller targets to the north (**Figure 2a**). The NGR recorded from this survey was 596161 E 180376N. The anomaly is 45 metres long and 10 metres wide and no length of shadow was recorded. The tiff file created was labelled 479. The magnetic hit registered a max reading of H6m to the north max 2.17nT.

2005 Multibeam

In 2005 a multibeam bathymetric survey was undertaken over site **7544**. The site consists of a ridge with two scours on either side (to the east and west). The ridge is 2 metres long, 2.5 metres wide and 0.1 metre upstanding. The eastern scour is 4 metres long, 3 metres wide and 0.1 metre deep. The western scour is 6 metres long, 2 metres wide and 0.05 metres deep. The total distance covered by this site is approximately 15 metres. In comparison to the 2002 sidescan data, the multibeam data illustrates much less of the site being currently exposed (**Figure 2b; 2c**).

SITE 7476

2001 Sidescan

Site **7476** was situated within the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, site **7476** was identified during a sidescan sonar and magnetometer survey. It consisted of a large linear grouping of reflectors with scour and shadow (**Figure 3**). The NGR recorded from this survey was 596187 E 180463 N, but in reviewing the data for this statement a 19 metre offset error (due to layback) has been identified. The corrected position is set out in the Summary Table. The anomaly is 10 metres long by 15 metres wide and no length of shadow was recorded. The tiff file created was labelled 403.

2005 Multibeam

In 2005 a multibeam bathymetric survey was undertaken over site **7476**. However, the site which was discovered in 2002 could not be identified in the multibeam data (**Figure 3**).

SITE 7477

2001 Sidescan

Site **7477** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002 site **7477** was identified during a sidescan sonar and magnetometer survey. It consisted of a large block shaped anomaly with scour and shadow (**Figure 3**). The NGR recorded from this survey was 596219 E 180475 N, but in reviewing the data for this statement a 19 metre offset error (due to layback) has been identified. The corrected position is set out in the Summary Table. The anomaly is 5 metres long by 2 metres wide and no length of shadow was recorded. The tiff file created was labelled 403.

2005 Multibeam

In 2005 a multibeam bathymetric survey was undertaken over site **7477**. However, due to the offset error (discussed above) the multibeam survey did not quite cover the area where **7477** is now thought to lie.

SITE 7478

2001 Sidescan

Site **7478** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, site **7478** was identified during a sidescan sonar and magnetometer survey. It consisted of an anomaly comprising three objects with a linear cable like feature with scour and other smaller targets in the area. (**Figure 4a**). The NGR recorded from this survey was 596374 E 180532 N. The northern object was 2.6 metres long, 0.9 metres wide, no shadow was visible. The centre object was 5 metres long, 0.3 metres wide and 0.4 metres upstanding. The southern object was 2.5 metres long, 1.5 metres wide and 0.4 metres upstanding. The linear cable was 6 metres long, 0.5 metres wide with no obvious shadow, but feature is located in scour. The scour is 18 metres long and 4 metres wide. The tiff file created was labelled 407.

2005 Multibeam

In 2005 a multibeam bathymetric survey was undertaken over site **7478**. The feature is cone shaped in appearance and located in a scour hole (**Figure 4b; 4c**). The feature has a 2 metre diameter at it's base and is 0.45 metres upstanding. The scour is 15 metres long, 7 metres wide and 0.45 metres deep. The charted depth for the bottom of the scour is 12.75 metres. The position has been slightly revised on the basis of the multibeam data and is set out in the Summary Table.

SITE 7546

2001 Sidescan

Site **7546** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, site **7546** was identified during a sidescan sonar and magnetometer survey. It consisted of a tight cluster of three reflectors with shadow (**Figure 5a**). The NGR recorded at the time of the survey was 596371 E 180440 N. Further analysis of this data has highlighted an offset in the original position which is now amended to 596392 N 180441 E.

The three features are contained in an area which is 3 metres in diameter. The northern feature was 0.1 metres long, 0.3 metres wide and 0.3 metres upstanding. The middle feature was 0.1 metres long, 0.3 metres wide and 0.3 metres upstanding. The southern feature was 2.5 metres long, 0.4 metres wide and 0.3 metres upstanding. The tiff file created was labelled 480. The magnetic hit registered a max reading of H 13m to the south Max 2.44nT.

2005 Multibeam

In 2005, a multibeam bathymetric survey was undertaken over site **7546**. The multibeam data was analysed at the old and amended positions identified in the 2002 sidescan sonar data. At the old position there was nothing visible. The amended position is an area of lumpy seabed, there is a lump at this co-ordinate which is 2 metres long, 1.5 metres wide and 0.03 metres upstanding on its southern side (**Figure 5b**).

SITE 7547

2001 Sidescan

Site **7547** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, site **7547** was identified during a sidescan sonar and magnetometer survey. It consisted of an anomaly, a dark reflector with no shadow (**Figure 5a**). The NGR recorded from this survey was 596410 E 180433 N. Further analysis of this data has highlighted an offset in the original position which is now amended to 596429 N 180437 E. The anomaly is 5 metres long by 5 metres wide and no length of shadow was recorded. The tiff file created was labelled 480. The magnetic hit registered a max reading of H 6m to the south Max -3.18NT.

2005 Multibeam

In 2005, a multibeam bathymetric survey was undertaken over site **7547**. However, due to the offset (discussed above) the multibeam survey did not quite cover site **7547**.

SITE 5026

2001 Sidescan

Site **5026** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

In 2002, the previously-identified site **5026** was confirmed during a sidescan sonar and magnetometer survey. It consisted of a small anomaly with linear appendage, corresponding with PLA 343/7, a possible submarine boom (**Figure 6**). The NGR recorded from this survey was 596150 E 180553 N. The anomaly is oval in shape and has diffuse dark reflectors and covers a total area of 5 x 1.5 metres which could be related to scouring. The feature is 2 metres long by 0.8 metres wide with no shadow. After a gap of 1.2 metres the feature reappears as a less distinct dark reflector which is approximately 1.5 metres long and 1 metre wide. The tiff files created were labelled 297 and 403.

2005 PLA dive description

The PLA dived the site in April 2005. They reported the site was located 360 metres west of Sea Reach No.2 buoy. The site consisted of a concrete sinker / anchor which had the following dimensions: The top was 1.3 metres x 1.3 metres, the base was 2 metes x 2 metres and it was 1.4 metres tall. The sinker was lying inverted on the seabed. There was a length of chain (5 inch long links) attached and running north for approximately 10 metres at which point it became embedded in the sand.

In October 2005 the PLA reported that the site had been recovered. However, material still seems to be present at this location (see below).

2005 Multibeam

In November 2005, a multibeam bathymetric survey was undertaken over site **5026**. The site consists of two ridges running parallel to each other approximately 10 metres apart. The southern ridge is the larger feature and the one visible on the 2002 sidescan sonar data. It is 30 metres long, 10 metres wide and 0.5 metres upstanding. The northern ridge is 15 metres long, 6 metres wide and 0.25 metres upstanding (**Figure 6b; 6c**).

SITE 7711

2001 Sidescan

Site **7711** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

Site **7711** was situated in the 2002 side scan sonar survey area, but it was not identified during the survey, possibly because it lies directly below the sidescan track (**Figure 7a**).

2005 Multibeam

Site **7711** was identified for the first time by the multibeam survey. It consists of a mound with a scour to the south (**Figure 7b; 7c**). The mound is 5 metres long, 3 metres wide and 0.4

metres upstanding on the south side of the mound taken from the base of the scour. The scour is 18 metres long, 4 metres wide and 0.25 metres deep .

SITE 7712

2001 Sidescan

Site **7712** was situated in the 2001 side scan sonar survey area, but it was not identified during the survey.

2002 Sidescan

Site **7712** was situated in the 2002 side scan sonar survey area, but it was not identified during the survey (**Figure 7a**).

2005 Multibeam

Site **7712** was identified for the first time by the multibeam survey. It consists of a mound located in a scour hole (**Figure 7b; 7c**). The mound is 1.8 metres long, 1.5 metres wide and 0.5 metres upstanding. The scour is 10 metres long, 5 metres wide and 0.5 metres deep.

4. SITE HISTORY

The sites **5195** and **5026** were first located during a routine survey in 1981. Divers attempted to identify the sites in 1981 but were unable to locate them. They did, however, locate and recover a section of submarine boom from the same area thereby suggesting an identity for the other anomalies in the area.

In 2005, the PLA identified and recovered sinkers and other debris consistent with an anti-submarine boom from three locations (**5025**, **5026**, **5193**).

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of ‘possible’ archaeological interest. The archaeological interest in the boom debris within the channel arises because this debris is part of a very major defensive structure that crossed the entire Thames from Shoeburyness to Minster, built in 1939-40. As such, the remains of the boom are both a monument to the momentous events of WWII as it affected the Thames, and also to the tremendous efforts of the engineers who designed and constructed the boom, and of the service personnel who guarded it. Elements of this structure survive at Shoeburyness, and are also likely to survive at other locations across the estuary. Anti-submarine booms were installed across several other estuaries and port entrances around the world in WWII (see **Figure 8**), and other examples are likely to survive. There is considerable heritage interest in defensive structures from WWII, including among local and national heritage agencies as well as the population at large.

Although the overall structure of anti-submarine boom is of archaeological interest, individual elements of the boom such as the debris within the dredging area are of limited interest in themselves, and such interest can be conserved by adequate recording.

6. CONSTRAINTS

It is unlikely that there are any human remains associated with the anti-submarine boom.

While there is no information to suggest that the boom was 'armed', it is possible that other seabed mines (comparable to 5021) were associated with it.

The majority of the sites (discussed above) are all upstanding to at least some degree. It is therefore likely that entanglement maybe an issue when investigating the sites further using divers.

7. SCOPE OF FURTHER STAGE I MITIGATION

No further Stage I mitigation is required prior to clearance, though additional multibeam data from the revised positions of 7477 and 7547 would compliment the record obtained to date, should a suitable opportunity arise.

Additional documentary investigation (Mitigation I A) is likely to yield details of the design, installation and operation of the anti-submarine boom, which should help to contextualise the recovered material and contribute to a broader appreciation of this phase of the defence of the Thames.

8. OUTLINE OF STAGE II MITIGATION

Sites which fall within or are close to the channel are to be recovered. Limited archaeological observation and recording (Mitigation II H) has been carried out during and after recovery of the material within the footprint of the channel. Material outside of the channel will remain *in situ*. Documentary research has been carried out to enhance the existing record.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

The sites will have undergone controlled partial dispersal/clearance, with archaeological observation and recording in the course of dispersal/recovery operations.

A post fieldwork programme will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

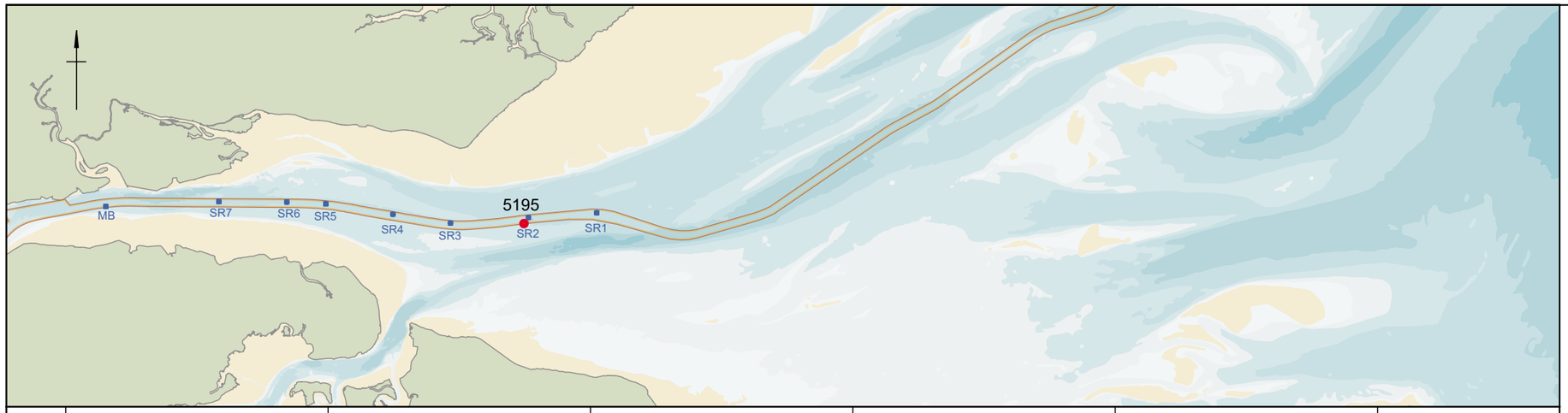
Material relating to sections of the submarine boom have been recovered by the PLA and currently reside with the PLA at Denton Wharf (**Figure 8**).

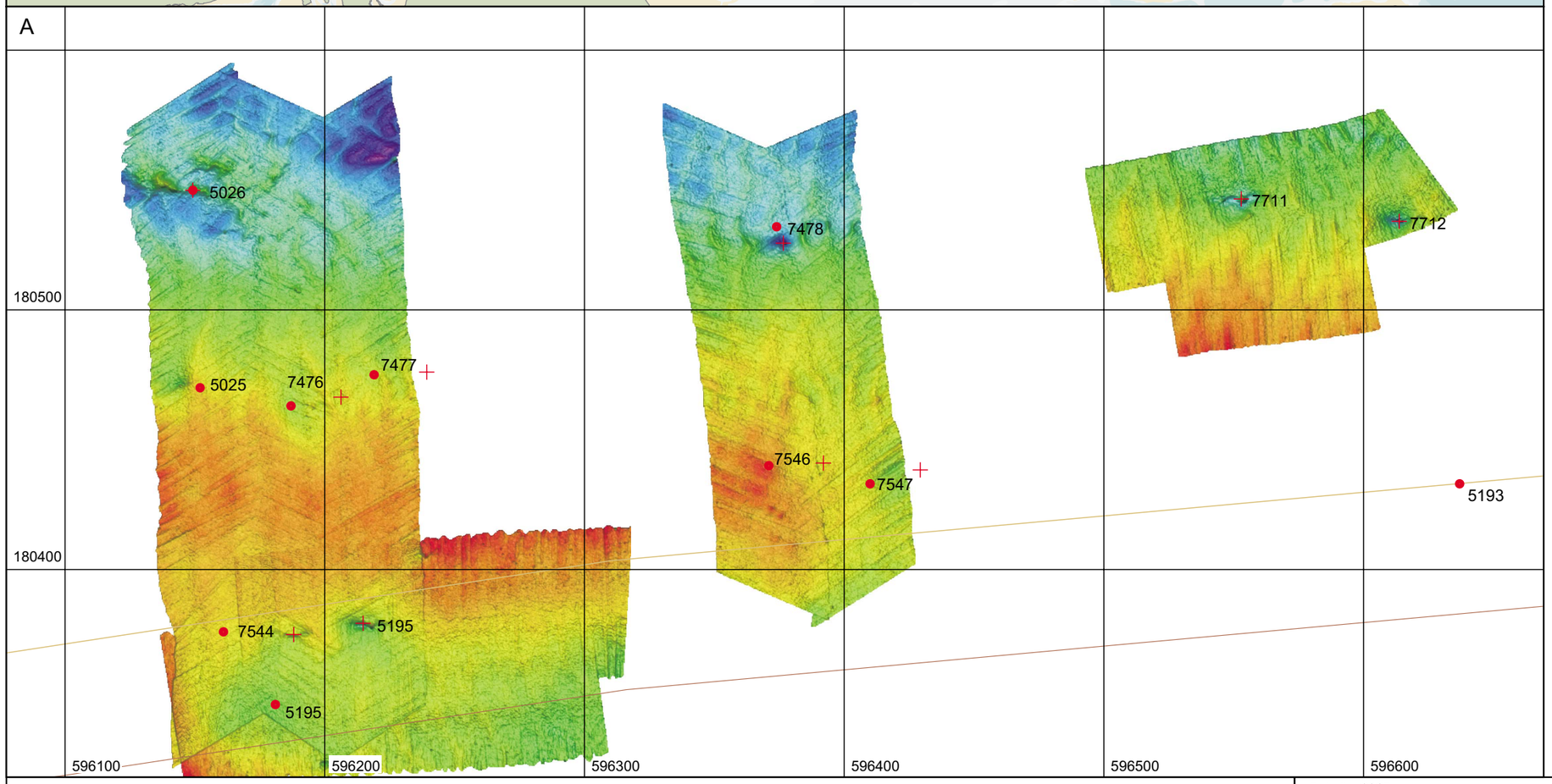
DIGITAL ARCHIVE

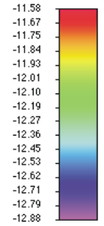
Material	Location
2002 sidescan sonar and magnetometer data	WA
2005 multibeam data	WA
WA photographs of PLA recovered artefacts	WA

PAPER ARCHIVE

Material	Location
UKHO (58374) for site **5195**	WA
UKHO (13159) for site **5026**	UKHO
NMR (800478) for site **5026**	NMR
Port of London Authority, 2005, *Wreck and Obstruction Categorisation Report*, includes PLA multibeam and pseudo side scan screen captures	WA
Port of London Authority, 2005, *Marine Diving Services Report*;	WA
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report	WA
WA photographs of PLA recovered artefacts	WA
Seven printed images of the 2005 multibeam data	WA
Two photographs of submarine booms in operation	WA







- Site location (from EIA)
- Revised position (2006)
- Channel marker buoy
- Dredging limits
- 50m buffer on dredging limits

Wessex Archaeology

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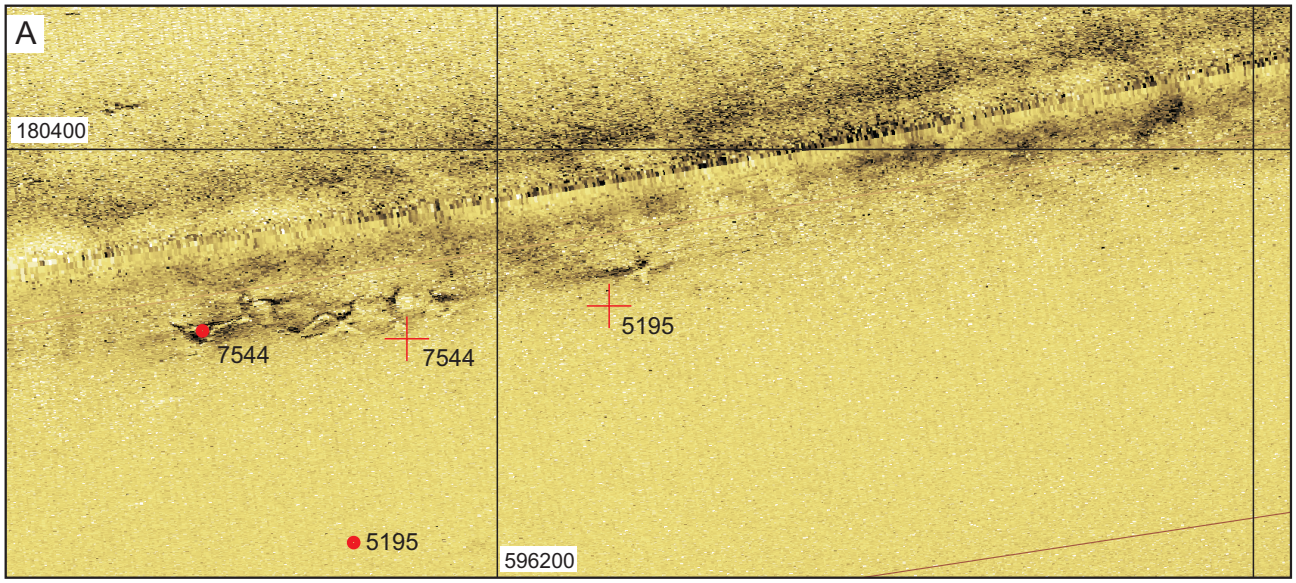
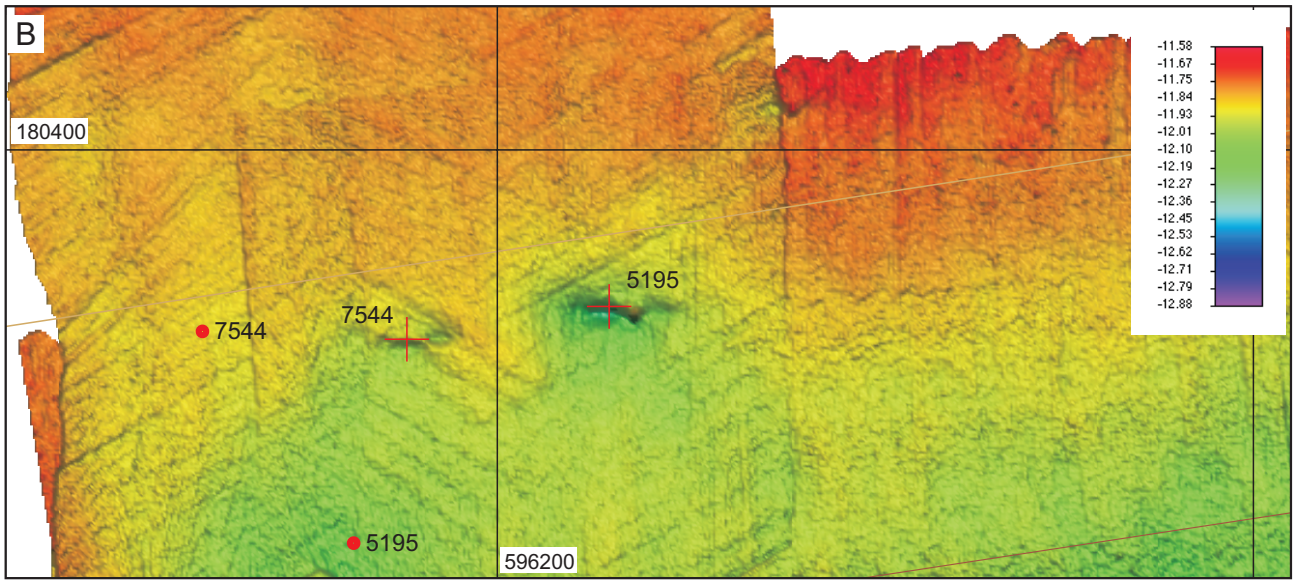
Location and Multibeam data for Sites 5195, 7544, 7476, 7477, 7478, 7546, 7547, 7586, 5026, 7711 and 7712

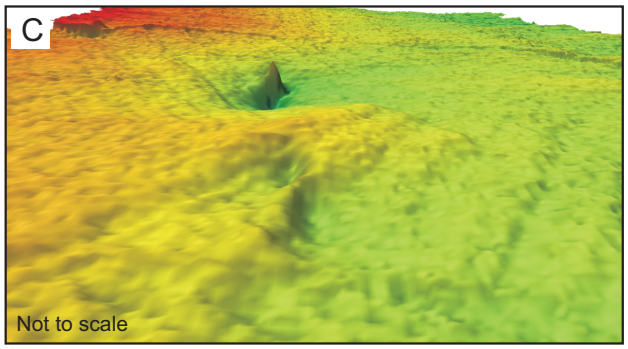
Figure 1



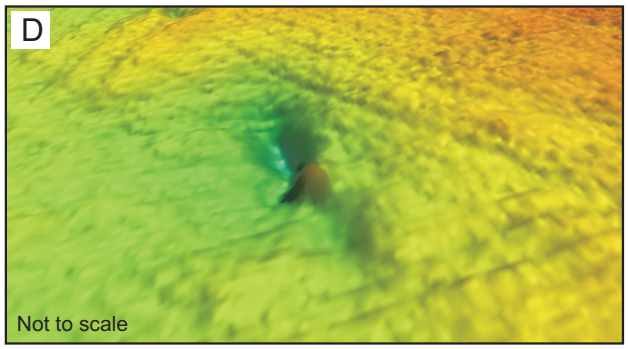
Sites 5195, 7544 - Sidescan Sonar 2002 survey data.



Location and Multibeam data for Sites 5195, 7544.



Oblique view from west.



Oblique view from east.

Site location (from EIA)
Revised position (2006)

Wessex Archaeology

Projection OSGB

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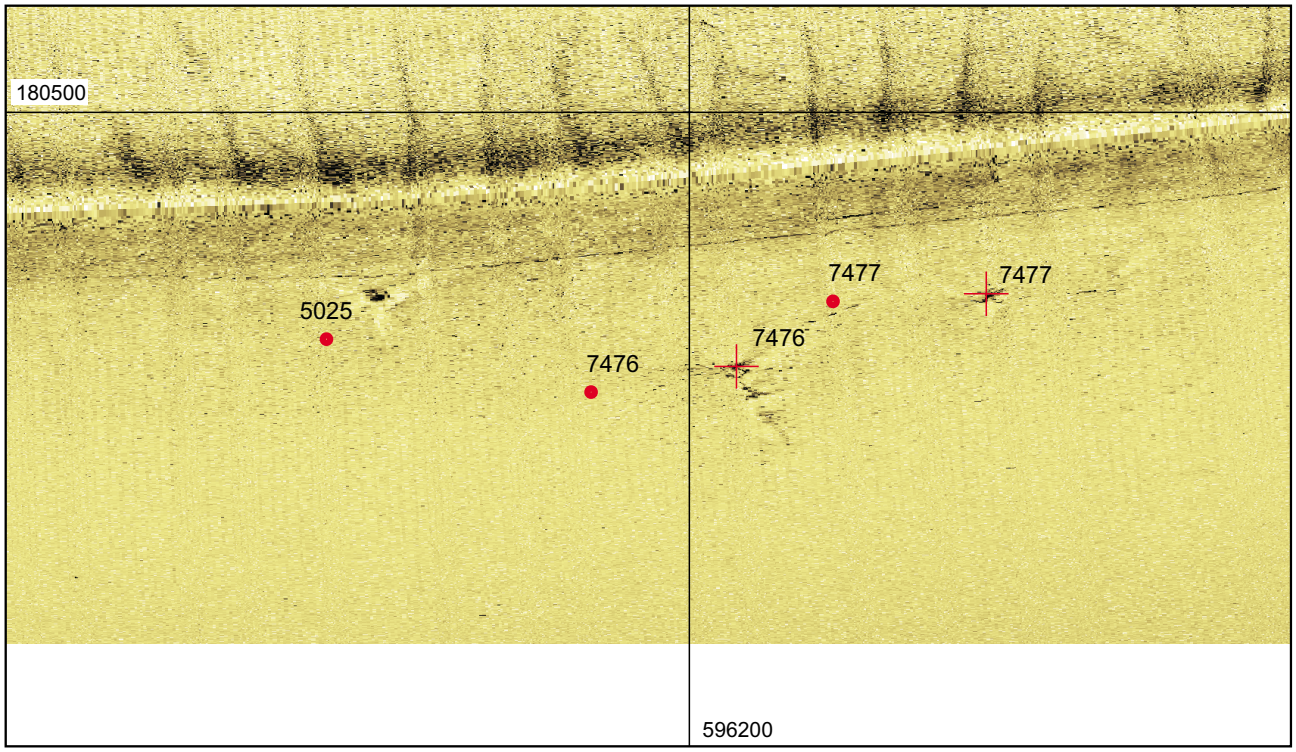
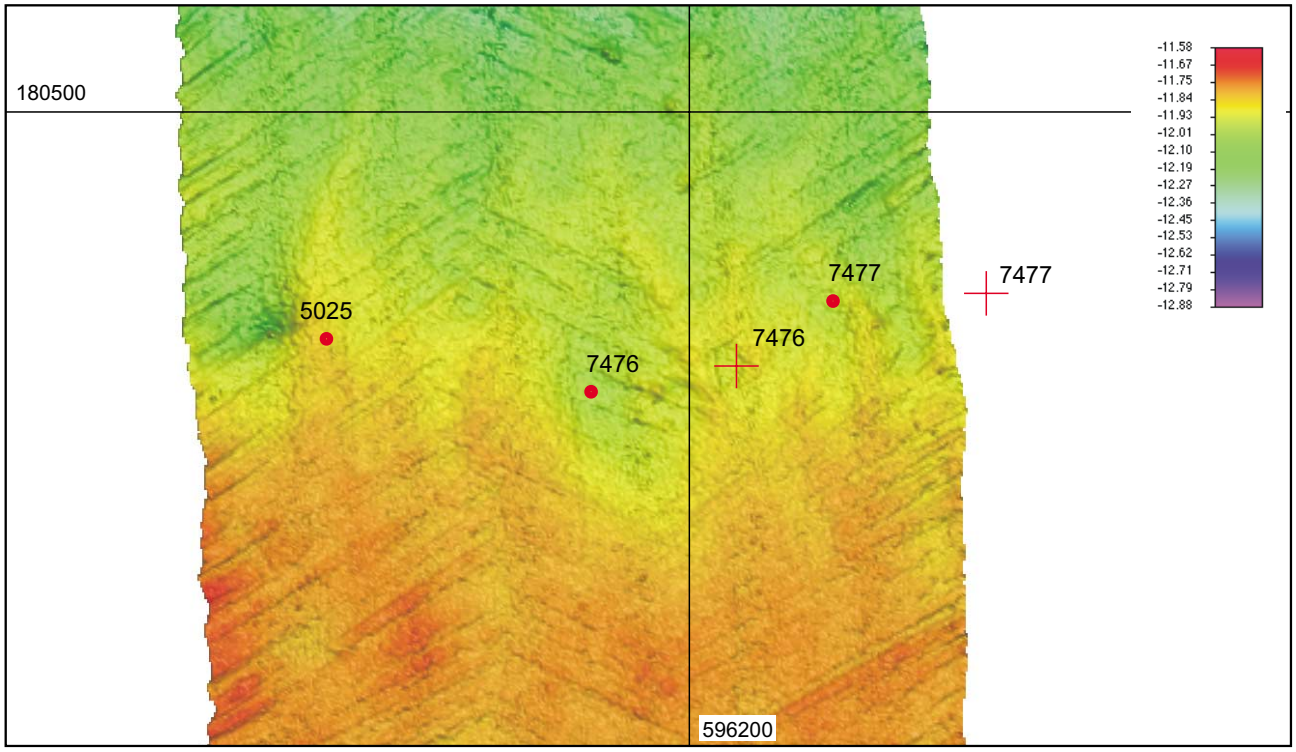
Multibeam and Sidescan Sonar data for Sites 5195, 7544. Figure 2



Sidescan Sonar 2002 survey data - plan view.



Multibeam data - plan view.

Site location (from EIA)
Revised position (2006)

Wessex Archaeology

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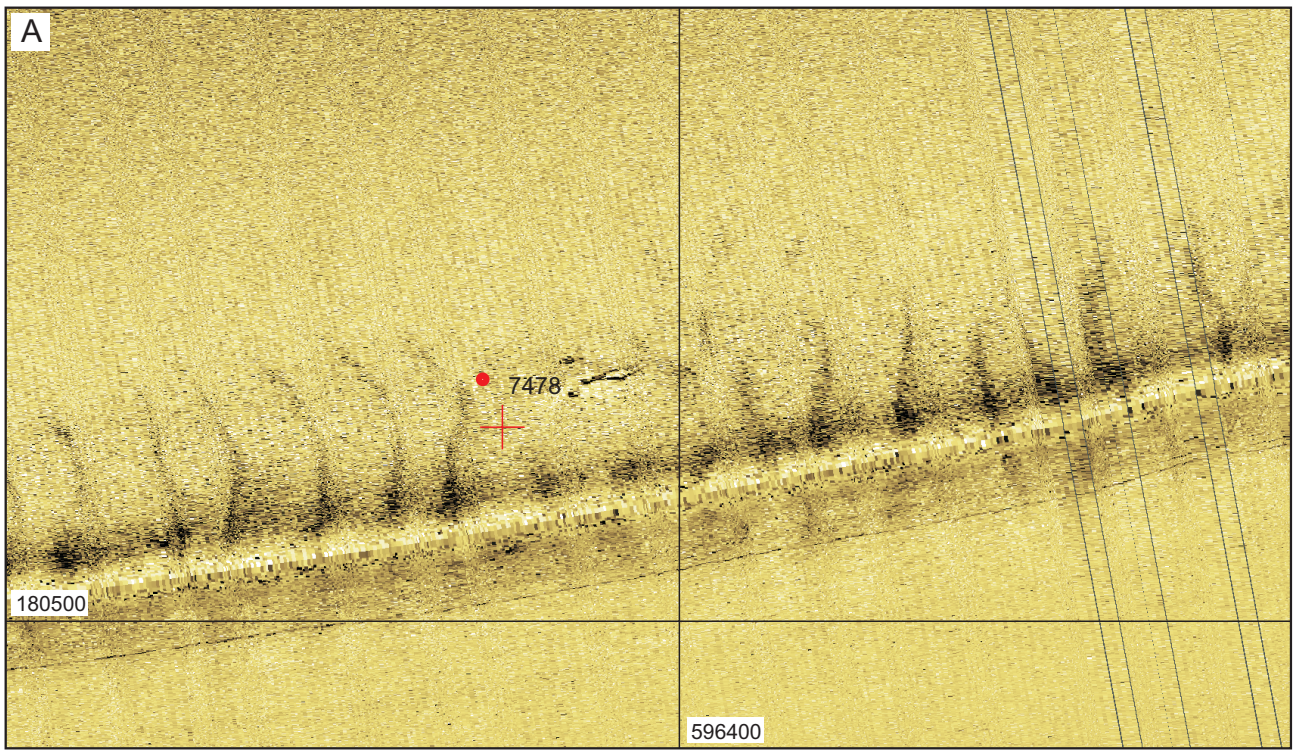
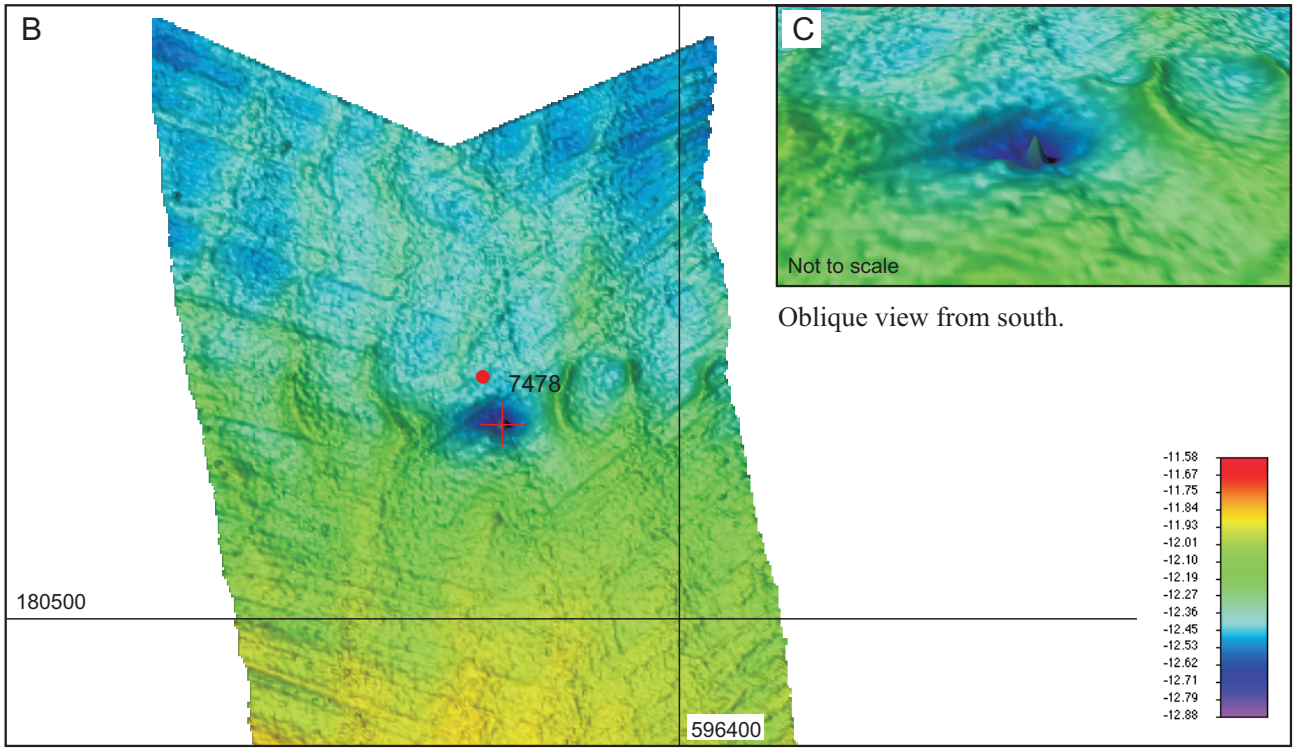
Multibeam and Sidescan Sonar data for Sites 7476 and 7477. Figure 3



Site 7478 - Sidescan Sonar 2002 survey data.



Oblique view from south.

Location and Multibeam data for Site 7478.

Site location (from EIA)
Revised position (2006)

Wessex Archaeology

Projection OSGB

Seazone Licence Number: 122003.003

Date:	03/02/06	Revision Number:	0
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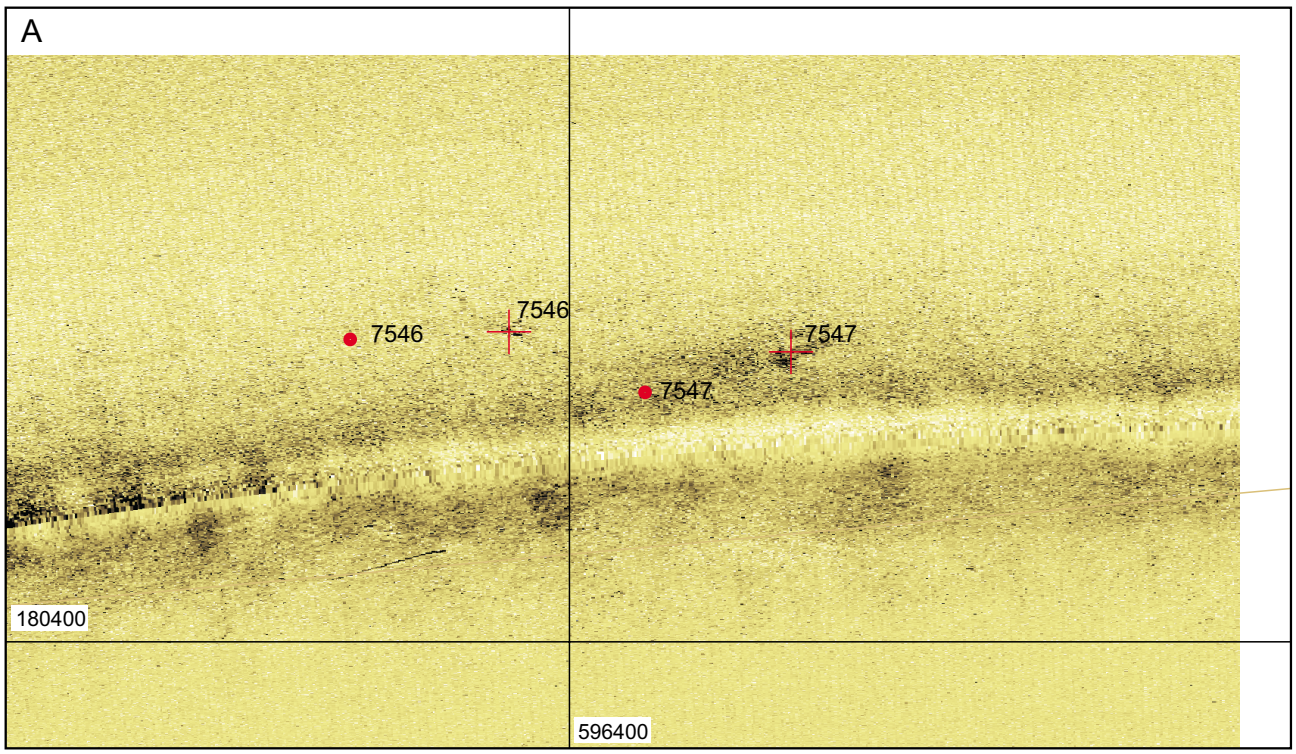
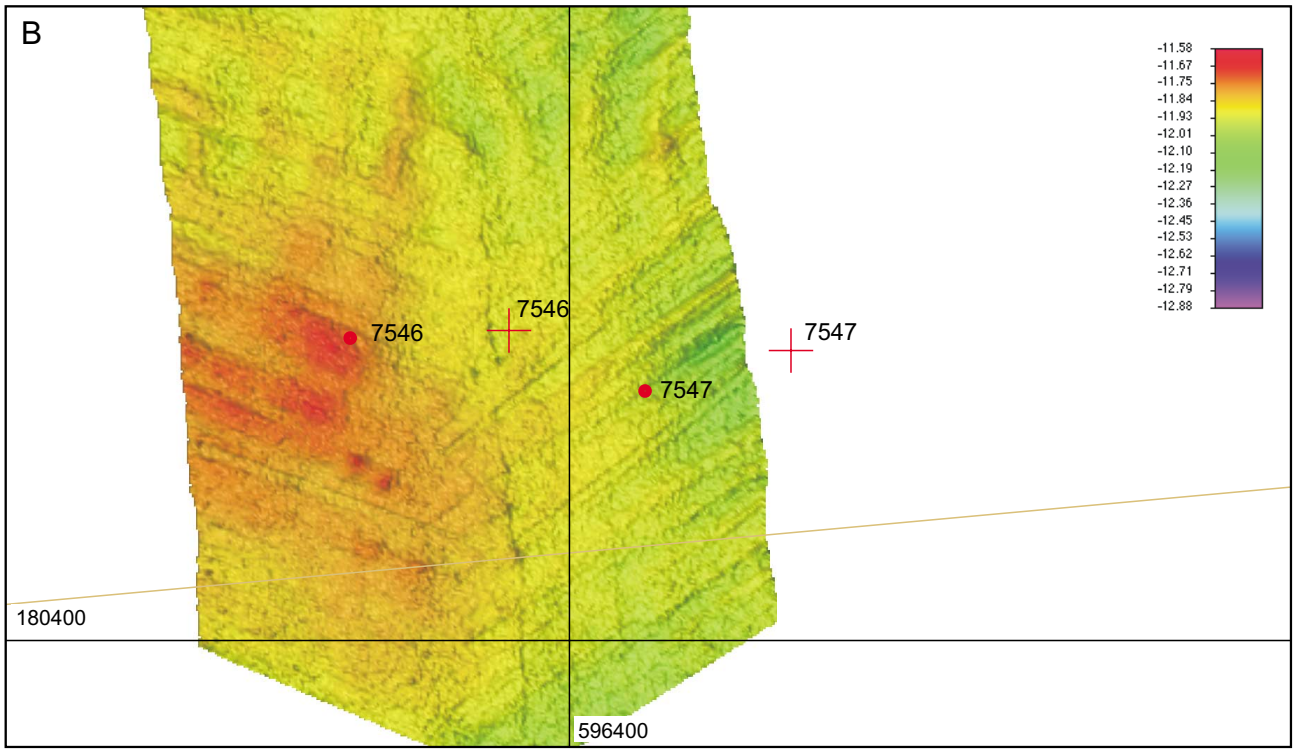
Multibeam and Sidescan Sonar data for Site 7478. Figure 4



Sidescan Sonar 2002 survey data - plan view.



Multibeam data - plan view.

Site location (from EIA)
Revised position (2006)

Wessex Archaeology

Projection OSGB

Seazone Licence Number: 122003.003

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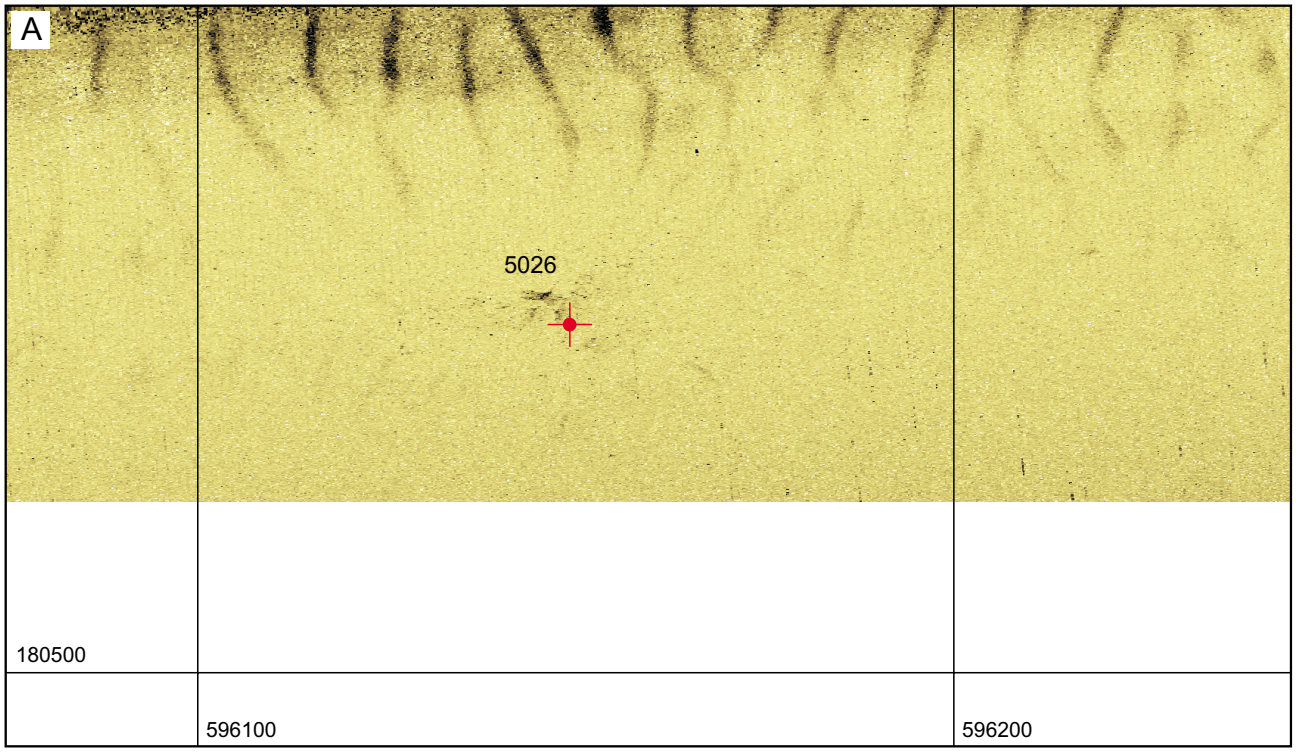
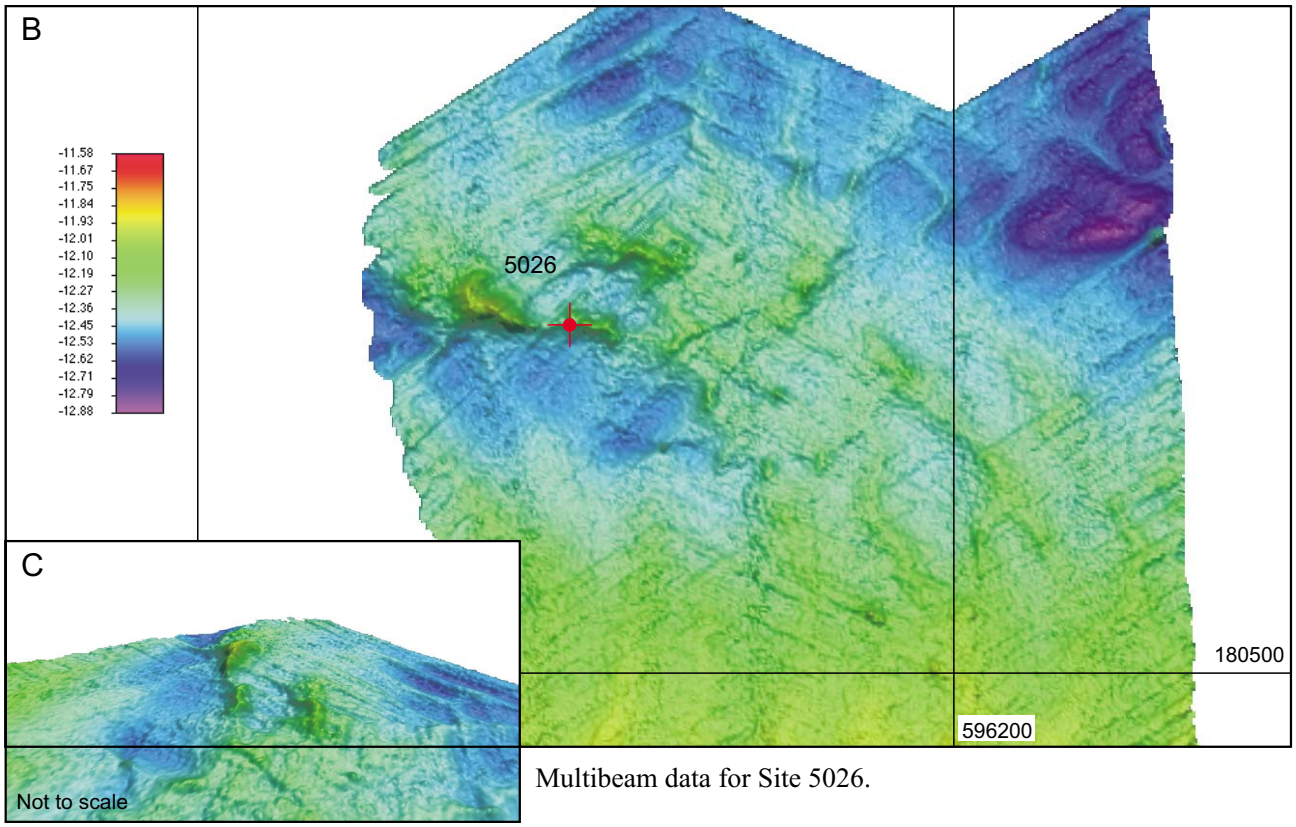
Multibeam and Sidescan Sonar data for Sites 7546 and 7547. Figure 5

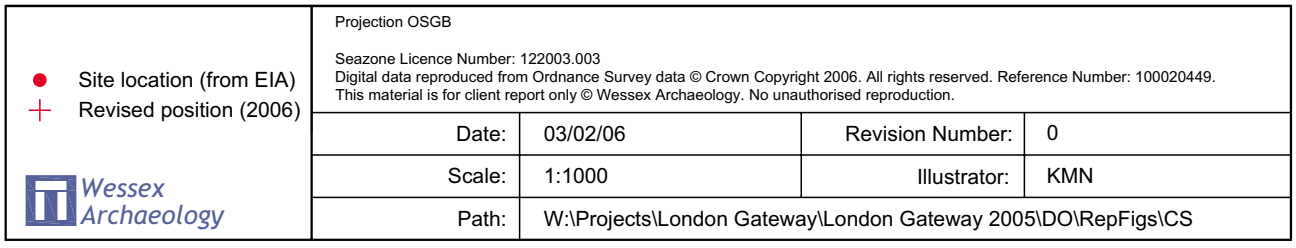


Site 5026 - Sidescan Sonar 2002 survey data.

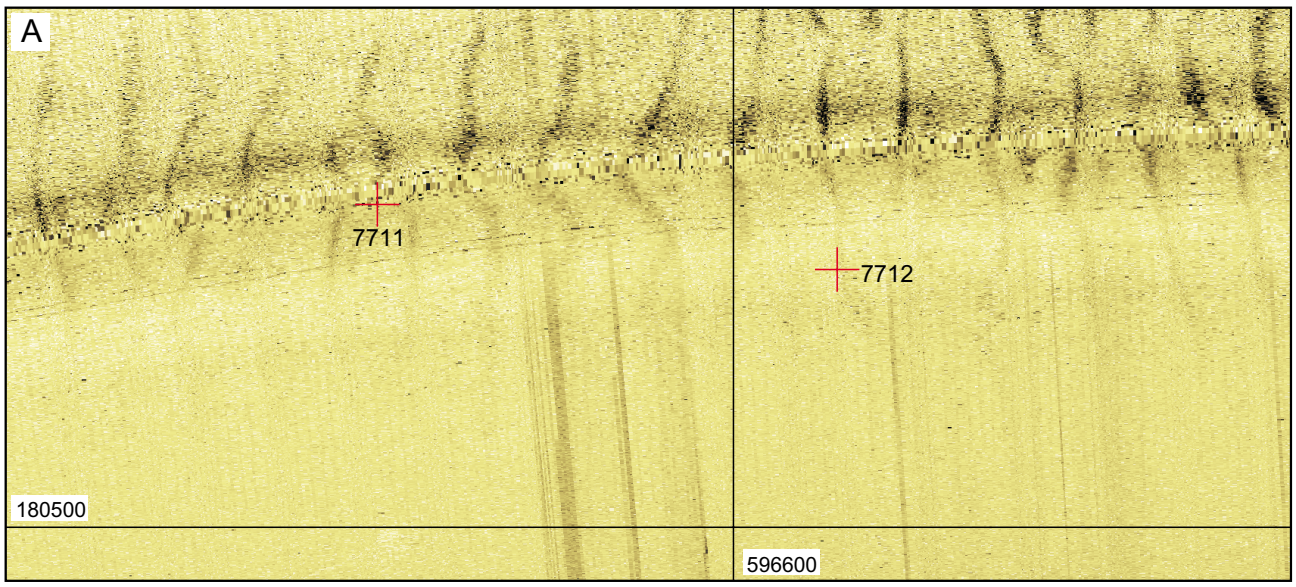


Multibeam data for Site 5026.

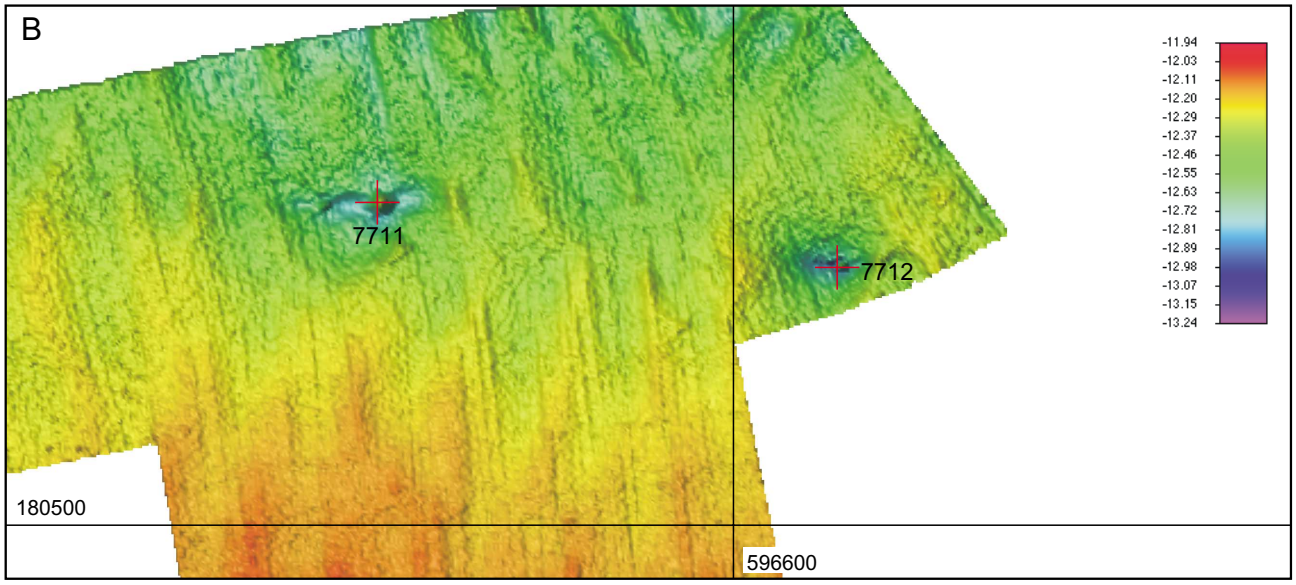
Oblique view from east.



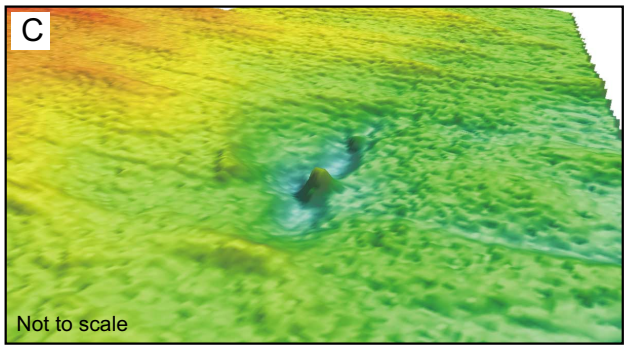
Multibeam and Sidescan Sonar data for Site 5026. Figure 6



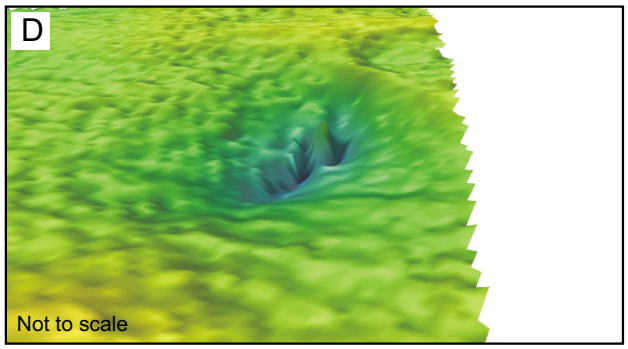
Sites 7711 and 7712 - Sidescan Sonar 2002 survey data.



Multibeam data for Sites 7711 and 7712.



Oblique view of Site 7711 from east.



Oblique view of Site 7712 from west.

● Site location (from EIA)
+ Revised position (2006)

Wessex Archaeology

Projection OSGB

Seazone Licence Number: 122003.003

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Multibeam and Sidescan Sonar data for Sites 7711 and 7712. Figure 7

WWII submarine boom example from Scapaflow.

Site 5193.

Site 5025.

Site 5025.

Projection OSGB

Date:	03/02/06	Revision Number:	0
Scale:	N/A	Illustrator:	KMN
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Wessex Archaeology

Anti submarine boom. Figure 8

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Second Draft

WA Ref: 61209.5204.02
January 2008

Site ID: 5204
Site Name: Unknown (Pottery Wreck)
PLA Wreck No.: 343/93
Mitigation Group: 2.1.1 Site of certain archaeological interest, above SR1
No. of Casualties: Unknown
Cause of Loss: Unknown
Vessel Type: Wooden vessel, possibly clinker built
Current Recording Status: Below Level 2a

1. INVESTIGATIONS TO DATE

The following table is a summary of all investigations of the site, including its first documented discovery.

1999	First located by the PLA (28/10/1999);
1999	Close sounded by Chartwell (21/12/1999);
2001	Emu sidescan sonar survey (29/03/2001);
2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA multibeam echo sounder survey (MBES) revealed a smooth mound measuring 7 metres north south by 3 metres east west with traces of debris up to 10 metres north (16/03/2005);
2005	Site dived by the PLA; a sample of timbers was lifted for identification (18/04/2005);
2005	Site dived twice by Nigel Nayling University of Wales (UWL), a sample of pottery sherds were lifted for analysis (29/07/2005);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005);
2006	WA and PWA diving investigation (17/08/2006);
2007	PLA site investigation using sidescan sonar (EG&G 272 dual frequency towfish), with WA in attendance (7-8/8/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2001	Wessex Archaeology, Assessment of Effects on the Archaeological Heritage: Inter-tidal and Marine, in respect of the proposed development of London Gateway;
2002	Wessex Archaeology, side scan data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification;*
2005	UKHO (58249);
2005	Port of London Authority, *Wreck and Obstruction Categorisation;*
2005	Port of London Authority, *Marine Diving Services Report;*
2005	Nayling, N, 2005, *London Gateway Project: Diving Inspection Report* 2 University of Wales Lampeter;

2005	Wessex Archaeology, 2005, Pottery Analysis;
2005	Wessex Archaeology, Geophysical Analysis of 2005 multibeam and 2001& 2002 sidescan sonar data (inclusive of one geo tiff and five tiff images);
2006	Wessex Archaeology, London Gateway Project River Thames, Archaeological Diving Investigation, Technical Report;
2007	Wessex Archaeology, Geophysical Analysis of 2007 sidescan sonar data (inclusive of one geo tiff and six tiff images).

3. SITE DESCRIPTION

Position (UTM) obtained from PLA multibeam data 2005: 346620.600 E 5706275.261 N
Location (derived from PLA multibeam data): The site is located east of Sea Reach No. 3. It is outside the southern edge of the dredged channel. The closest point to the dredged channel is at a distance of 6 metres (**Figure 1**).
Bed Depth: 14.5 metres
Minimum Target Depth: 10.40 metres
Extent: 7m long, 3m wide and 2m upstanding
UKHO Status: LIVE

2001 WA sidescan sonar interpretation:

The coverage of the 2001 sidescan sonar survey included the position of the site, however it was not identified in the data.

2002 WA sidescan sonar interpretation:

The coverage of the 2002 sidescan sonar survey included the position of the site, however it was not identified in the data.

2005 WA multibeam interpretation:

The site consists of a prominent mound with a smaller mound like feature adjoining it to the south and a ridge like feature with less height to the north. There is a large area of scour on the eastern side of the site (**Figure 1A to D**).

The main mound is 8 metres long and 8 metres wide and upstanding by 0.7 metres. The ridge like feature is 3 metres long and 2 metres wide and forms a curve, with the exterior of the curve to the west. It is upstanding by 0.4 metres (**Figure 1A**).

On the eastern side of the prominent mound there is a smaller linear feature lying parallel to the ridge like feature, approx 1 meter away. It is 3 metres long and 3.5 metres wide, and upstanding by 0.015 metres. It disappears into another upstanding feature which has been scoured on the eastern side. This feature is 0.45 metres upstanding and 3 metres wide. It continues for 2 metres beyond the ridge like feature (**Figure 1B**).

To the south of the main mound there are two upstanding features, one to the south east and another to the south west (**Figure 1B-C**). The south-eastern feature appears to be projecting out of the main mound; it is 4 metres long, 3.5 metres wide and 0.25 metres upstanding. The south-western feature does not appear to be attached to the main mound; the gap between them is *c.* 0.5 metres. The feature is 2.5 metres long, 5 metres wide and 0.15 metres upstanding.

The site has two scour pits, one to the east of the main mound and another in the north western corner (**Figure 1A**). The eastern pit is 60 metres long and 10 metres wide with a maximum depth of 0.5 metres. The north western pit is 10 metres long and 7 metres wide with an upstanding bank on its western edge of 0.2 metres. The maximum depth of this scour pit is 0.65 metres. These two features may be part of the same erosion process and indicative of material lying beneath the seabed.

The development of the scour pit to the east suggests that the prominent net sediment flow over the site is from west to east.

2005 PLA diving survey:

The site was dived by the PLA on the 18th April 2005. The initial inspection by the PLA reported an old wooden vessel possibly clinker built. The frames of the vessel were protruding from the sand in a debris field approximately 7 metres by 3 metres. The frames were approximately 100mm square and the side planking was 25mm thick and 150 mm deep. A small sample of timbers were recovered to the surface (pictures PLA report), no metal objects were noted.

2005 UWL diving survey:

The site was dived twice by Nigel Nayling of the University of Wales, Lampeter (UWL) on behalf of the PLA on the 29th July 2005. Mr Nayling confirmed the presence of articulated framing from a marked mound. A section of keel was also located (approximately 7 metres in length) extending out from the mound sloping upwards to a point 2 metres proud of the seabed. A selection of pottery sherds were recovered for identification.

Recovered finds:

Analysis of the timbers recovered by the PLA was undertaken by Nigel Nayling. He concluded they were oak, but were unsuitable samples for dendrochronological dating.

The two pottery samples recovered by Nigel Nayling were assessed by WA (**Figure 3**), both were post-medieval coarse redware fabrics (general utilitarian wares). The first sherd is just over one half of a flared bowl, the diameter at the rim of the bowl is 220mm, it is white-slipped and glazed on the internal surface. Sometimes described as ‘late slipped kitchenwares’, these white-slipped vessels date to the 19th and early 20th century, and are particularly characteristic of the northern production centres of south Yorkshire and Newcastle. There is no means of dating this vessel more closely within this broad date range. Only the lower part of the second vessel survives. This is a convex vessel, with one handle stump from a vertical looped handle, probably a large cup or porringer (handled bowl). It is glazed both internally and externally. The fabric is a relatively fine variant of the general redware tradition and a 19th or 20th century date seems most likely; there is no means of refining this dating.

The condition of the pottery sherds is remarkably good. The sherds have very little marine growth on them, and although not whole pots the breaks do appear to be very clean, possibly implying they were recently exposed. Both samples were surface recoveries from the mound area of the wreck (N. Nayling pers. comm.).

2006 WA and PLA diving survey:

The site was dived again on 17th August 2006. Two WA divers were integrated into the PLA dive team. A Sonardyne SCOUT acoustic tracking system and the WA in house recording system were installed on the diving vessel.

The diver made bottom in the north-east of the central wreck mound and proceeded westwards towards the wreck. Before reaching the main part of the site the diver reported half buried planking. The diver noted a large central timber protruding from the seabed in a scoured area of riverbed. The timber was *c.* 0.5-0.6 metres wide with rabbets on both sides and was interpreted as a section of keel.

In the north, a fresh break in the keel was noted. This could have been caused by a large object (anchor or trawl) being pulled through the site. On either side of the keel broken up smaller timbers, possibly planks, were noted. The diver followed the length of the keel for *c.* 5 metres, at which point fresh damage to the timber was noted. It could not be determined whether the keel continued into the seabed in this area.

Proceeding southwards onto flat seabed, a number of metal concretions were observed on the seabed. In the south of the site, a circular, hollow object made from soft metal (copper or brass) was noted. The object was *c.* 0.4 metres in diameter and associated with either rope or wire on one side.

Turning north towards the mound again, a large, heavily concreted metal object was encountered. Just to the east of this object the clay riverbed could be felt in deeply scoured channels. Intact pottery and broken up timber was observed in the scours. Further north, a broken large rectangular timber was noted lying at a right angle to the keel**.** The timber had an old, fairly eroded break on one side and a scarf joint at the other end.

A rolled up lead sheet was found further north in the scour hole. Crossing an area of broken up timbers, probably planks, more lead was found at the northern edge of the central mound. When crossing the mound the diver could feel a number of clay pipes in the sediment. Just south of the mound he discovered fabric in the soft sediment. Further east again, more lead was lying on the riverbed.

Even though the 'Pottery Wreck' appears to be fairly broken up, the site contains structural elements and a range of artefact types.

2007 WA sidescan sonar interpretation:

The sidescan sonar data confirmed the information gathered from the multibeam data and provided additional detail. The data shows a main mound measuring 7.5 metres by 3.8 metres, orientated approximately north-south. The sidescan sonar data indicates that it stands 1.2 metres proud of the seabed consistently along the length of the feature (**Figure 2**).

A small linear feature is observed situated approximately 1 metre to the east of the main mound and is approximately 2.1 metres long. To the north-east of the main mound two adjacent features (measuring 1.5 x 0.9 x 0.4 metres and 1.9 x 0.5 metres, respectively) are observed and correspond to the 'small ridge-like' feature described in the 2005 WA multibeam data interpretation.

A feature measuring 3.2 x 0.7 x 0.3 metres is situated approximately 30 metres south-west of the main mound. It is not known if this feature is directly associated with the Pottery Wreck site.

Scour is observed on the sidescan sonar data orientated east-north-east by west-south-west and is observed associated with both the main wreck feature and the small anomalies.

4. SITE HISTORY

The identity of the wreck is not currently known. The site was discovered in 1999 by the PLA.

According to reports from work carried out on the site in 2005 by the PLA and Nigel Nayling, UWL, the 'Pottery Wreck' site comprises a central 7 metres long timber, possibly a keel, protruding from a mound, with clinker frames and planks. A sample of clinker frames and planks was recovered from the site by the PLA. The wreck was named after pottery samples that were recovered from the site by Nigel Nayling. The samples were identified as parts of late slipped white bowls dating to the 19th or early 20th century.

WA's and PLA's diving survey in 2006 confirmed the initial interpretation of the site, and demonstrated the presence of ship's structure and associated artefactual material. The keel section was traced for 5 metres and other structural components were observed, though not identified. Other material including lead, clay pipes, textile and soft metal objects were identified.

Since its discovery WA has received no reports of salvage or clearance works carried out on site.

5. ARCHAEOLOGICAL INTEREST

This wreck has been rated as of 'certain' archaeological interest. The key aspects of the site which have lead to the above rating are:

- The wooden oak framing;
- The PLA report that the wreck was clinker built;
- The reports (N. Nayling, WA) of a surviving keel, suggesting the remains include at least part of the lower hull of the vessel;
- The presence of ship's structure with associated artefactual material;
- The description that the timbers are protruding from the mound implies that there are further buried remains of unknown extents;
- The description of the mound could indicate the remains of cargo or ballast;
- The pottery samples indicate a 19th or 20th century date. They were surface recoveries from the mound area of the site. The pottery is in a good condition which possibly indicates a coherent assemblage of pottery within the wreck;

- The fact that fresh breaks were observed in the exposed timbers shows that the site is under direct threat of damage and/or destruction, and immediate action is necessary in order to record as much as possible before further damage occurs.

Geophysics and diver reports indicate a substantial quantity of remains on the seabed. Little is known about the wreck. However, recovered items suggest a wooden vessel with pottery on board. No archaeological or documentary research has been carried out for this site and the remains may have high potential for future investigations. A brief examination of the recovered timbers revealed constructional details that would also be consistent with a vessel much older than indicated by the pottery found.

6. CONSTRAINTS

The identity of the wreck is not currently known, it is therefore not possible to state whether there will be issues with ordnance or human remains.

7. SCOPE OF STAGE I MITIGATION

The aim of Stage I Mitigation was to achieve a Level 2 record of the site. The Level 2 objective is the production of a record that provides sufficient data to establish the extent, character, date and importance of the site. The following aspects of the wreck were considered in addressing these objectives:

Build

- Construction (material, fastenings, methods)
- Propulsion (sail, steam, diesel or and combination)
- Diagnostic features (machinery, fittings, armament)

Use

- Artefact / Cargo (dating objects)

Survival

- General survival of the site

Investigation

Traces of any previous work on the site (salvage, excavation etc).

The current recording status of this site is below Level 2a, as presence, position and the type of site are known. However, further diving investigation would be necessary to establish the full site extents, including possible buried sections, and ascertain character, date and importance of the site.

8. OUTLINE OF STAGE II MITIGATION

The wreck lies only 6 metres outside the dredged channel and will be recovered with in water archaeological observation and recording in the course of recovery operations (Mitigation II H). Specifically, the wreck will be recovered by PLA divers under archaeological attendance and with diver tracking.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

The wreck will be recovered with in water archaeological observation and recording in the course of recovery operations.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

Recovered Material:

Finds	Dated recovered and by who	Location
Timber samples	2005, PLA	Unknown, PLA?
Two pottery samples	2005, Nigel Nayling	WA

DIGITAL ARCHIVE

The digital archive consists of the following:

Material	Location
2002 sidescan sonar data	WA
2005 multibeam data	WA
2007 sidescan sonar data	WA

PAPER ARCHIVE

The paper archive consists of the following:

Material	Location
UKHO Report (58249);	WA
Port of London Authority, 2005, *Wreck and Obstruction Categorisation Report,* includes PLA multibeam and pseudo sidescan screen captures;	WA
Port of London Authority, 2005, *Marine Diving Services Report*;	WA
Nayling, N, 2005, *London Gateway Project: Diving Inspection Report* 2 University of Wales Lampeter;	WA
Wessex Archaeology, 2001 Assessment of Effects Archaeological Heritage: Inter-tidal and Marine in respect of the proposed development of London Gateway;	WA
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report;	WA
Wessex Archaeology, 2005, Pottery Analysis;	WA
Five printed images of the 2005 multibeam data;	WA
Wessex Archaeology, 2006, London Gateway Project River Thames, Archaeological Diving Investigation, Technical Report.	WA

University of Wales Lampeter London Gateway Archaeology Report 02/2005

London Gateway Project: Diving Inspection Report 2

Nigel Nayling

Summary

Three seabed targets, identified as of varying archaeological potential within the possible area of impact of proposed dredging for the London Gateway Project, were inspected by a diving archaeologist in line with the agreed Archaeological Mitigation Framework. One site comprises two large sections of a steel built vessel identified as the *Dovenby*, a barque which sank in 1914. Closely stacked bricks located at a second site may relate to the documented sinking of a brick-carrying barge in 1922. A third site, comprising the partially exposed remains of a wooden wreck, is unidentified.

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1 Background

1.1 INTRODUCTION

This document is a factual technical report on results of diving operations carried out to assess the archaeological nature of previously identified underwater anomalies in areas of proposed dredging for the London Gateway Project (LGP). Three locations, identified as probable wrecks of possible archaeological significance in previous work (see below) were selected for inspection. Sites in this report are referred to primarily through use of codes assigned by Wessex Archaeology to facilitate cross-referencing with previous reports.

1.2 PREVIOUS WORK

Previous assessment of the underwater cultural heritage in the area potentially affected by the London Gateway Port Development has included:
A desk-based assessment distributed as Appendix B of *The (London Gateway Port) Harbour Empowerment Order 2002: Assessment of Effects on Cultural Heritage in Respect of the Proposed Development of London Gateway Port Development* based on investigations undertaken by Wessex Archaeology.
An updated wreck site identification exercise carried out by Wessex Archaeology between October 2002 and February 2003 to enhance the Environmental Assessment of London Gateway, including *Enhanced Wreck Site Identification*. This task comprised two elements, a review of existing sidescan survey and wreck data held by the Port of London Authority, and additional sidescan and magnetometer survey. The survey area comprised the Limit of Deviation (LOD) and an area of proposed dredging extending 2.77km eastwards along the channel from the Sea Reach No.1 navigation buoy.

1.3 AIMS AND OBJECTIVES

The aim of this study was to assess the character of three sites on the seabed within the area of proposed dredging in the Yantlet Channel to inform future decisions on appropriate mitigation. In line with the Archaeological Mitigation

Framework for LGP, direct observation by a competent and suitably experienced archaeologist (the author), by means of diving, was employed. The aim of diving operations was to investigate each of the sites, sufficient to determine whether they are, or are not, of archaeological significance. This report does not attempt to assess the extent, or detailed nature of the archaeological resource at each location, or to provide guidance on their future management.

1.4 METHODOLOGY

In accordance with the Archaeological Mitigation Framework, each of the sites had been surveyed by the Port of London Authority using multibeam bathymetry, prior to inspection. The results of these surveys were used to assist in determining the diving programme, and to assist location of the sites. Some of the survey results are integrated within this report. Each site had previously been visited by a dive team from the PLA under the supervision of Kevin Leadbetter and relevant observations are also included here. Using procedures broadly in line with those employed previously (Nayling 2005), each of the sites was visited by the PLA dive team with the author in attendance.

1.5 RESULTS

1.5.1 WA 5230, 343/99, OSGB 36 591581 180324

The site is located on the south side of the main channel between Sea Reach No 3 and Sea Reach No 4 buoys. The wreck may be that of barge that sank in 1922 (Admiralty Reference No 12886) which was shown on charts prior to 1926 located some 110m from the surveyed anomaly. The site was located by PLA survey and inspected by divers in 2002. Although not subjected to additional magnetometer and sonar survey by Wessex Archaeology in 2001/2, the site was listed in its updated wreck site listing (Leather 2003, table 1). More recent survey (2005) indicated two areas of debris: an area extending 8 x 4 m and 1m above the general bed level and a smaller area of debris 14m south in the original charted position (591581 180310) extending from the shoal to the south-west. PLA Marine Services diver inspection reported that the obstruction is composed of piles of bricks (some of which are neatly stacked), wood and concreted metal indicating that the

obstruction could be the wreck of a wooden dumb barge or sailing barge. Diving on 28/7/05 confirmed this description. Samples of stamped brick were recovered for possible identification. Features observed are consistent with presence of a relatively modern, brick carrying barge as indicated in Admiralty records.

1.5.2 WA5204, 343/93, OSGB 36 593858 180121

The site is located east of Sea Reach No. 3, 20m from the southern edge of the existing, dredged channel. The wreck was apparently first surveyed by the PLA during channel extension survey in 1999. Although not subjected to additional magnetometer and sonar survey by Wessex Archaeology in 2001/2, the site was listed in its updated wreck site listing (Leather 2003, table 1). PLA survey in 2005 revealed a smooth mound measuring some 7m (NS) by 3m (EW) with signs of debris up to 10m to the north. Initial inpection by PLA divers indicated that the obstruction is the remains of a wooden vessel with framing timbers protruding from the sand in a debris field roughly 7m x 3m.

The site was dived twice by the author on 29/7/05. The presence of apparently articulated framing timbers protruding from a marked mound was confirmed. Additionally, a section of keel some 7m in length was found to extend out from this mound, sloping upwards such that, at its exposed uppermost end, it was some 2m clear of the seabed. A small number of pottery sherds from the debris mound were recovered for possible identification. Small pieces of loose timber which had previously been recovered from the site were examined but, although oak, found to be unsuitable for dendrochronological dating.

1.5.3 WA5010 and WA 5012, *Dovenby*, 343/11 and 12, OSGB 36 597736 180646 and 597665 180831

This site is extensively recorded in the records of the PLA. Built in the Sunderland yard of Pickersgill in 1891, this steel barque sank in collision with the Dutch steamer *Sindoro* carrying a cargo of *guano* from Lobos d'Afuera to London in 1914. Records indicate that the wreck was dispersed with explosives soon after wrecking and had also been reduced by cutting with oxy-acetylene in 1967. The site was surveyed in 2001 and 2002 using sidescan and magnetometer survey (Leather

2003), and more recently using multibeam bathymetry. Surveys show clear wreckage in two distinct locations some 100m apart. Both main locations associated with this site were dived. The presence of substantial, upstanding metal frames was confirmed. Seabed inspection was consistent with the remains representing those of the *Dovenby*.

1.6 DISCUSSION

The identification of the *Dovenby* seems secure. Wreck structure has been substantially degraded through intentional clearance and subsequent erosion. The dating of the two other sites examined might best be resolved by examination of ceramics (brick from one, pottery from the other) recovered during diving inspections. The extent of any surviving wooden wreck structure at these latter two sites remains unclear.

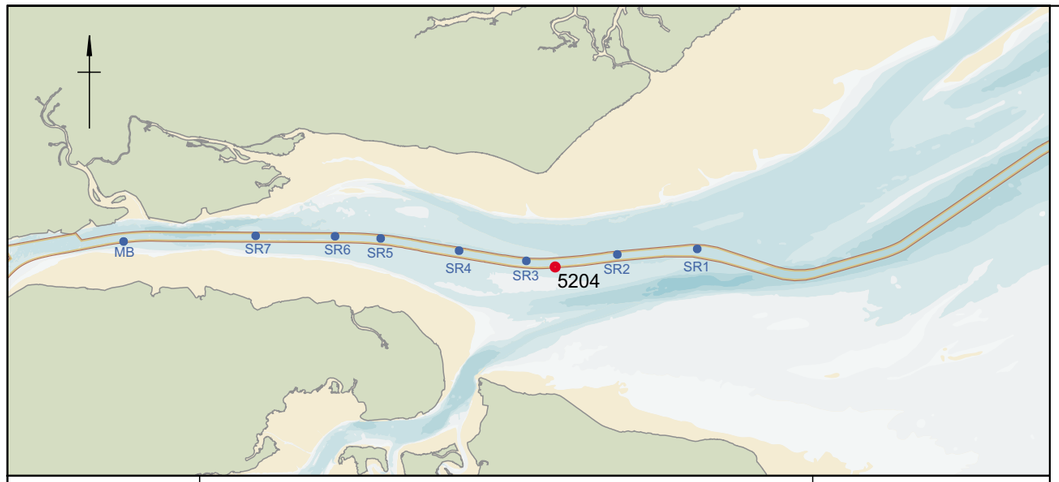
1.7 ACKNOWLEDGEMENTS

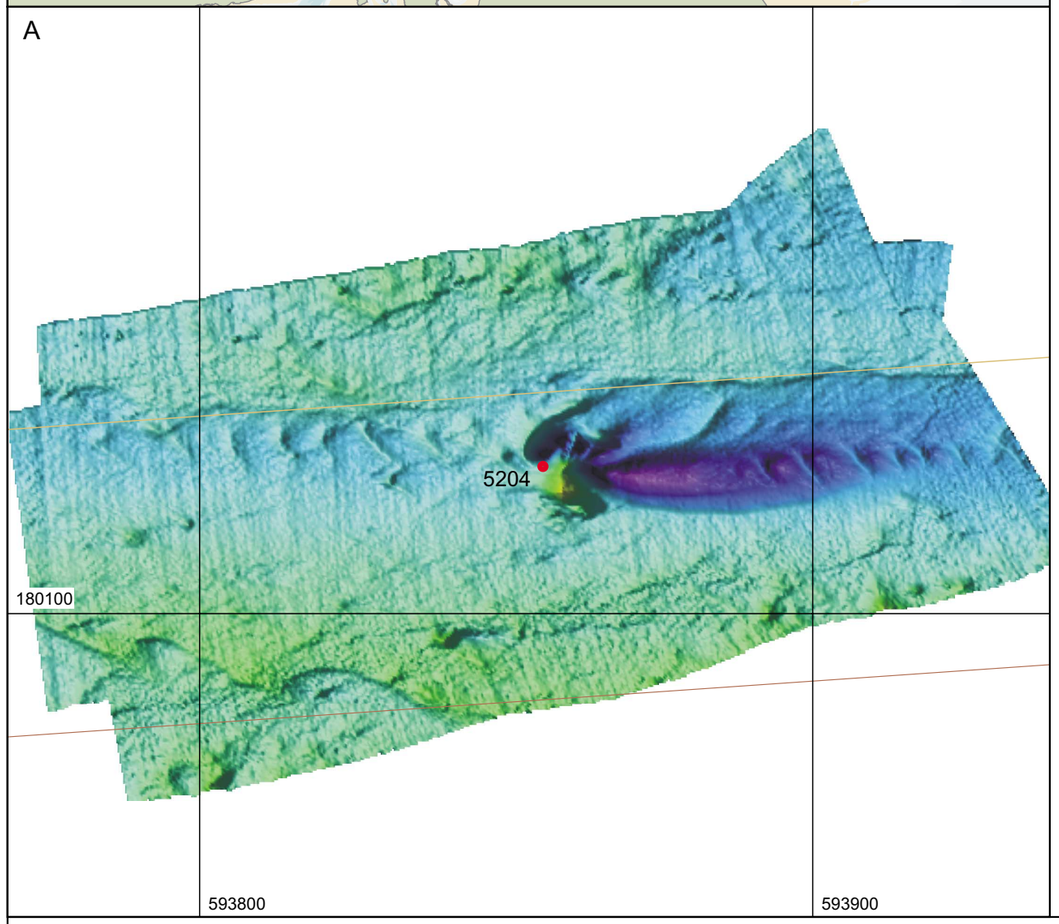
Hydrographic data and bathymetric survey results were supplied by John Pinder, PLA. The advice of Peter Steen and the support of the dive team at the Port of London Authority are gratefully acknowledged.

1.8 REFERENCES

Leather, S, 2003 *Updated Wreck Site Identification: Sidescan Sonar and Marine Magnetometer Survey*, Wessex Archaeology, **London Gateway Development Technical Report Appendix Q**

Nayling, N, 2005 *London Gateway Project: Diving Inspection Report 1*, **University of Wales Lampeter London Gateway Archaeology Report 01/2005**





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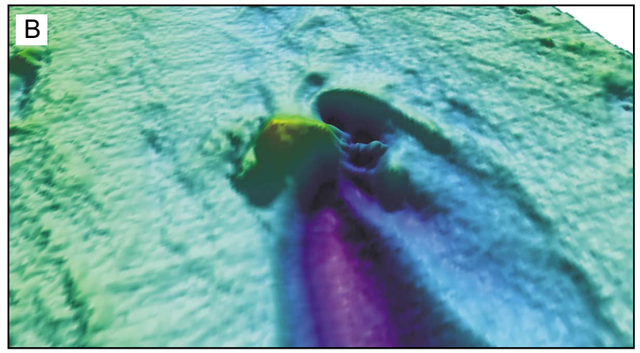
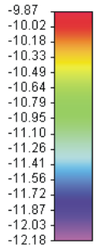
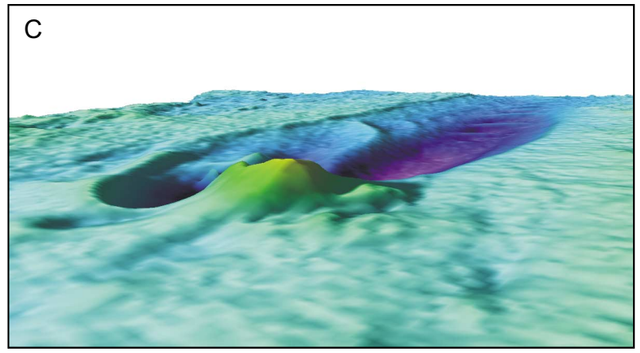
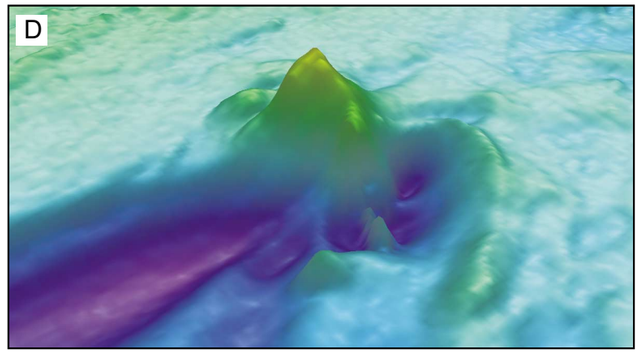


Oblique view from the east.





Oblique view from the south-west.



Oblique view from the north.

- Site location
- Channel marker buoy
- Dredging limits
- 50m buffer on dredging limits

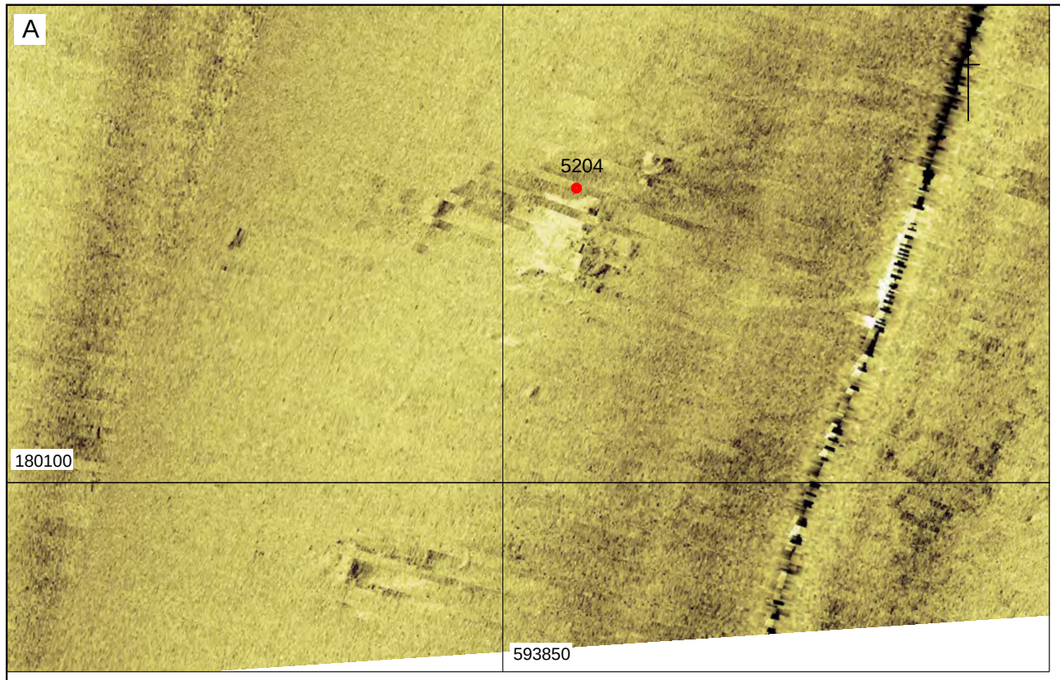
Wessex Archaeology

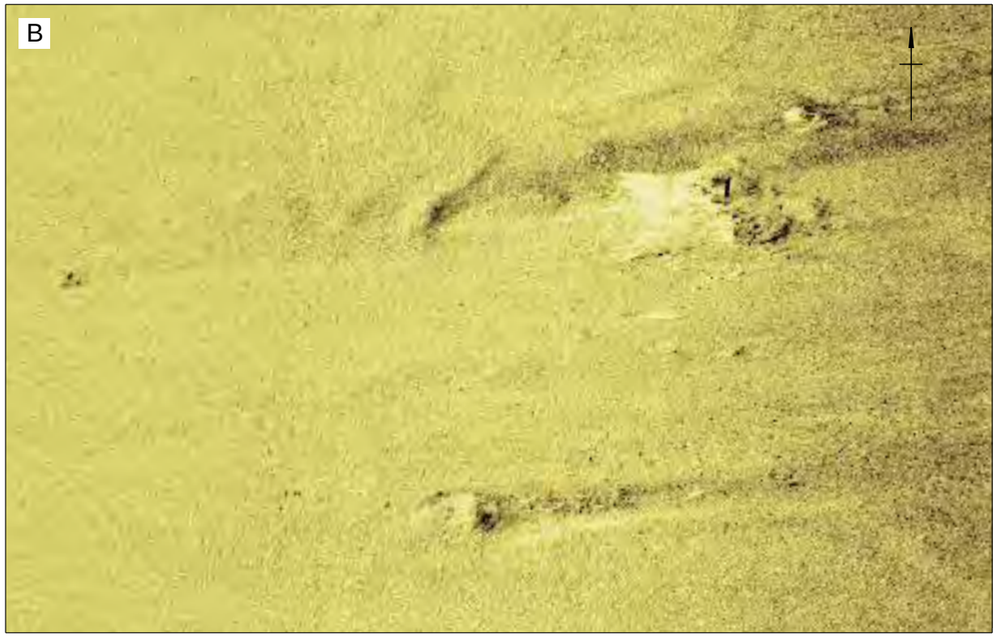
Projection OSGB

Date:	11/01/06	Revision Number:	0
Scale:	1:250,000 1:1,000	Illustrator:	KMN
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Location and Multibeam data for Site 5204.

Figure 1





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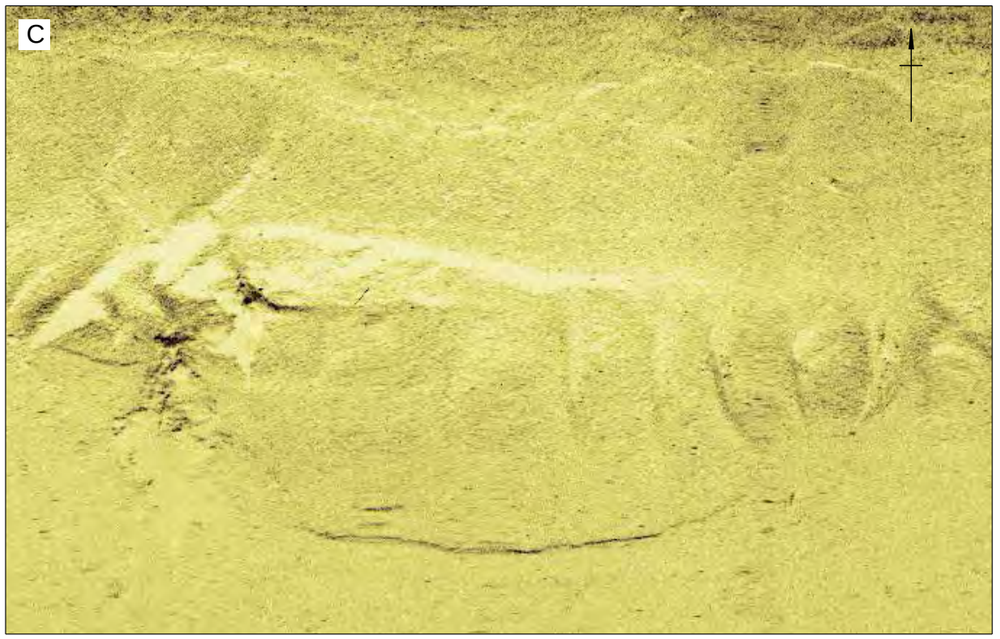

Not to scale

● Site location

Wessex Archaeology

Projection OSGB

Date:	30/10/07	Revision Number:	0
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Path:	W:\Projects\London Gateway\London Gateway 2007\DO\RepFigs\CMS_2007		

Sidescan Sonar image of Site 5204

Figure 2

Date:	20/11/07	Revision Number:	1
Scale:	N/A	Illustrator:	KMN
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Wessex Archaeology

Pottery recovered from Site 5204. Figure 3

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Third Draft

WA Ref: 61209.5230.03
January 2008

Site ID: 5230, 7128, 7224 and 7540
Site Name: Unknown (Brick Barge)
PLA Wreck No.: 343/99
Mitigation Group: 2.1.2. Site of probable archaeological interest, above SR1
No. of Causalities: Unknown
Vessel Type: Unknown (possible barge)
Cause of Loss: Unknown
Current Recording Status: Below Level 2a

The UKHO have officially charted the remains of **5230** as a possible brick barge, based on letters received from the PLA in 1922. In 2002 geophysical investigations in the area identified two other targets (**7540** and **7128**), thought to be associated with the same wreck. In 2002 the PLA also located a third anomaly in the area **7224**. This has subsequently been dived by the PLA and reported to be the wreck of a brick barge. Site **5230**'s position appears to be in error as the 2002 sidescan confirms the location of the wreck at **7224**. Site **7128** appears to be a ridge and part of **7224**, whilst **7540** is located to the west and could be an area of debris.

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the sites; the summaries begin with the sites discovery, and include all forms of investigation to date:

Site 5230

1922	Wreck believed to have been lost in 1922. Possibly a barge carrying a cargo of bricks (PLA letter 24/04/1922);
1922	Site surveyed by PLA least depth 9.2 metres (PLA letter 24/07/1992).
2005	Site 7224/ revised 5230 dived by the PLA. Reported to be piles of bricks, wood and concreted metal. One brick, two metal bars and a section of half inch chain were recovered to the surface (24/02/2005);
2005	Site 7224/ revised 5230 dived by Nigel Nayling of UWL on behalf of the PLA; recovery of bricks (28/07/2005);
2006	PLA site investigation using Reson 8125 multibeam bathymetry system (09/03/2006);
2007	WA diving investigation of site 5230 (revised position) (25-26/22/2007).

Site 7128

2001	Emu sidescan sonar survey (29/03/2001);
2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002).
2006	PLA site investigation using Reson 8125 multibeam bathymetry system (09/03/2006).

Site 7224

2002	Site located by PLA during survey at 591581 E 180324 N, charted as an obstruction in 11 metres of water. Site possibly related to UKHO 12886, which lies 192 metres west of this position (08/07/2002);
2002	Site dived by the PLA. Reported to be timbers and debris, possible dumping. The PLA report that the remains have been partially recovered (?) (20/08/2002);
2005	Area sounded by MBES on the 18/01/2005 and data extracted as wreck search. The site has a least depth of 11.46 metres sounded 14 metres north of the charted position, centred on an area of debris extending 8 x 4 metres and 1 metre upstanding in a general seabed depth of 12.4 metres. The original charted position for the site (NGR 591581 180310) was 14 metres to the south where a smaller area of debris has been identified.
2005	Site 7224/ revised 5230 dived by the PLA. Reported to be piles of bricks, wood and concreted metal. One brick, two metal bars and a section of half inch chain were recovered to the surface (24/02/2005);
2005	Site 7224/ revised 5230 dived by Nigel Nayling of UWL on behalf of the PLA; recovery of bricks (28/07/2005).
2006	PLA site investigation using Reson 8125 multibeam system (09/03/2006).

Site 7540

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002).
2006	PLA site investigation using Reson 8125 multibeam bathymetry system (09/03/2006).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2005	UKHO (12886)
2001	Wessex Archaeology, Assessment of Effects on the Archaeological Heritage: Inter-tidal and Marine, in respect of the proposed development of London Gateway.
2002	Wessex Archaeology, sidescan data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification*
2005	Nayling, N, 2005, *London Gateway Project: Diving Inspection Report* 2 University of Wales Lampeter;
2005	Wessex Archaeology, 2005, Brick Analysis.
2005	Port of London Authority, *Wreck and Obstruction Categorisation;*
2005	Port of London Authority, *Marine Diving Services Report*
2006	Wessex Archaeology, Geophysical Analysis of 2006 multibeam, 2001& 2002 sidescan sonar data, which produced: one geo tiff and nine tiff images;
2007	Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report.*

3. SITE DESCRIPTION

Introduction

The UKHO have officially charted the remains of **5230** as a possible brick barge, based on letters received from the PLA in 1922. In 2002 geophysical investigations in the area identified two other targets (**7540** and **7128**), thought to be associated with the same wreck. In 2002 the PLA also located a third anomaly in the area **7224**. This has subsequently been dived

by the PLA in 2002 and 2005 and reported to be the wreck of a brick barge. The 2002 PLA dive report suggests material was recovered from site **7224,** although no description is given.

Site **5230**'s position appears to be incorrect as the 2006 multibeam confirms the location of the wreck at **7224**. Site **7128** appears to be a large linear ridge and part of **7224**, whilst **7540** could be an area of debris.

The site consists of a large linear ridge (**7224** and **7128**) which has a scour running parallel to it on its northern side. Approximately 10 metres to the north of the ridge is a prominent mound, which was dived by UWL (**5230 / 7224**). Feature **7540** is located 50 metres west of the mound and is in a small scour hole (**Figure 1**).

The 2006 multibeam data is the most accurate and up-to-date survey for these sites. Therefore the co-ordinates derived from the 2006 multibeam bathymetry data have been attributed to the three sites. The table below summarises the site's details and position in relation to the dredged channel edge.

Site	Revised UTM	Position derived from:	Sites location within the channel	Bed depth (metres)	Minimum target depth (metres)	Site extent (metres)	UKHO status
5230	344361.351 E 5706633.522 N	2006 multibeam	50m inside dredged channel	12.75m	11.72m	15x9x1.2m	DEAD
7224 /7128	344382.053 E 5706618.106 N	2006 multibeam	47m inside dredged channel	12.30m	11.85m	140x14x1m	Not recorded with the UKHO
7540	344306.129 E 5706642.571 N	2006 multibeam	47m inside dredged channel	12.7m	-	10x6x0.15m deep	Not recorded with the UKHO

Site 5230

2001 WA sidescan sonar interpretation:

Site **5230** was situated within the 2001 sidescan sonar survey area, but it was not identified during the survey.

2002 WA sidescan sonar interpretation:

The site consists of a dark reflector which is irregular in shape, located 11 metres north of the western end of the linear ridge (discussed below). The feature is 7 metres long, 4 metres wide and 0.9 metres upstanding. The tiff file created was labelled as 'target 475' (**Figure 2**).

2005 PLA dive description:

The PLA dived the site in February 2005. The initial inspection reported the site contained piles of bricks (some neatly stacked), wood and concreted metal. The divers recovered a sample of bricks, two metal bars (one straight and the other L shaped) and a section of

concreted half inch chain (**Figure 5**). The bricks appear to have letters 'D' and the number '8' stamped into the surface of a shallow-frog.

2005 UWL dive description:

Nigel Nayling of UWL dived the site on behalf of the PLA on the 28th July 2005. Mr Nayling's inspection confirmed the PLA's site description (above). He also recovered a sample of the bricks. He suggested the observed features were consistent with the presence of a relatively modern barge carrying bricks as indicated by the Admiralty records.

Recovered finds:

Two ceramic bricks were recovered by the PLA for analysis by WA. They are both in good condition and of the characteristic 'dirty yellow' fabric of the London stock brick (**Figure 5**). They are both of the same form, with dimensions of *c.* 235 x 105 x 70mm, and a rudimentary frog stamped with the letters DK(?)B. These are likely to derive from one of the Kent clayfields, and could have been barged around the coast to the London docks. The stamps suggest that the bricks could be of post-1850 date, but cannot be linked to a known place of manufacture.

2006 WA interpretation of PLA multibeam data:

Feature **5230** is documented as being the wreck of a brick barge. At the original location of **5230** nothing was identified in the multibeam data. However, an anomaly was identified 100 metes to the east. This anomaly was confirmed as the wreck by Nigel Nayling of UWL who recovered artefacts from the site (discussed above; **Figures 1-2**).

The main mound is 15 metes long, 9 metres wide and 1.2 upstanding. It is located 9 metres to the north of the western end of feature **7128** / **7224** (discussed below). On the northern side of the mound a small feature is located 3 metres away, which is 5 metes long, 3 metres wide and 0.25 metres upstanding (**Figure 2**).

On the western side of the mound is a large scour 37 metres long (orientated east west), 23 metres wide and 0.4 metres deep. An object is located in the scour which is 6 metres long, 2 metres wide and 0.25 metres upstanding (**Figure 2**).

2007 WA diving investigation:

During the first dive, the diver found a small mound that seemed to be predominantly made up of bricks and fragments of bricks, generally heavily covered and buried in mud and silt. The diver estimated the mound to be approximately 0.5 metres high and continuing to the north. He recovered one whole yellowish brick (230x105x65mm, frogged on one side) and a half yellowish brick (150x110x65mm, frogged on one side with faint traces of a stamp) from this mound (**Figure 6A**) and moved east. The diver encountered a scatter of river pebbles and a long concretion approximately 1.5 metres long and lying north-south. There also appeared to be other hard features (probably concretions) in this area well buried and too large to move or sample. The diver recovered a fragment of sawn wood (270x25x20mm) with traces of five iron nails which was buried in the river bed (**Figure 6B**).

Moving east, the diver noted that there was not a very well defined edge to the mound, but the concentration of material became less. Apart from isolated brick no features were evident as he went further east, and the seabed began to rise slightly and comprised very flat soft clay, completely clear of mud and silt.

During the second dive, the diver made bottom approximately 10 metres south-west of the site. In this area the diver came across an isolated timber on the seabed (plank-shaped, *c.* 0.8x0.2x0.03 metres). A flat concretion was attached to the middle of the timber. The timber was broken at one end.

Approaching the site, the diver noted a distinct incline of the seabed. The diver reported a large concretion buried in the seabed, approximately 1 metre of which was exposed (possibly the same concretion encountered during the first dive). In close vicinity of the concretion the diver came across the first brick, in a distance of *c.* 7 metres of the centre of the anomaly, quickly followed by more bricks. The brick scatter became denser as the diver approached the top of the mound, and it appeared that the mound is built of bricks, or at least covered by bricks. On top of the mound (overall height probably around 1 metre) small pieces of wood were encountered in between the bricks. The pieces of wood were strongly abraded and predominantly oval in shape. The samples recovered vary in size from 0.24 to 0.12 metres length (**Figure 6C**). Together with the wood samples a small, roughly triangular concretion (55x35x20mm) and a small piece of possible slag (70x60x20mm) were recovered (**Figures 6D-E**).

The orientation of the mound is roughly east-west. Probing on top of the mound showed that the features (predominantly brick, some wood and concretion) are either exposed on the surface or covered by up to 0.20-0.30 metres of fine silty sand. One concretion could be worked free, it was an elongated, flat object (*c.* 650x100x20mm in size) which seemed to become slightly narrower towards one end. It was too heavy to be recovered.

Turning west, the diver reported a large, upstanding, wall-like concretion protruding from the seabed. Its height is at least 1 metre, it is *c.* 0.1 metre thick and several metres long. It runs approximately west-south-west to east-north-east. It has more concreted features attached to its sides. The feature could be moved in its upper, upstanding part but seemed to be firmly attached at the bottom. It was not possible to establish the full length of the feature because the current picked up rapidly and the diver had to be recovered.

It is thought that the upstanding metal feature is identical with the central feature in the multibeam image. It does not seem to be the isolated feature depicted in the north-western part of the multibeam, because no gap was noted between the mound and the feature. In fact, the upstanding metal feature seemed to be at the crest of the mound. According to the PLA report of 2005 several piles of brick are present on the site. Due to limited bottom time, the western end of the site including the isolated feature at the edge of the main anomaly, the scour and a possible feature at the western end of the scour were not covered during the investigation.

Site 7128 / 7224

2001 WA sidescan sonar interpretation:

The site consists of a long drawn out elliptical shape with associated anomalies at the western end possibly a large wreck. The NGR recorded was 591647 E 180303 N. The anomaly is 138 metres long, 15 metres wide, and a length of shadow was recorded. The tiff file created was labelled as ‘target 27’.

2002 WA sidescan sonar interpretation:

The site consists of a long flat elliptical anomaly with a hard defined edge, which has a low profile to the seabed and associated debris to the west. The anomaly is 140 metres long, 15 metres wide, and no length of shadow was recorded (**Figure 3**). The tiff file created was labelled as 'target 475'.

2006 WA interpretation of PLA multibeam data:

Feature **7128** was identified by WA during the sidescan sonar survey in 2002; it was subsequently also identified by the PLA in a different survey in 2002 (**7224**). Both sites are points on the same feature which is a long linear ridge orientated east-west (**Figure 3**).

The ridge is 140 metres long, 14 metres wide and 1 metre upstanding on the northern side. On the northern side of the ridge a large linear scour runs the length of the feature, it is 110 metres long, 17 metres wide and 0.35 metres deep. A small ridge protrudes from the western end of the feature; it is 8 metres long, 3.5 metes wide and 0.8 metres upstanding on the northern side (**Figure 3**).

Site 7540

2001 WA sidescan sonar interpretation:

Site **7540** was situated within the 2001 sidescan sonar survey area, but it was not identified during the survey.

2002 WA sidescan sonar interpretation:

The site consists of a small reflector with shadow. The NGR recorded was 591525 E 180329 N. The anomaly is 5 metres long, 10 metres wide, and no length of shadow was recorded (**Figure 4**). The tiff file created was labelled as 'target 474'.

2006 WA interpretation of PLA multibeam data:

The site consists of a small scour, it is 10 metres long, 6 metres wide and 0.15 metres deep, orientated north-east by south-west (**Figure 4**).

4. SITE HISTORY

The identity of the wreck is not currently known. The site was discovered in 1922 by the PLA. The 2007 diving investigation showed that the main site appears to consist of a mound of brick together with pieces of wood and large metal remains. There are no reports of salvage or clearance works having being carried out on the site.

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of 'probable' archaeological interest. The key aspect of the site that have lead to the above rating are:

- The documented features so far indicate the presence of a vessel with major metal construction parts and minor wooden features, carrying a cargo of bricks. The upstanding central feature on top of the mound might be a bulkhead protruding from the seabed;

- The brick samples indicate a post-1850 date. The bricks were surface recoveries from the site but the divers reports and the good condition of the bricks suggests a partially (at least) intact cargo assemblage;
- The diving investigations indicate that major parts of the site are buried below the seabed, suggesting further information can be ascertained from the site;
- The area was a known trading route for the transport of bricks, thus it is possible documentary research may expand upon local trading networks and connections.

As no documentary research has been carried out on the site, little can be surmised of the vessel's importance. However, the multibeam data indicates the presence of a predominant mound with scattered debris and an unusual linear ridge close to the site. It is thought that the upstanding metal feature reported during the 2007 diving survey is identical with the central feature in the multibeam image. It does not seem to be the isolated feature depicted in the north-western part of the multibeam, because no gap was noted between the mound and the feature. In fact, the upstanding metal feature seemed to be at the crest of the mound. According to the PLA report of 2005 several piles of brick are present on the site. Due to limited bottom time, the western end of the site including the isolated feature at the edge of the main anomaly, the scour and a possible feature at the western end of the scour were not covered during the investigation.

6. CONSTRAINTS

The identity of the wreck is not currently known, it is therefore not possible to state whether there will be issues with ordnance or human remains.

7. SCOPE OF FURTHER STAGE I MITIGATION

Stage 1 Mitigation is intended to achieve a Level 2 record of the site, which is a record that provides sufficient data to establish the extent, character, date and importance of the site. The current recording status of the wreck is below Level 2a. Presence, position and the type of site are known. There are indications of the site's date and character. However, further research would be necessary to establish the full site extents and ascertain its character, date and importance.

8. OUTLINE OF STAGE II MITIGATION H

The wreck lies 47 metres inside the dredged channel. The site will be cleared with limited archaeological observation and recording in the course of dispersal operations.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

The site will have been cleared by grabbing. The site will have undergone controlled clearance, with limited archaeological observation and recording in the course of dispersal operations.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

Finds recovered	Date recovered and by who	Location
An unquantified amount of finds	2002, PLA	Unknown
Brick, metal / rope concretions	2005, PLA	PLA
Two brick samples	2005, Nigel Nayling	WA
Two brick samples, five pieces of wood, a small concretion and a piece of slag (?)	2007, WA	WA

DIGITAL ARCHIVE

Material	Location
2001 sidescan sonar data	WA
2002 sidescan sonar and magnetometer data	WA
2006 multibeam data	WA
Ten photographs of recovered finds (2005)	WA
2007 dive recordings	WA

PAPER ARCHIVE

Material	Location
UKHO Report (12886)	WA
Port of London Authority, 2005, *Wreck and Obstruction Categorisation Report,* includes PLA multibeam and pseudo side scan screen captures	WA
Port of London Authority, 2005, *Marine Diving Services Report*	WA
Nayling, N, 2005, *London Gateway Project: Diving Inspection Report* 2 University of Wales Lampeter	WA
Wessex Archaeology, 2001 Assessment of Effects Archaeological Heritage: Inter-tidal and Marine in respect of the proposed development of London Gateway	WA
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report.	WA
Wessex Archaeology, 2005, Brick Analysis	WA
Eleven printed images of the 2006 multibeam data	WA
Ten photographs of recovered finds (2005)	WA
Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report*	WA

University of Wales Lampeter London Gateway Archaeology Report 02/2005

London Gateway Project: Diving Inspection Report 2

Nigel Nayling

Summary

Three seabed targets, identified as of varying archaeological potential within the possible area of impact of proposed dredging for the London Gateway Project, were inspected by a diving archaeologist in line with the agreed Archaeological Mitigation Framework. One site comprises two large sections of a steel built vessel identified as the *Dovenby*, a barque which sank in 1914. Closely stacked bricks located at a second site may relate to the documented sinking of a brick-carrying barge in 1922. A third site, comprising the partially exposed remains of a wooden wreck, is unidentified.

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1 Background

1.1 INTRODUCTION

This document is a factual technical report on results of diving operations carried out to assess the archaeological nature of previously identified underwater anomalies in areas of proposed dredging for the London Gateway Project (LGP). Three locations, identified as probable wrecks of possible archaeological significance in previous work (see below) were selected for inspection. Sites in this report are referred to primarily through use of codes assigned by Wessex Archaeology to facilitate cross-referencing with previous reports.

1.2 PREVIOUS WORK

Previous assessment of the underwater cultural heritage in the area potentially affected by the London Gateway Port Development has included:
A desk-based assessment distributed as Appendix B of *The (London Gateway Port) Harbour Empowerment Order 2002: Assessment of Effects on Cultural Heritage in Respect of the Proposed Development of London Gateway Port Development* based on investigations undertaken by Wessex Archaeology.
An updated wreck site identification exercise carried out by Wessex Archaeology between October 2002 and February 2003 to enhance the Environmental Assessment of London Gateway, including *Enhanced Wreck Site Identification*. This task comprised two elements, a review of existing sidescan survey and wreck data held by the Port of London Authority, and additional sidescan and magnetometer survey. The survey area comprised the Limit of Deviation (LOD) and an area of proposed dredging extending 2.77km eastwards along the channel from the Sea Reach No.1 navigation buoy.

1.3 AIMS AND OBJECTIVES

The aim of this study was to assess the character of three sites on the seabed within the area of proposed dredging in the Yantlet Channel to inform future decisions on appropriate mitigation. In line with the Archaeological Mitigation

Framework for LGP, direct observation by a competent and suitably experienced archaeologist (the author), by means of diving, was employed. The aim of diving operations was to investigate each of the sites, sufficient to determine whether they are, or are not, of archaeological significance. This report does not attempt to assess the extent, or detailed nature of the archaeological resource at each location, or to provide guidance on their future management.

1.4 METHODOLOGY

In accordance with the Archaeological Mitigation Framework, each of the sites had been surveyed by the Port of London Authority using multibeam bathymetry, prior to inspection. The results of these surveys were used to assist in determining the diving programme, and to assist location of the sites. Some of the survey results are integrated within this report. Each site had previously been visited by a dive team from the PLA under the supervision of Kevin Leadbetter and relevant observations are also included here. Using procedures broadly in line with those employed previously (Nayling 2005), each of the sites was visited by the PLA dive team with the author in attendance.

1.5 RESULTS

1.5.1 WA 5230, 343/99, OSGB 36 591581 180324

The site is located on the south side of the main channel between Sea Reach No 3 and Sea Reach No 4 buoys. The wreck may be that of barge that sank in 1922 (Admiralty Reference No 12886) which was shown on charts prior to 1926 located some 110m from the surveyed anomaly. The site was located by PLA survey and inspected by divers in 2002. Although not subjected to additional magnetometer and sonar survey by Wessex Archaeology in 2001/2, the site was listed in its updated wreck site listing (Leather 2003, table 1). More recent survey (2005) indicated two areas of debris: an area extending 8 x 4 m and 1m above the general bed level and a smaller area of debris 14m south in the original charted position (591581 180310) extending from the shoal to the south-west. PLA Marine Services diver inspection reported that the obstruction is composed of piles of bricks (some of which are neatly stacked), wood and concreted metal indicating that the

obstruction could be the wreck of a wooden dumb barge or sailing barge. Diving on 28/7/05 confirmed this description. Samples of stamped brick were recovered for possible identification. Features observed are consistent with presence of a relatively modern, brick carrying barge as indicated in Admiralty records.

1.5.2 WA5204, 343/93, OSGB 36 593858 180121

The site is located east of Sea Reach No. 3, 20m from the southern edge of the existing, dredged channel. The wreck was apparently first surveyed by the PLA during channel extension survey in 1999. Although not subjected to additional magnetometer and sonar survey by Wessex Archaeology in 2001/2, the site was listed in its updated wreck site listing (Leather 2003, table 1). PLA survey in 2005 revealed a smooth mound measuring some 7m (NS) by 3m (EW) with signs of debris up to 10m to the north. Initial inpection by PLA divers indicated that the obstruction is the remains of a wooden vessel with framing timbers protruding from the sand in a debris field roughly 7m x 3m.

The site was dived twice by the author on 29/7/05. The presence of apparently articulated framing timbers protruding from a marked mound was confirmed. Additionally, a section of keel some 7m in length was found to extend out from this mound, sloping upwards such that, at its exposed uppermost end, it was some 2m clear of the seabed. A small number of pottery sherds from the debris mound were recovered for possible identification. Small pieces of loose timber which had previously been recovered from the site were examined but, although oak, found to be unsuitable for dendrochronological dating.

1.5.3 WA5010 and WA 5012, *Dovenby*, 343/11 and 12, OSGB 36 597736 180646 and 597665 180831

This site is extensively recorded in the records of the PLA. Built in the Sunderland yard of Pickersgill in 1891, this steel barque sank in collision with the Dutch steamer *Sindoro* carrying a cargo of *guano* from Lobos d'Afuera to London in 1914. Records indicate that the wreck was dispersed with explosives soon after wrecking and had also been reduced by cutting with oxy-acetylene in 1967. The site was surveyed in 2001 and 2002 using sidescan and magnetometer survey (Leather

2003), and more recently using multibeam bathymetry. Surveys show clear wreckage in two distinct locations some 100m apart. Both main locations associated with this site were dived. The presence of substantial, upstanding metal frames was confirmed. Seabed inspection was consistent with the remains representing those of the *Dovenby*.

1.6 DISCUSSION

The identification of the *Dovenby* seems secure. Wreck structure has been substantially degraded through intentional clearance and subsequent erosion. The dating of the two other sites examined might best be resolved by examination of ceramics (brick from one, pottery from the other) recovered during diving inspections. The extent of any surviving wooden wreck structure at these latter two sites remains unclear.

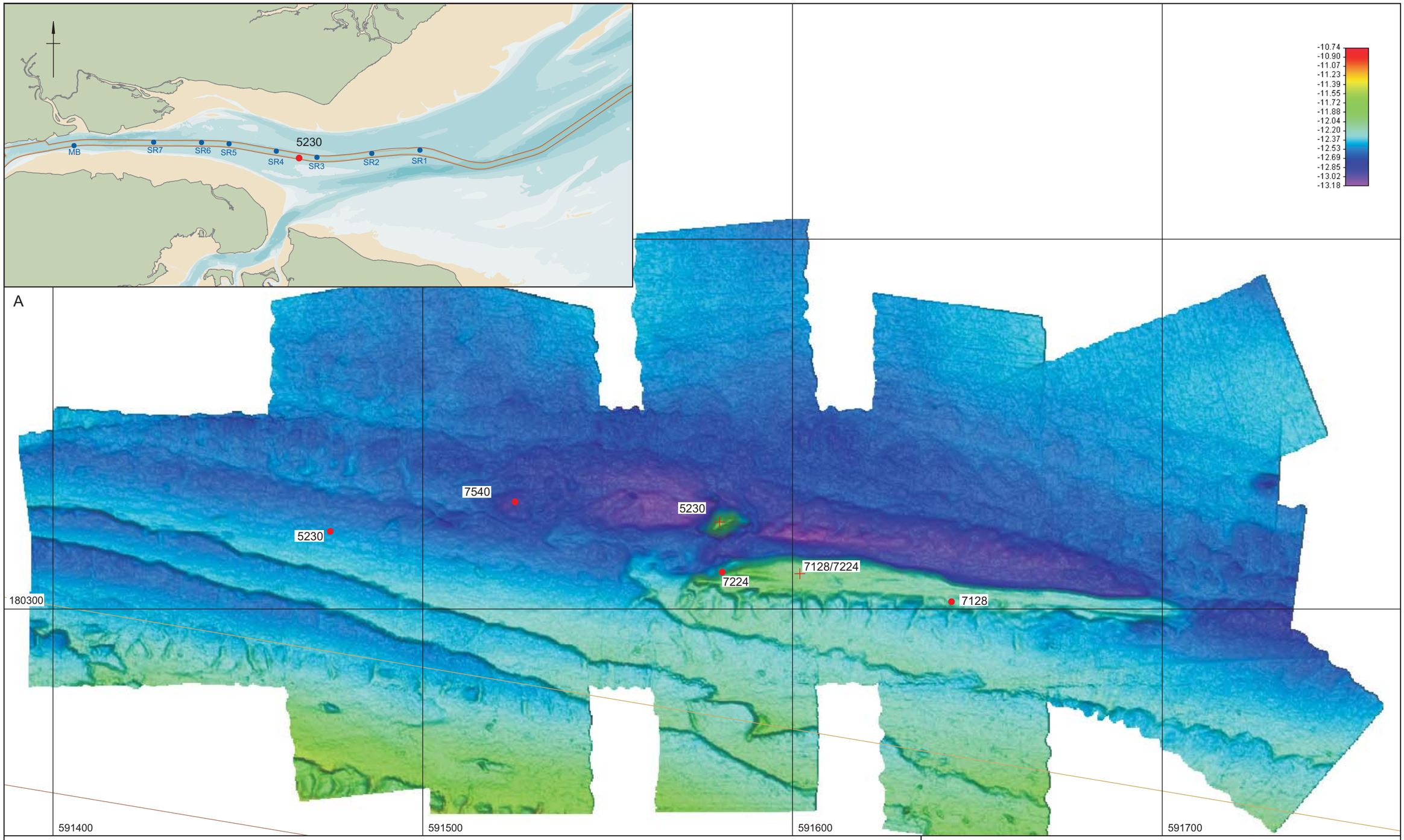
1.7 ACKNOWLEDGEMENTS

Hydrographic data and bathymetric survey results were supplied by John Pinder, PLA. The advice of Peter Steen and the support of the dive team at the Port of London Authority are gratefully acknowledged.

1.8 REFERENCES

Leather, S, 2003 *Updated Wreck Site Identification: Sidescan Sonar and Marine Magnetometer Survey*, Wessex Archaeology, **London Gateway Development Technical Report Appendix Q**

Nayling, N, 2005 *London Gateway Project: Diving Inspection Report 1*, **University of Wales Lampeter London Gateway Archaeology Report 01/2005**



Site location (from EIA)
Revised position (2006)
Channel marker buoy
Dredging limits
50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

Date:	29/03/06	Revision Number:	0
Scale:	1:250,000 1:1000	Illustrator:	KMN
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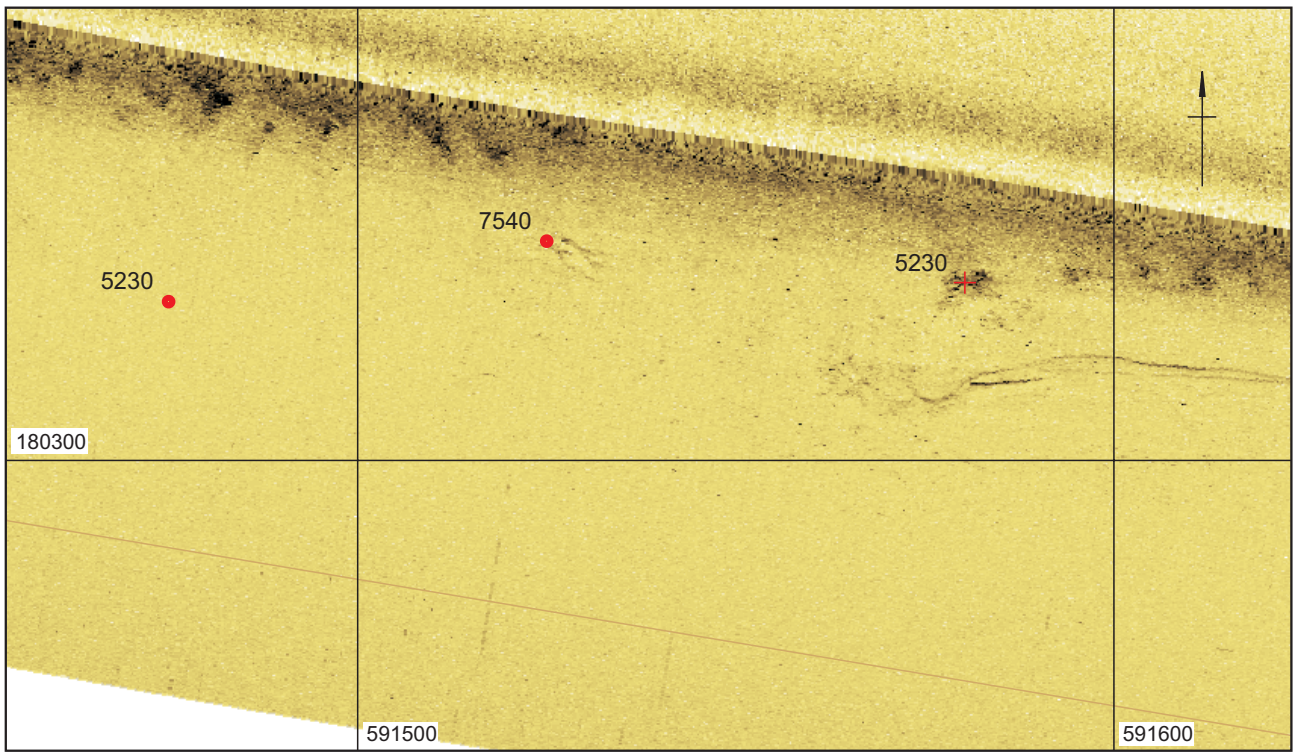
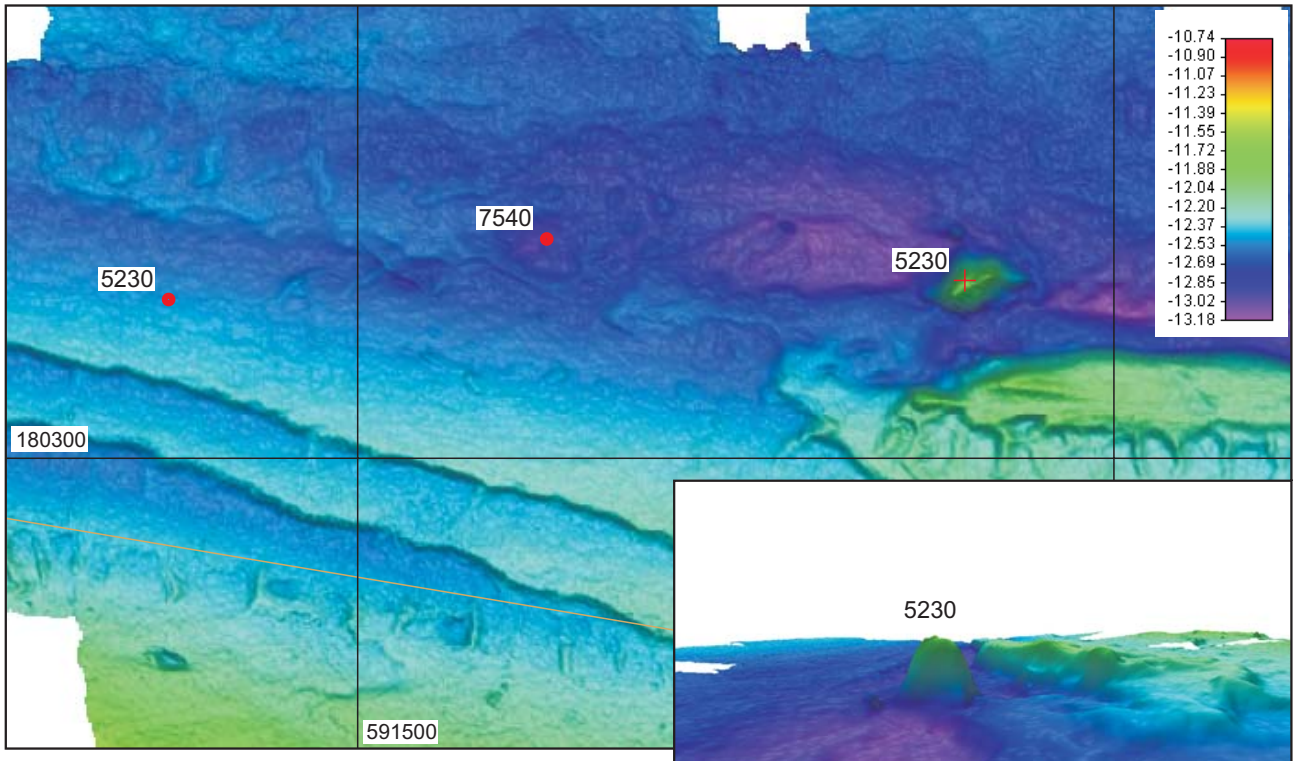
Location and Multibeam data for Sites 5230, 7128, 7224 and 7540.

Figure 1



2002 Sidescan Sonar image of Site 5230.



Multibeam data for Site 5230 plan view.

Oblique view from west.

● Site location (from EIA) + Revised position (2006) Wessex Archaeology	Projection OSGB Seazone Licence Number: 122003.003 Digital data reproduced from Ordnance Survey data © Crown Copyright 2006. All rights reserved. Reference Number: 100020449. This material is for client report only © Wessex Archaeology. No unauthorised reproduction.			
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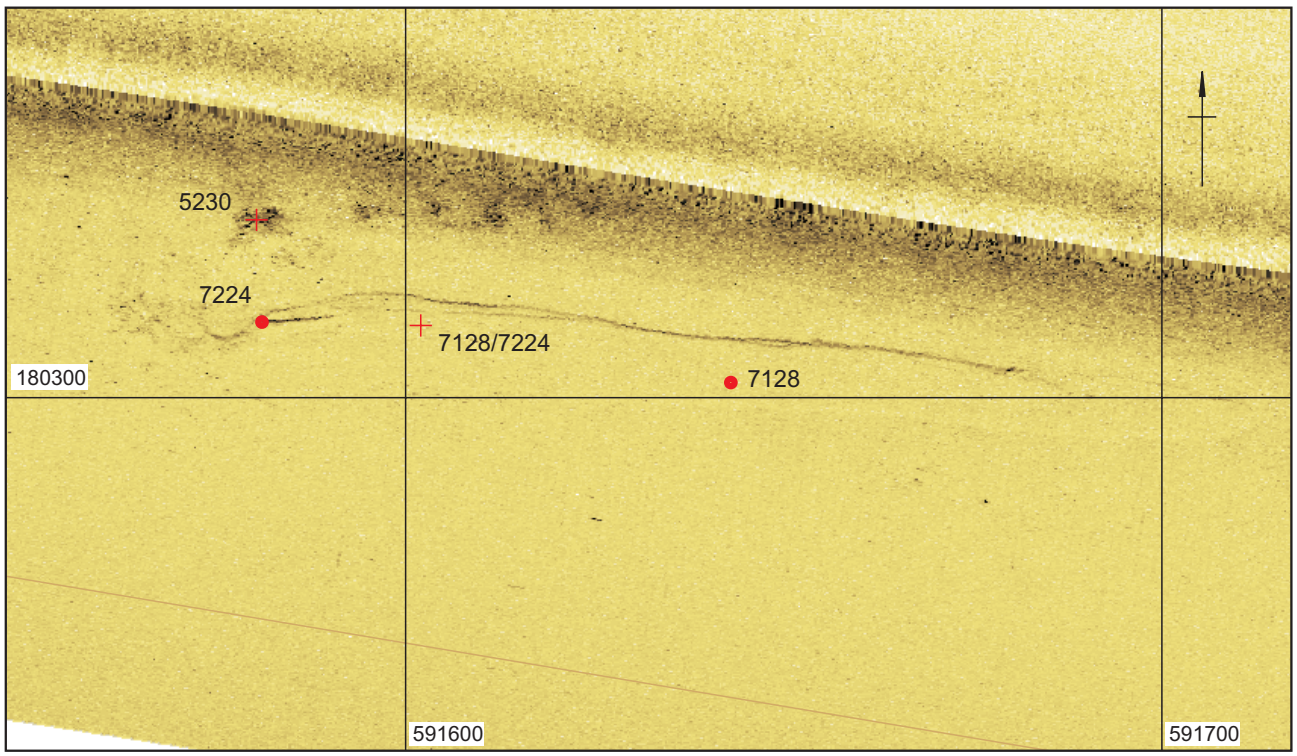
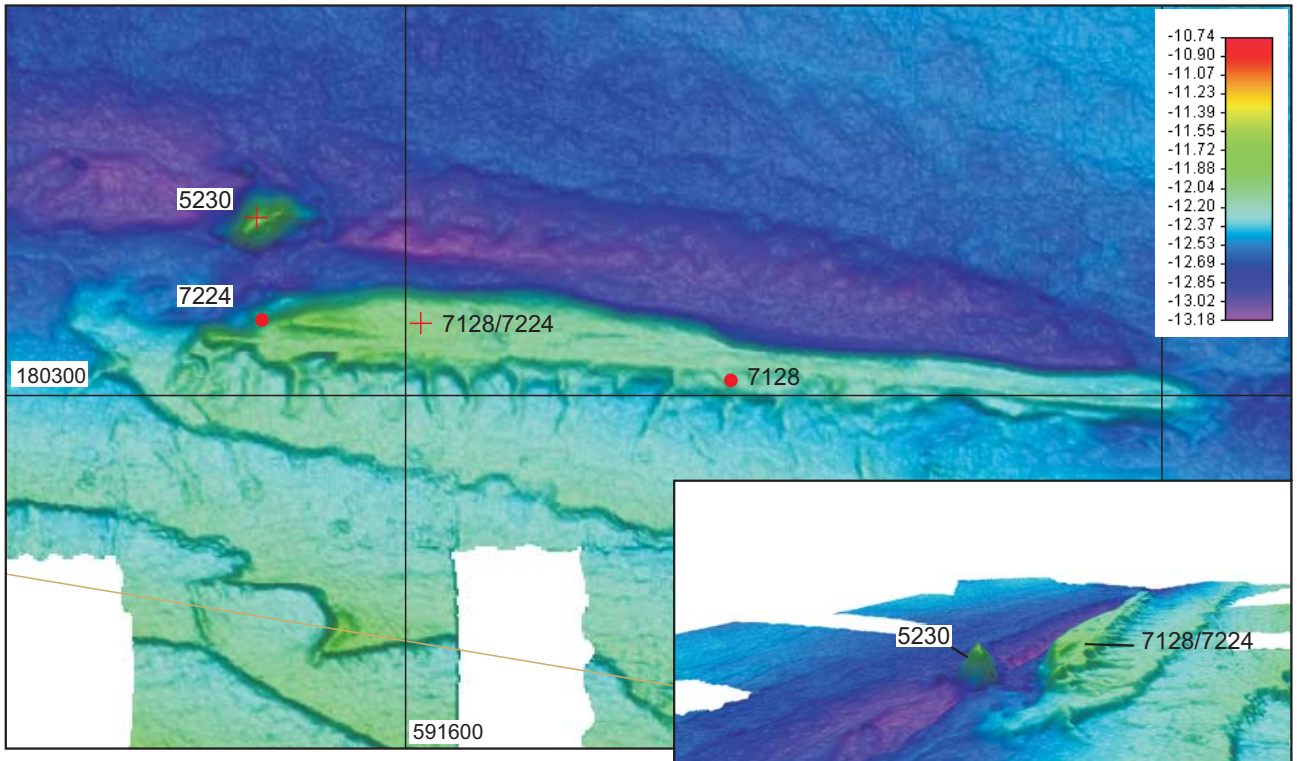
Multibeam and Sidescan Sonar images of Site 5230. Figure 2



2002 Sidescan Sonar image of Sites 7128 and 7224.



Multibeam data for Sites 7128 and 7224 plan view.

Oblique view from west.

Site location (from EIA)
Revised position (2006)

Wessex Archaeology

Projection OSGB

Seazone Licence Number: 122003.003

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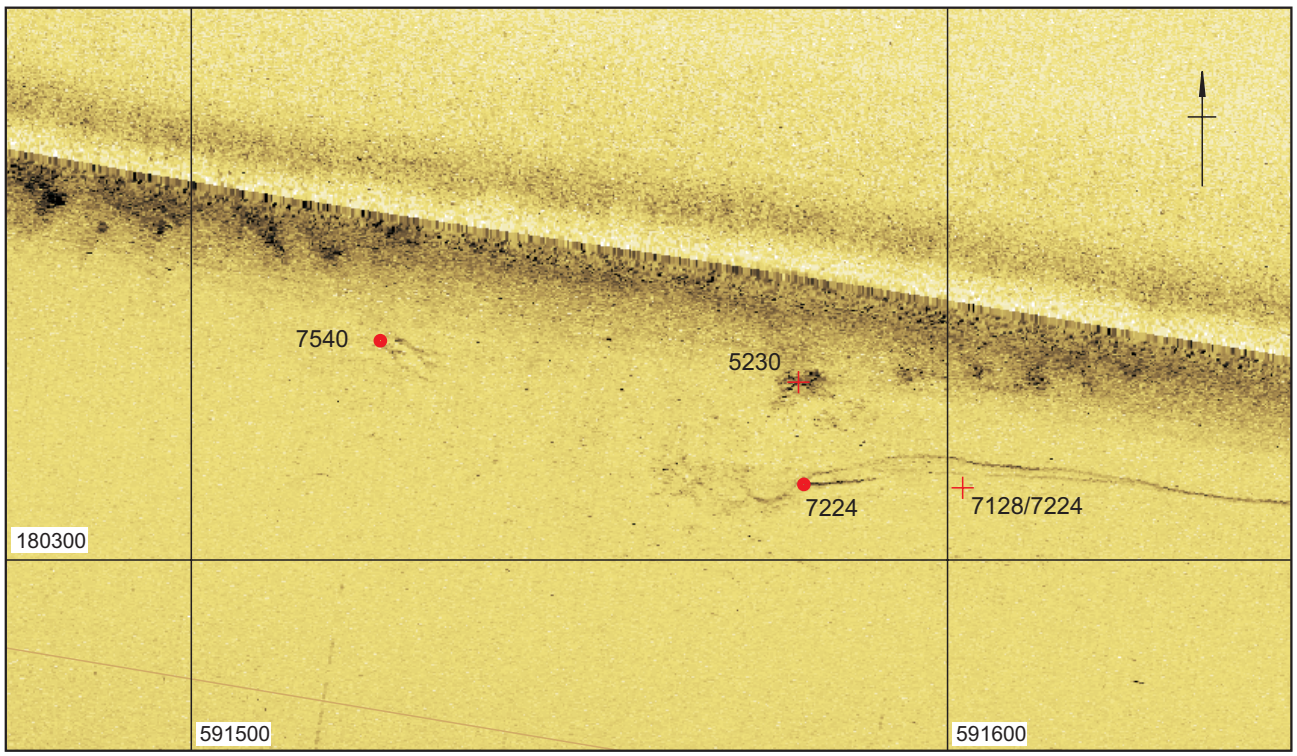
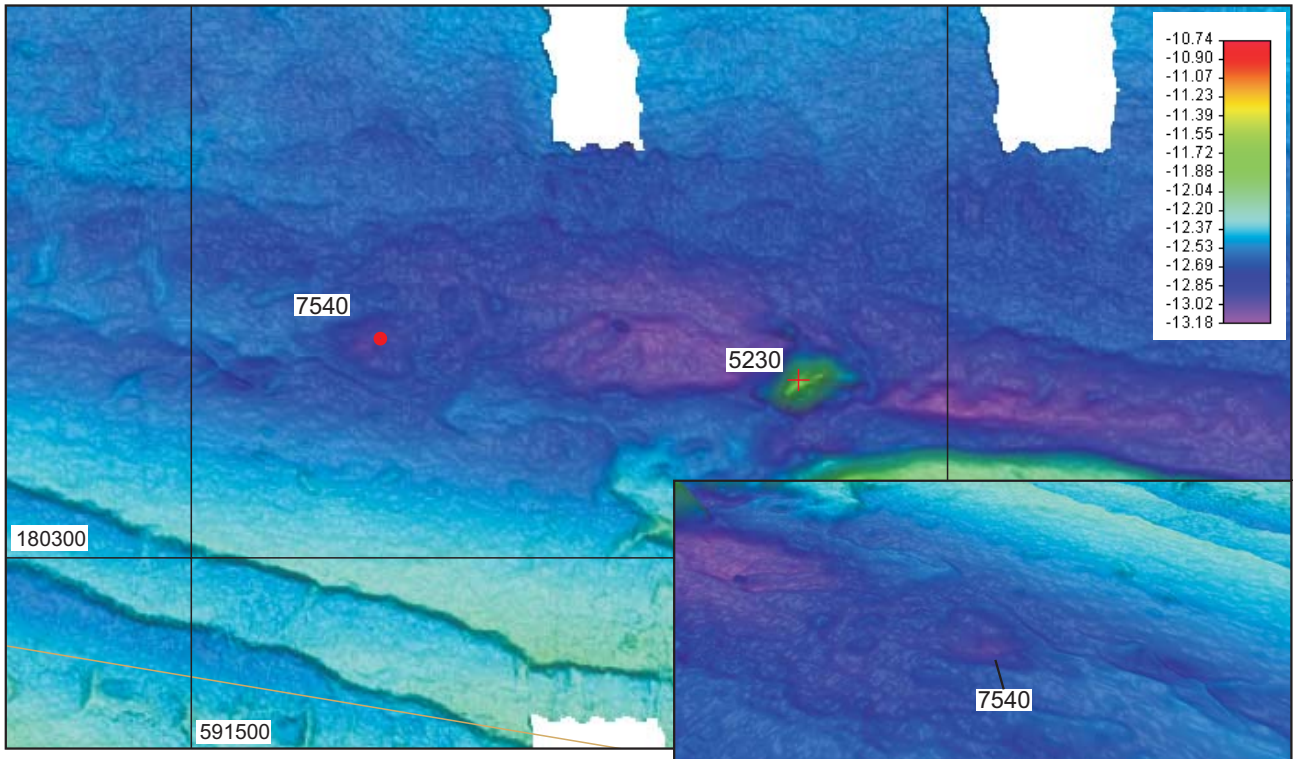
Multibeam and Sidescan Sonar images of Sites 7128 and 7224. Figure 3



2002 Sidescan Sonar image of Site 7540.



Multibeam data for Site 7540 plan view.

Oblique view from north.

● Site location (from EIA) + Revised position (2006)	Projection OSGB Seazone Licence Number: 122003.003 Digital data reproduced from Ordnance Survey data © Crown Copyright 2006. All rights reserved. Reference Number: 100020449. This material is for client report only © Wessex Archaeology. No unauthorised reproduction.		
Wessex Archaeology	Date: 29/03/06	Revision Number:	0
	Scale: 1:1000	Illustrator:	KMN
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Multibeam and Sidescan Sonar images of Site 7540. Figure 4

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Wessex Archaeology

2005 finds.

Figure 5

Wessex Archaeology

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2007 Finds.

Figure 6

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Second draft

WA Ref: 61209.6595.02
December 2007

Site ID: 6595
Site Name: Halcrow A5
PLA Wreck No.: 201/20
Mitigation Group: 2.2.2. Site of probable archaeological interest, seaward of SR1
No. of Casualties: Unknown
Vessel Type: Unknown
Cause of Loss: Unknown

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the site's discovery and includes all forms of investigation to date:

2001	Emu sidescan sonar survey (29/03/2001);
2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2001	Wessex Archaeology, Assessment of Effects on the Archaeological Heritage: Inter-tidal and Marine, in respect of the proposed development of London Gateway;
2002	Wessex Archaeology, side scan data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification*,;
2005	Wessex Archaeology, Geophysical Analysis of 2005 of multibeam and 2001 & 2002 sidescan sonar data, inclusive of: one geo tiff and six tiff images.

3. SITE DESCRIPTION

Position (NGR) obtained from 2001 sidescan survey: 602777 E 180075 N

Location (derived from 2001 sidescan data): The site is located south-east of Sea Reach No.1, 44 metres inside the northern edge of the dredged channel (**Figure 1**).
Dredged Depth: 14 metres – 16.7 metres
Minimum Target Depth: Unknown
Extent: 5 metres x 10 metres
UKHO Status – Site not listed with the UKHO

2001 WA sidescan sonar interpretation:

The site consists of anomaly with shadow. The NGR recorded was 602747 E 180092 N. The anomaly is 5 metres long and 10 metres wide, with a length of shadow of 10 metres. The tiff file created was referenced as '87' (**Figure 2**).

2002 WA sidescan sonar interpretation:

The site was not originally located in the 2002 sidescan interpretation. Further analysis of the data revealed a feature 25 metres north-east from the 2001 position at 602798.89 E 180085.76 N. The feature is 2.6 metres long, 2 metes wide with no discernable height (**Figure 2**).

2005 WA interpretation of PLA multibeam data:

The multibeam bathymetric survey specifically focused on locating site **6595**; however, it was not identified in the survey data (**Figure 1**).

4. SITE HISTORY

The identity of the site is not currently known. The site was discovered in the 2001 sidescan sonar data, and after additional processing in 2006, in the 2002 sidescan sonar data. However nothing anomalous was identified in the 2005 multibeam data.

The UKHO and the PLA have no documented record for this site.

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of 'probable' archaeological interest. The 2001 sidescan sonar survey shows an anomaly that is indicative of anthropogenic material that may have cultural heritage value.

6. CONSTRAINTS

The character and nature of the site is currently unknown, it is therefore not possible to state whether there will be issues with ordnance or human remains.

7. SCOPE OF FURTHER STAGE MITIGATION

As the site was not located during the 2005 geophysical survey no mitigation is required. The site is now considered to have been highlighted by Halcrow as a result of a positioning typo.

8. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

The site was reported (in 2001-2) to be located 44 metres inside the northern edge of the dredged channel. As no features have been located during the geophysical survey in 2005 the site is ready for clearance and dredging activities.

ARCHIVE

RECOVERED MATERIAL

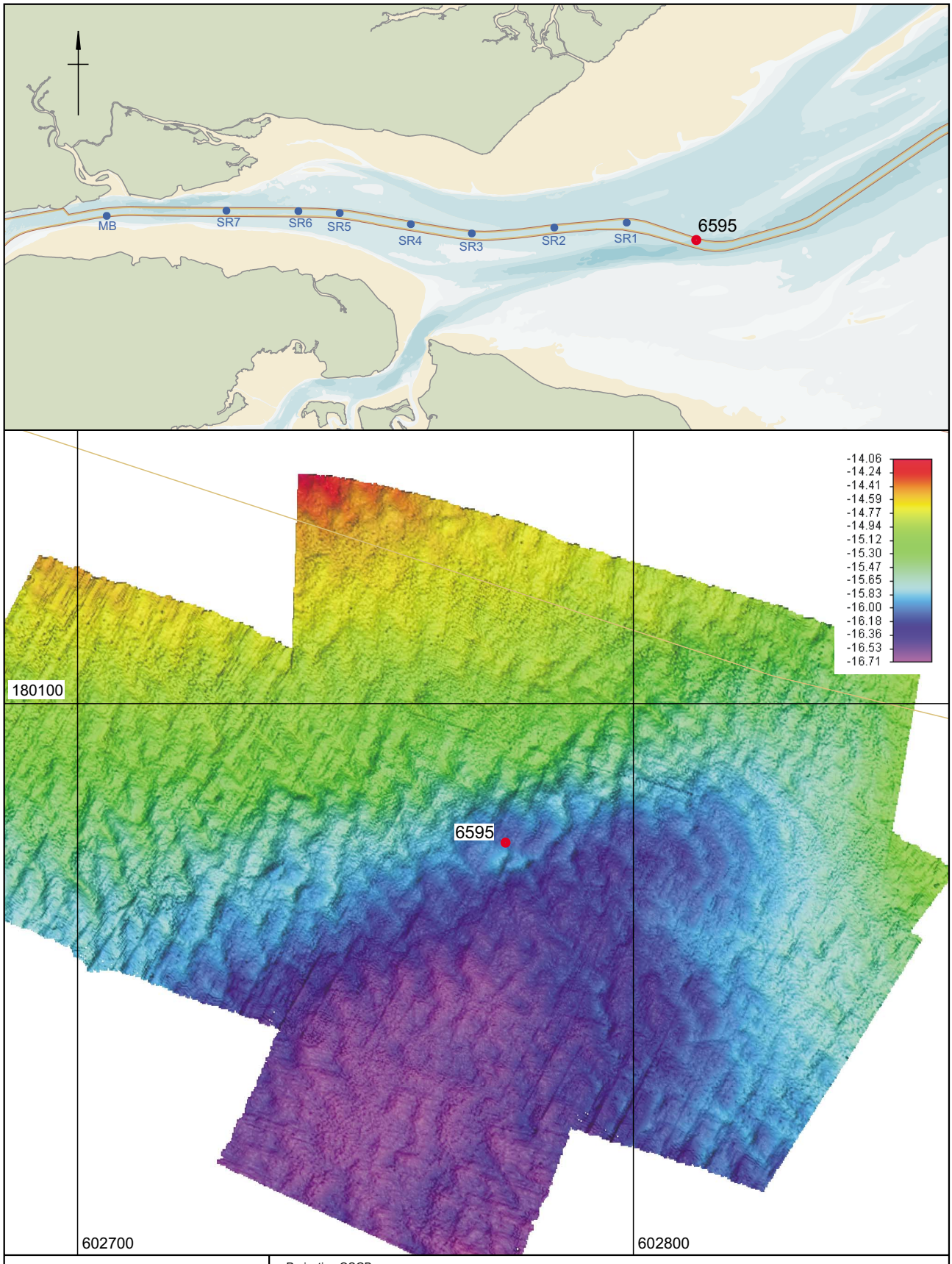
No material has currently been recovered from the site.

DIGITAL ARCHIVE

Material	Location
2001 sidescan	WA
2002 sidescan and magnetometer	WA
2005 multibeam data – site not visible	WA

PAPER ARCHIVE

Material	Location
Wessex Archaeology, 2001 Assessment of Effects Archaeological Heritage: Inter-tidal and Marine in respect of the proposed development of London Gateway	WA
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report	WA
Five printed images of the 2005 multibeam data	WA



Site location
Channel marker buoy
Dredging limits
50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

Seazone Licence Number: 122003.003

Date:	23/02/06	Revision Number:	0
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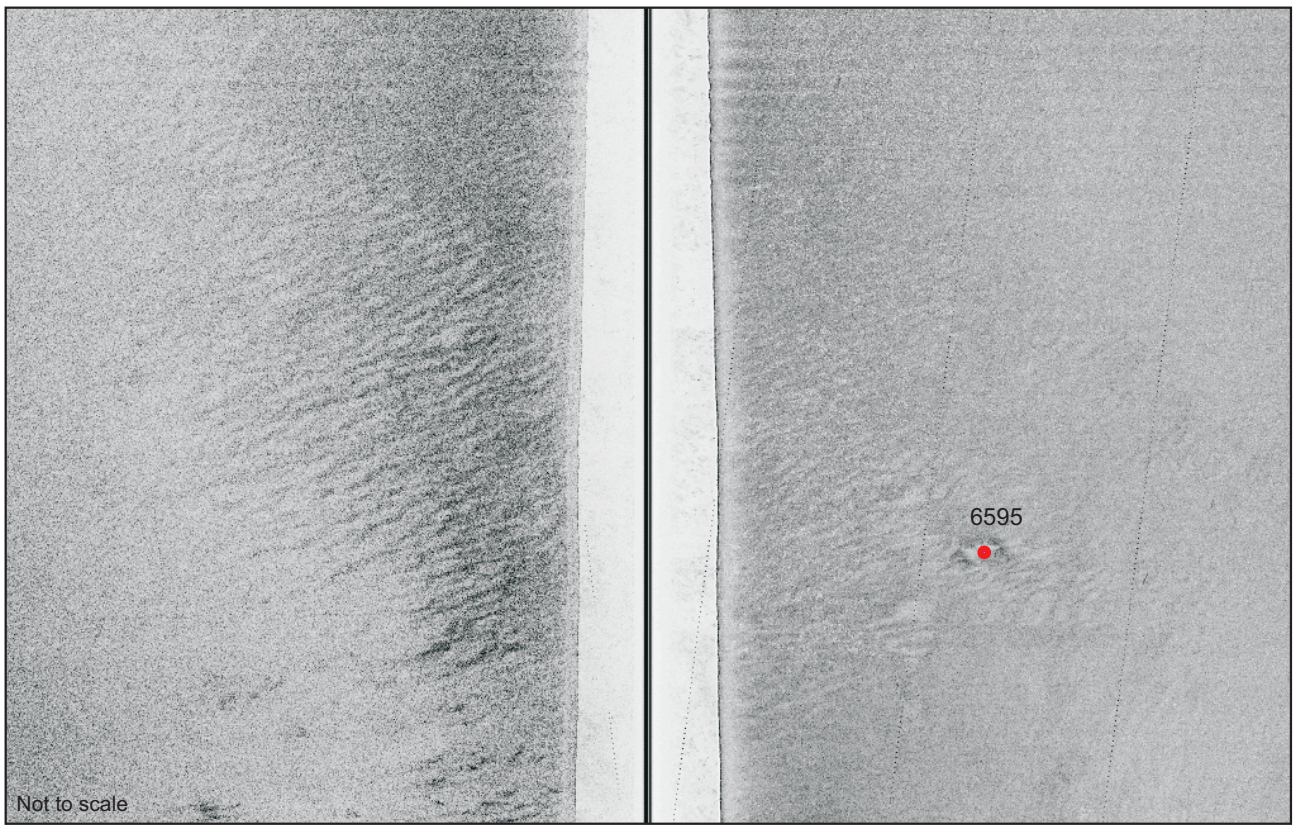
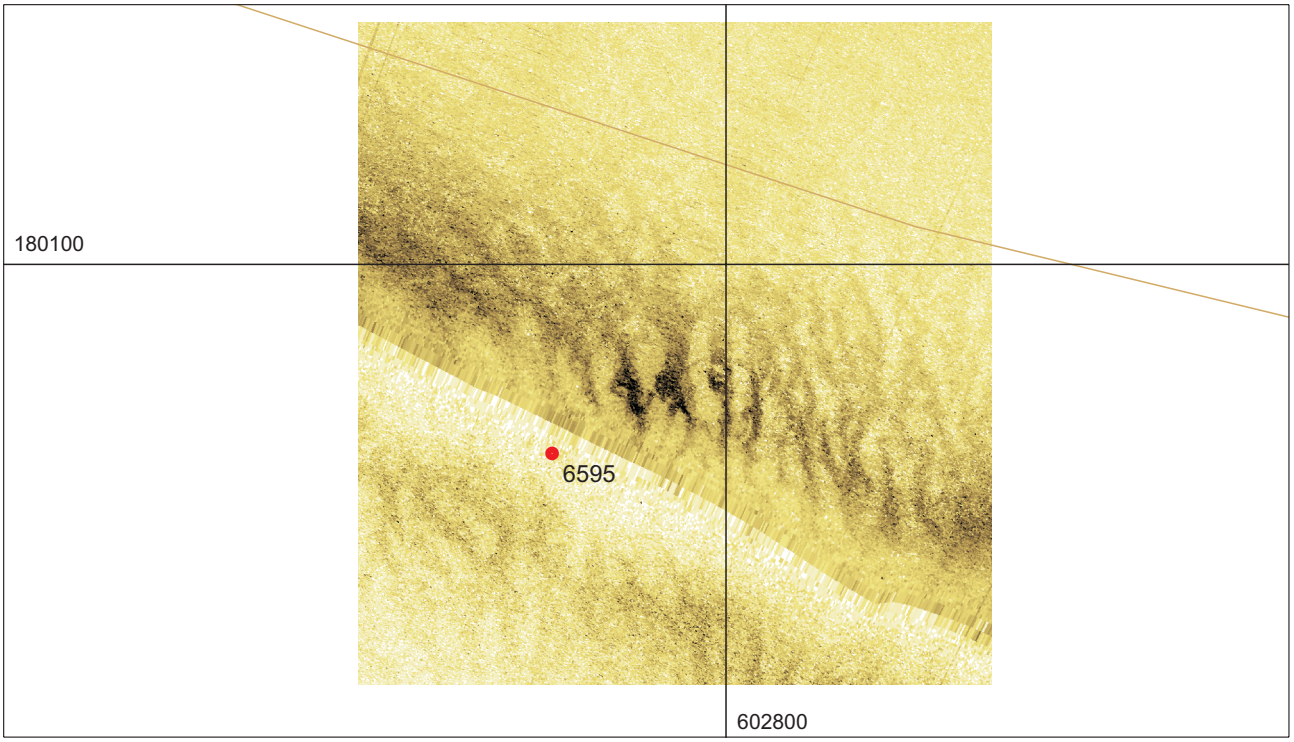
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Location and Multibeam data for Site 6595. Figure 1



Sidescan Sonar 2001 survey data.



Sidescan Sonar 2002 survey data.

Site location

Projection OSGB

Seazone Licence Number: 122003.003

Date:	23/02/06	Revision Number:	0
Scale:	B: 1:1000	Illustrator:	KMN
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Wessex Archaeology

Sidescan Sonar images of Site 6595. Figure 2

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Third Draft

WA Ref: 61209.7345.03
January 2008

Site ID: 7345
Site Name: Unknown
PLA Wreck No.: The PLA has no report for this site
Mitigation Group: 2.1.2. Site of probable archaeological interest, above SR1
No. of Causalities: Unknown
Vessel Type: Small wooden vessel with copper nails(?)
Cause of Loss: Unknown
Current Recording Status: Level 1b

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the sites discovery and includes all forms of investigation to date:

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2006	PLA site investigation using Reson 8125 multibeam echosounder system (09/03/2005);
2006	PLA diving investigation (21/04/2006);
2007	WA diving investigation (19-20+22/11/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2002	Wessex Archaeology, sidescan sonar data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification*, inclusive of: target 256;
2006	Wessex Archaeology, Geophysical Analysis of 2005 multibeam and 2002 sidescan sonar data, inclusive of: one geo tiff and five tiff images;
2006	PLA Diving Report WA7345 342;
2007	Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report.*

3. SITE DESCRIPTION

Position (UTM) obtained from PLA multibeam data 2006: 337162.638 E 5708191.988 N
Location (derived PLA multibeam data 2006): The site is located 700 metres west of Sea Reach Number 6 Buoy, 82 metres inside the northern edge of the dredged channel (**Figure 1**).
Bed Depth: 12.9 metres
Minimum Target Depth: 12.44 metres
Extent: 13 x 12 x 0.6 metres
UKHO Status – Not recorded with the UKHO

2001 WA sidescan sonar interpretation:

Site **7345** was situated within the 2001 sidescan sonar survey area, but it was not identified during the survey.

2002 WA sidescan sonar interpretation:

The site consists of an area of disturbed seabed which is less reflective than the surrounding seabed. This area contains several dark reflectors with no clear shadow. The largest reflector is 13 metres long by 2.5 metres wide. The NGR recorded was 584291 E 181387 N. The tiff file created was referenced as '256' (**Figure 2**).

2006 WA multibeam interpretation:

The site consists of a single feature, which is irregular in shape. The feature is orientated east-west and is 12 metres long, 11 metres wide and 0.6 metres upstanding on the western side, which is the steeper side of the feature. On the eastern side it is only 0.2 metres upstanding (**Figure 1**).

2006 PLA diving survey:

A 10 metres circular search using a stray line centred on the multibeam site location was conducted. 'Initially the diver reported finding a hard flat sandy bottom, but then he encountered "soft" (the diver reported that he could easily probe the waves with his hand) sandwaves to the north of the position. At the base of one of the sandwaves, which were about 600 mm from crest to trough, he found a small piece of wood protruding from the sand. After probing into the sandwave with his hands the diver recovered a section of planking which was brought to the surface for inspection and photographing. The section appears to be part of a small vessel with planking roughly 4 - 4.5 inches wide by 0.75 inches thick. The entire section is approximately 3.5 feet long by 2.0 feet wide […]. The planking and ribs are held together with copper nails. The ribs are roughly 4 inches apart and 1 inch by 1 inch in section' (PLA Diving Report WA7345 342; **Figure 3**).

2007 WA diving survey:

The divers reported the seabed to be flat and to consist of soft fine sand and silt. Poorly sorted subangular medium to coarse gravel or shelly seabed material was noted in places, as well as some flint. Very low and poorly defined sandridges (max. 0.2 metres high) are protruding from the seabed (running approximately north-south). A small exposed area of peat-like organic material was noted in one place.

The sandy/silty seabed was probed in three places. No resistance to penetration to maximum depth of probe was observed. Slightly firmer layers were felt, however the maximum depth of the probe was reached.

A piece of wood was found loose, not buried, on the sandy surface (max. dimensions 230x240x60mm) *c.* 15 metres north of the site and recovered to the surface (**Figure 4A**). The piece is very roughly rectangular, highly eroded and smoothed, and pitted with what appear to be the holes left by wood boring organisms. Its surface is very soft and it is very dark in colour. The type of wood is unclear. No fastenings or tool marks are visible. It is unclear whether it is anthropogenic in nature. The surrounding area was searched, no further artefacts or features were located.

A number of part-buried plastic bags were found, together with a modern period bottle and an isolated red brick which was clearly modern and unabraided.

Some slag was encountered in what appeared to be a 'gravelly' patch on the seabed. Three slag samples were recovered (**Figure 4B**).

Two isolated pieces of coal (**Figure 4C**) and a small concretion that seems to be a concreted bolt (**Figure 4D**) were also found and recovered to the surface. The bolt is only partly exposed in the concretion and not readily dateable, although the amount of concretion suggests it has been submerged for some time.

During the dives, a thorough search has been completed to the west and the north of the geophysical anomaly, however, the eastern and the southern part of the site have not been investigated yet, including the eastern part of the anomaly itself.

4. SITE HISTORY

The site was identified in 2002 sidescan sonar data, and surveyed in 2006 with multibeam bathymetry. The multibeam echosounder survey confirmed the presence and position of the site. A subsequent diving survey confirmed the presence of at least a part of a small wooden vessel with copper nails, which has been recovered. More isolated features (wood, concreted bolt, coal, slag) were found during the 2007 diving survey. Since its discovery WA has received no further reports of salvage or clearance works carried out on the site.

The UKHO and the PLA have no documented record for this site.

5. ARCHAEOLOGICAL INTEREST

This site was rated as of 'probable' archaeological interest but has since been down graded to 'uncertain' archaeological interest based on the results of the 2007 diving survey. The multibeam data indicated the presence of an upstanding (by 0.6 metres) irregular shaped feature. The 2006 diving inspection confirmed that at least part of it was the remains of a small wooden vessel with copper nails. The recovered part could be either hull or deck planking. The available information (such as the use of copper nails and the carvel construction) indicates a post-medieval date for the vessel; however, the possibility that it may be earlier or later cannot be ruled out. No feature of 0.6 metres height was encountered during the 2007 dives. However, the area has not been searched completely and more bottom time would be required in order to comprehensively cover the site. Whereas a thorough search

has been completed to the west (*c.* 10 metres, the concreted bolt was found just to the west of the site) and the north (*c.* 15 metres, where the wood was found), the eastern and the southern part of the site have not been investigated yet, including the eastern part of the geophysical anomaly itself.

6. CONSTRAINTS

The identity or indeed presence of a vessel is not known, it is therefore not possible to state whether there will be issues with ordnance or human remains.

7. OUTLINE OF STAGE II MITIGATION

Stage 1 Mitigation was intended to achieve a Level 2 record of the site, which is a record that provides sufficient data to establish the extent, character, date and importance of the site. At this stage, the results of the 2006 and 2007 diving surveys are inconclusive, because the area of the site has not been fully covered. The current recording status of the site corresponds to Level 1b, as presence, position and the site type are known.

The site lies 86 metres inside the dredged channel. The site will subject to aspects of the dredging protocol that relate to operations within areas of sites of 'uncertain' archaeological interest. No further mitigation will be implemented.

8. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

It is anticipated that this location will be dredged.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

The entire vessel section found during the 2006 diving survey has been recovered and is now stored underwater in the dive base at Denton Wharf.

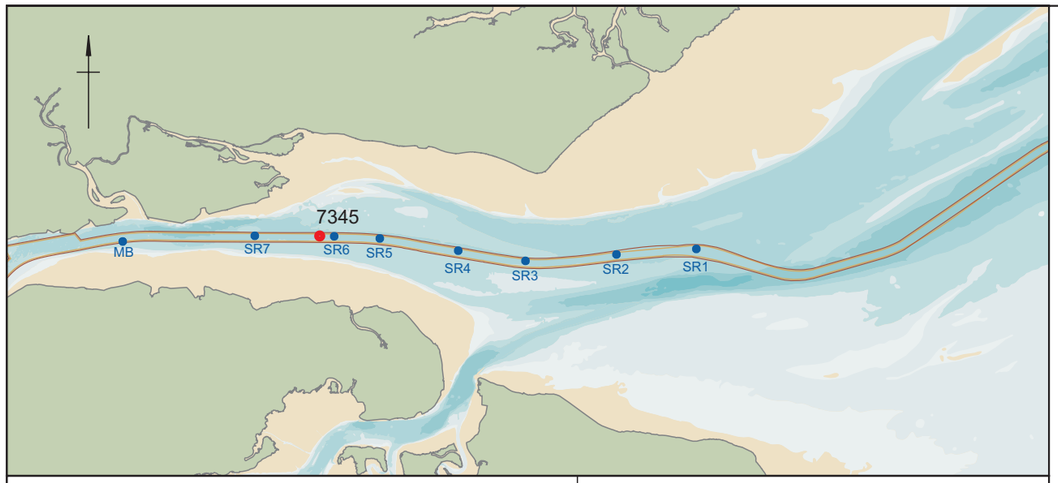
Three slag samples, two pieces of coal, a piece of wood and a concreted bolt were recovered during the 2007 diving survey and are currently stored at WA in Salisbury.

DIGITAL ARCHIVE

Material	Location
2002 sidescan sonar and magnetometer data	WA
2006 multibeam data	WA
2007 dive recordings	WA

PAPER ARCHIVE

Material	Location
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report	WA
Five printed images of the 2006 multibeam data	WA
PLA, 2006, Diving Report WA7345 342	WA
Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report*	WA



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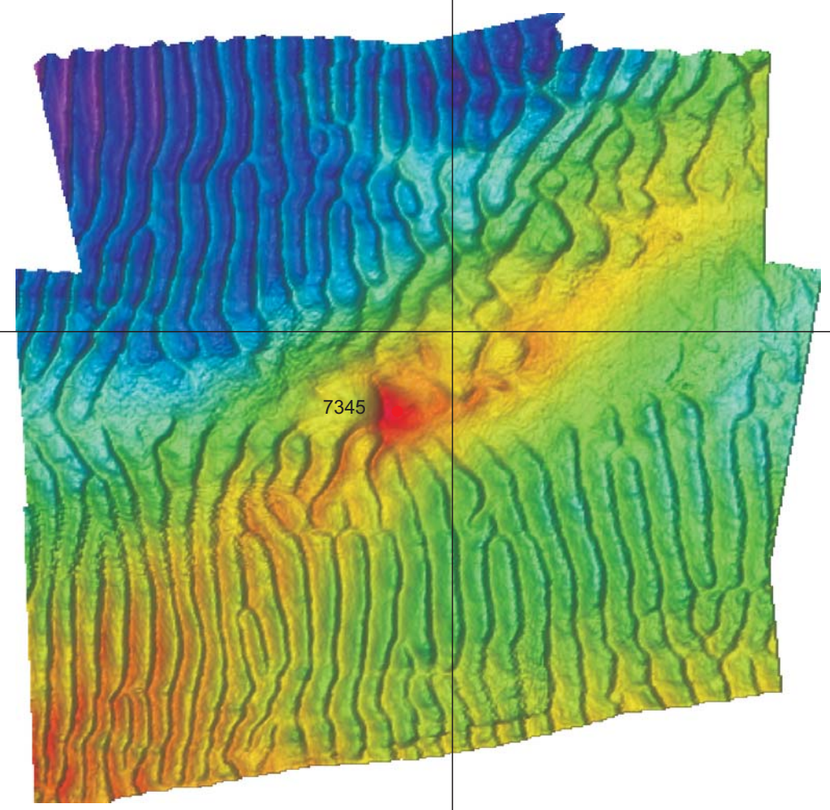

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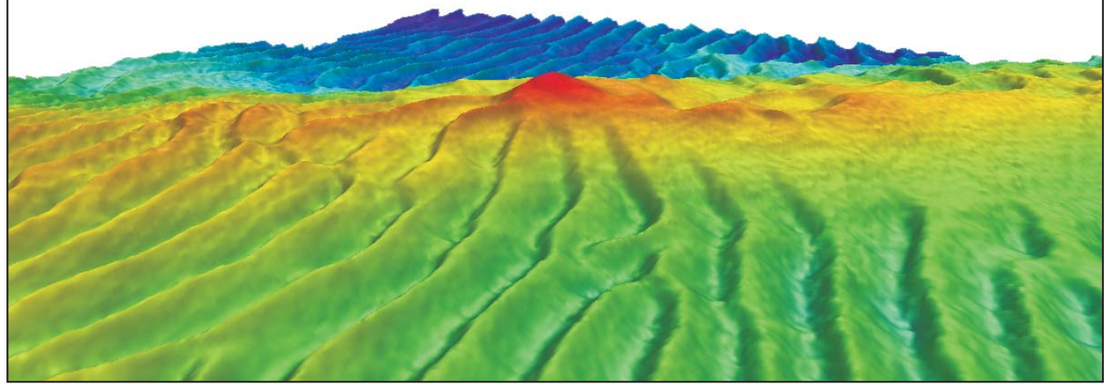
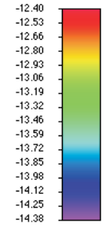


Oblique view from south east.



Not to scale

- Site location
- Channel marker buoy
- Dredging limits
- 50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

Date:	31/03/06	Revision Number:	0
Scale:	1:250,000 1:1000	Illustrator:	KMN
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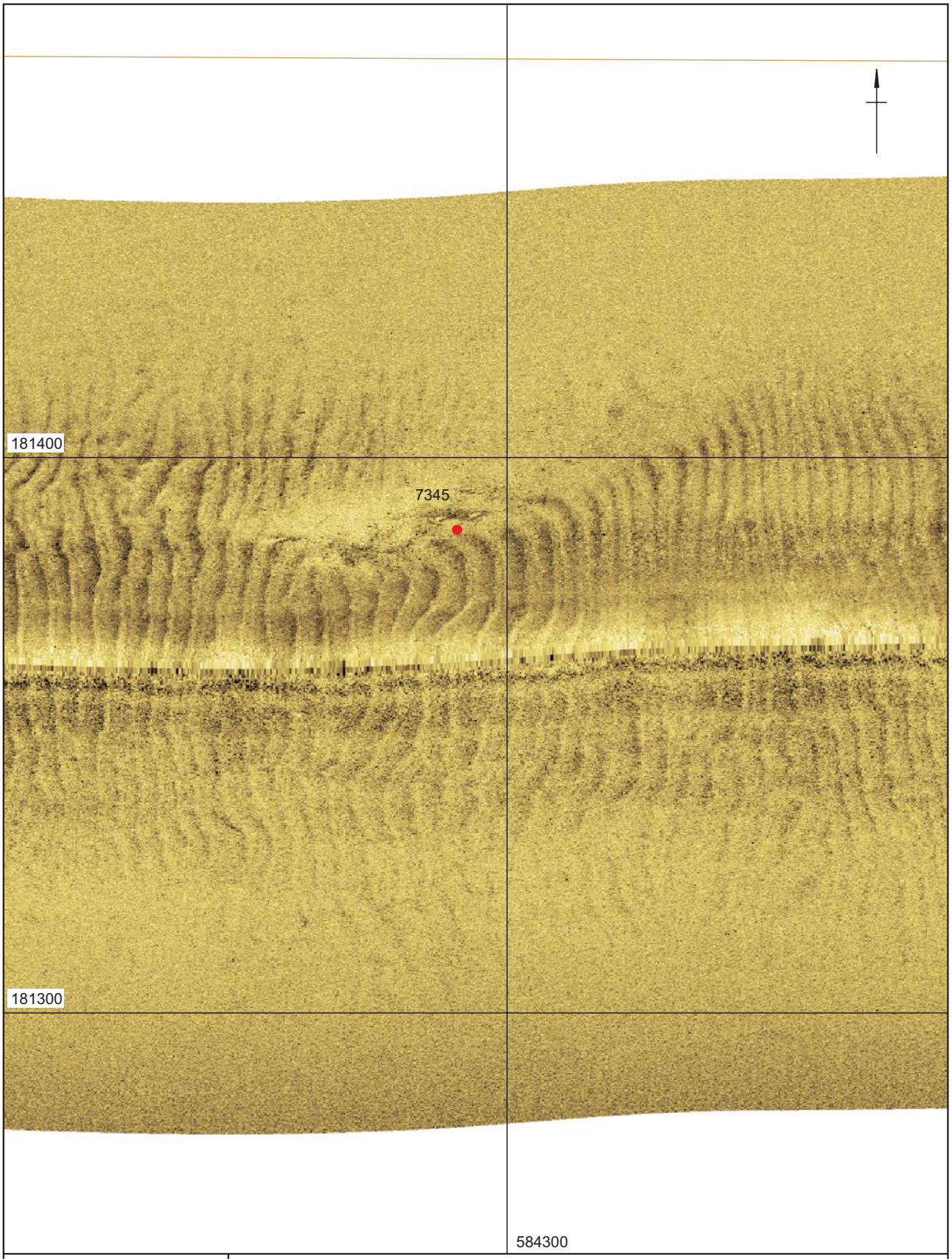
Location and Multibeam data for Site 7345.

Figure 1



Site location

Projection OSGB

Seazone Licence Number: 122003.003

Date:	31/03/06	Revision Number:	0
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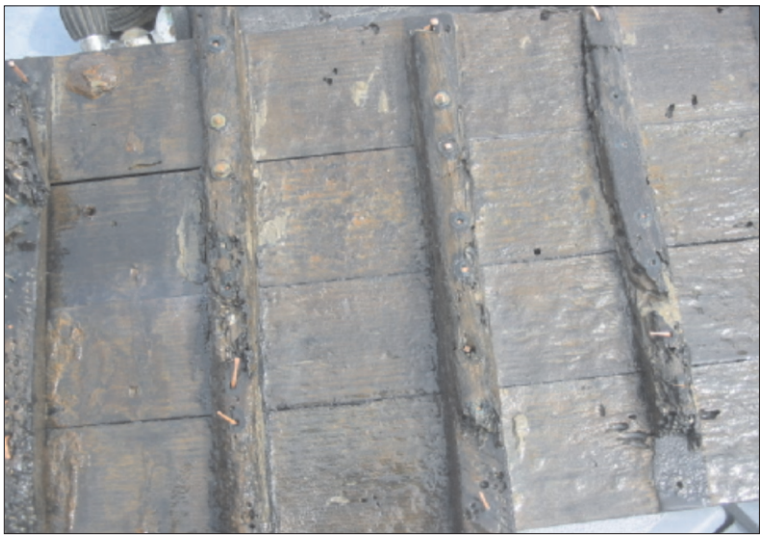
Wessex Archaeology

2002 Sidescan Sonar image of Site 7345. Figure 2



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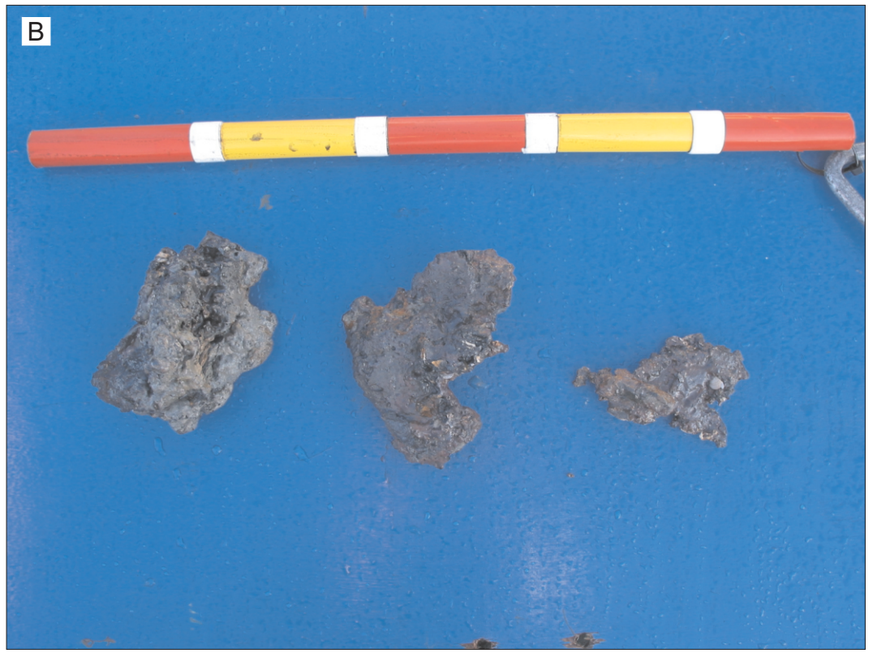
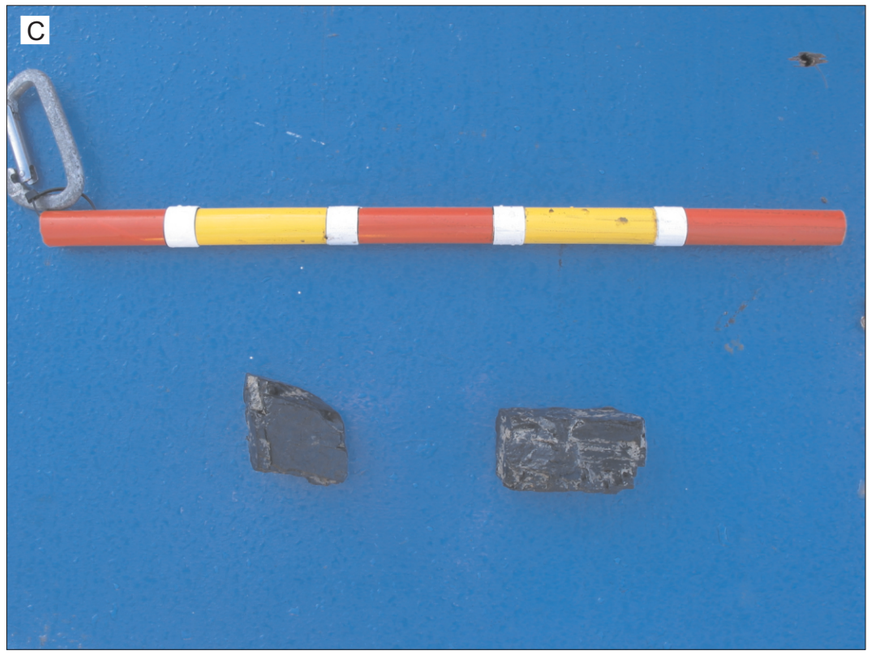
Wessex Archaeology

Section of planking with copper nails recovered in 2006.

Figure 3





Wessex Archaeology

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Scale:	N/A	Illustrator:	KJB
Path:	W:\Projects\London Gateway\London_Gateway_2007\Drawing Office\Report Figures\CMS_2007		

2007 Finds.

Figure 4

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Third Draft

WA Ref: 61209.7404.03
January 2008

Site ID: 7404
Site Name: Probably natural in origin (previously: Unknown (60 metres feature))
PLA Wreck No.: The PLA has no report for this site
Mitigation Group: 2.1.2. Site of probable archaeological interest, above SR1
No. of Casualties: n/a
Cause of Loss: n/a
Vessel Type: n/a
Current Recording Status: Level 1b

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the sites discovery and includes all forms of investigation to date:

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2006	PLA site investigation using Reson 8125 multibeam system (09/03/2006);
2006	PLA diving investigation (22/04/2006);
2007	WA diving investigation (19/11/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2002	Wessex Archaeology, sidescan data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification;*
2006	Wessex Archaeology, Geophysical Analysis of 2006 multibeam and 2002 sidescan data inclusive of: one geo tiff and four tiff images;
2006	PLA Diving Report WA7404 342;
2007	Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report.*

3. SITE DESCRIPTION

Position (UTM) obtained from PLA multibeam data 2006: 336497.331 E 5708300.029 N
Location (derived from PLA multibeam data 2006): The site is located between Sea Reach Buoys No 6 and 7, on the northern channel edge extending directly into the channel (**Figure 1**).
Bed Depth: 12.2 metres
Minimum Target Depth: 10.52 metres

Extent: 55 x 13 x 1.8 metres
UKHO Status – Not recorded with the UKHO

2001 WA sidescan sonar interpretation:

Site **7404** was situated within the 2001 sidescan sonar survey area, but it was not identified during the survey.

2002 WA sidescan sonar interpretation:

The site consists of a large rectangular feature with associated artefacts. The NGR recorded was 583617 E 181470 N. The anomaly is 20 metres long and 60 metres wide, no length of shadow was recorded. The tiff file created was referenced as '331' (**Figure 2**).

2006 WA multibeam interpretation:

The survey area consists of prominent sandwaves orientated in a north-south direction. To the east of the 2002 position (by 4 metres) is a very large sandwave. It is 55 metres long, 13 metres wide and 1.8 metres upstanding (**Figure 1**).

The survey area contains many sandwaves which are smaller in size, but there is another sandwave with similar dimensions suggesting the sandwave feature is natural, although it is large enough to cover the extents of a large vessel (**Figure 1**).

2006 PLA diving survey:

A 10 metres circular search using a stray line centred on the multibeam site location was conducted. 'The diver reported finding an undulating sandy bottom with sandwaves up to 1.7 metres from trough to crest. The sandwaves were soft and the diver could easily probe the surface. Several sandwaves were probed but no evidence of any structure was found. Four small items were recovered to the surface all of which were found lying on the seabed. The diver completed a further circular search to the east of the first area and reported finding similar bed conditions and no sign of any artefacts. […] The items recovered are two pieces of wood, one piece of bone and a lump of coal. The wood has a soft spongy texture' (PLA Diving Report WA7404 342; **Figure 3**).

2007 WA diving survey:

The diver made bottom *c.* 8 metres east of the middle of the site and began east-west corridor searches to the north, followed by east-west searches to the south. The diver covered a length of *c.* 47 metres north to south, and a width of *c.* 40-50 metres east to west.

The diver identified a system of sandwaves running north-south across the seabed, as depicted in the multibeam. The seabed was made up of coarse to medium grained sand which was compact in the troughs between sandwaves but quite loose when it made up the sandwaves themselves. Upon encountering a sandwave, the diver probed it with a 1 metre long probe. The sandwaves were probed near the base and at the point which the diver assumed to be the crest of the sandwave. The probe did not meet with any resistance which would have indicated the presence of a solid surface.

The approximate average height of the sandwaves was 0.5 metres. The diver did not encounter any sandwave upstanding to the level which 7404 was depicted on the 2006 multibeam. Based on the tracking and the vessel position relative to the georeferenced

multibeam image, it can be said with confidence that the diver's extensive east-west corridor searches would have covered the location where 7404 is depicted. No small finds were encountered.

4. SITE HISTORY

The identity of the site is not currently known. The site was discovered in 2002 during the sidescan sonar survey, it has since been resurveyed in 2006 during a multibeam bathymetry survey. A subsequent diving survey confirmed the presence of big sandwaves on the seabed, along with wooden artefacts, coal and animal bone. No evidence was found for the presence of archaeological features in the area during the 2007 diving survey. Since its discovery WA has received no reports of salvage or clearance works carried out on the site.

The UKHO and the PLA have no documented record for this site.

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of 'probable' archaeological interest. The multibeam data indicated an area of prominent sandwaves, which although natural were thought to possibly cover features of archaeological interest.

This assumption was further reinforced by a diver survey in 2006, which resulted in the recovery of two wooden artefacts, a lump of coal and an animal bone (*Calcaneus*, most likely from *Bos* or *Cervus*; pers. comm. J. Grimm, WA) which were lying on the seabed in the area of the sandwaves. The form and nature of the artefacts indicated that they may have derived from a vessel (possibly a vessel's rigging), which may be buried beneath the sandwaves.

In 2007 it appeared that the configuration of the system of sandwaves had changed since the 2006 multibeam survey and that the prominent sandwave depicted in the location of site 7404 in the 2006 multibeam data had changed. No evidence was found for the presence of archaeological features in the area, neither covered by a sandwave nor exposed on the seabed. However, the possibility remains that a vessel is buried underneath the seabed as possibly indicated by the sidescan sonar data and the presence of the finds recovered in 2006.

6. CONSTRAINTS

The identity of the site is not currently known, it is therefore not possible to state whether there will be issues with ordnance or human remains.

7. OUTLINE OF STAGE II MITIGATION

The site lies on the dredged channel edge, extending directly into the channel. The site will be cleared. Stage I Mitigation showed the site is very likely to be natural in origin. No further mitigation is required.

8. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

It is anticipated that the site will be cleared.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

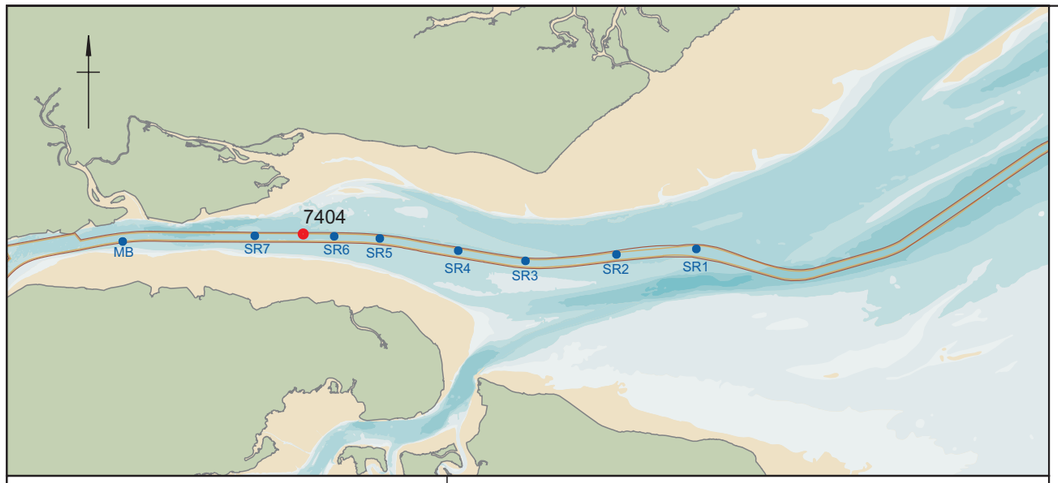
Two wooden artefacts, a lump of coal and an animal bone have been recovered from the site. They are now stored underwater at the dive base at Denton Wharf.

DIGITAL ARCHIVE

Material	Location
2002 sidescan sonar data	WA
2006 multibeam data	WA
2007 dive recordings	WA

PAPER ARCHIVE

Material	Location
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report	WA
Five printed images of the 2006 multibeam data	WA
PLA, 2006, Diving Report WA7404 342	WA
Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report*	WA



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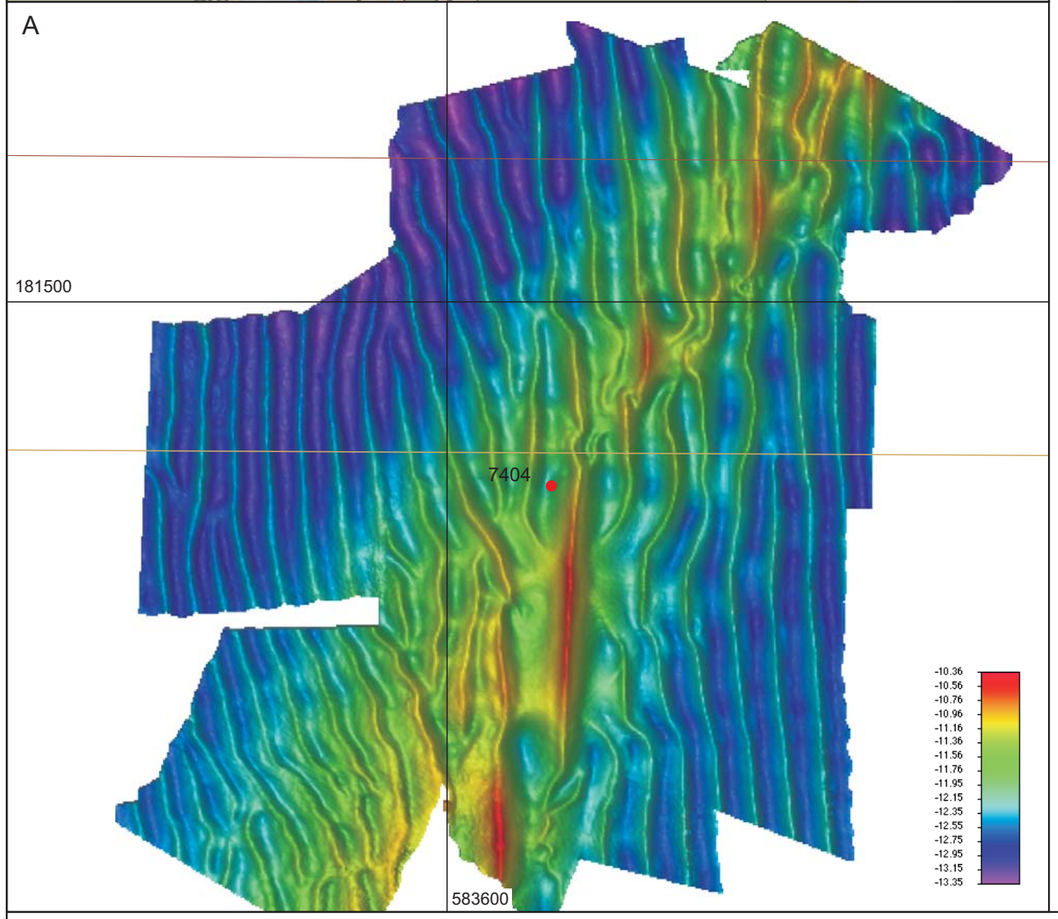

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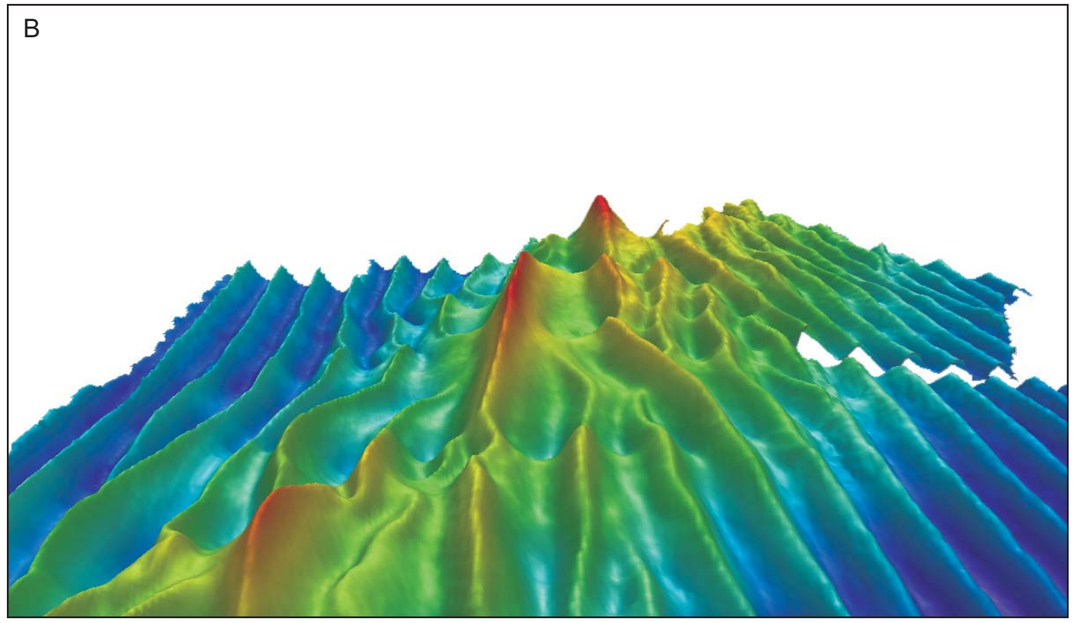


Oblique view from south.

Not to scale

- Site location
- Channel marker buoy
- Dredging limits
- 50m buffer on dredging limits

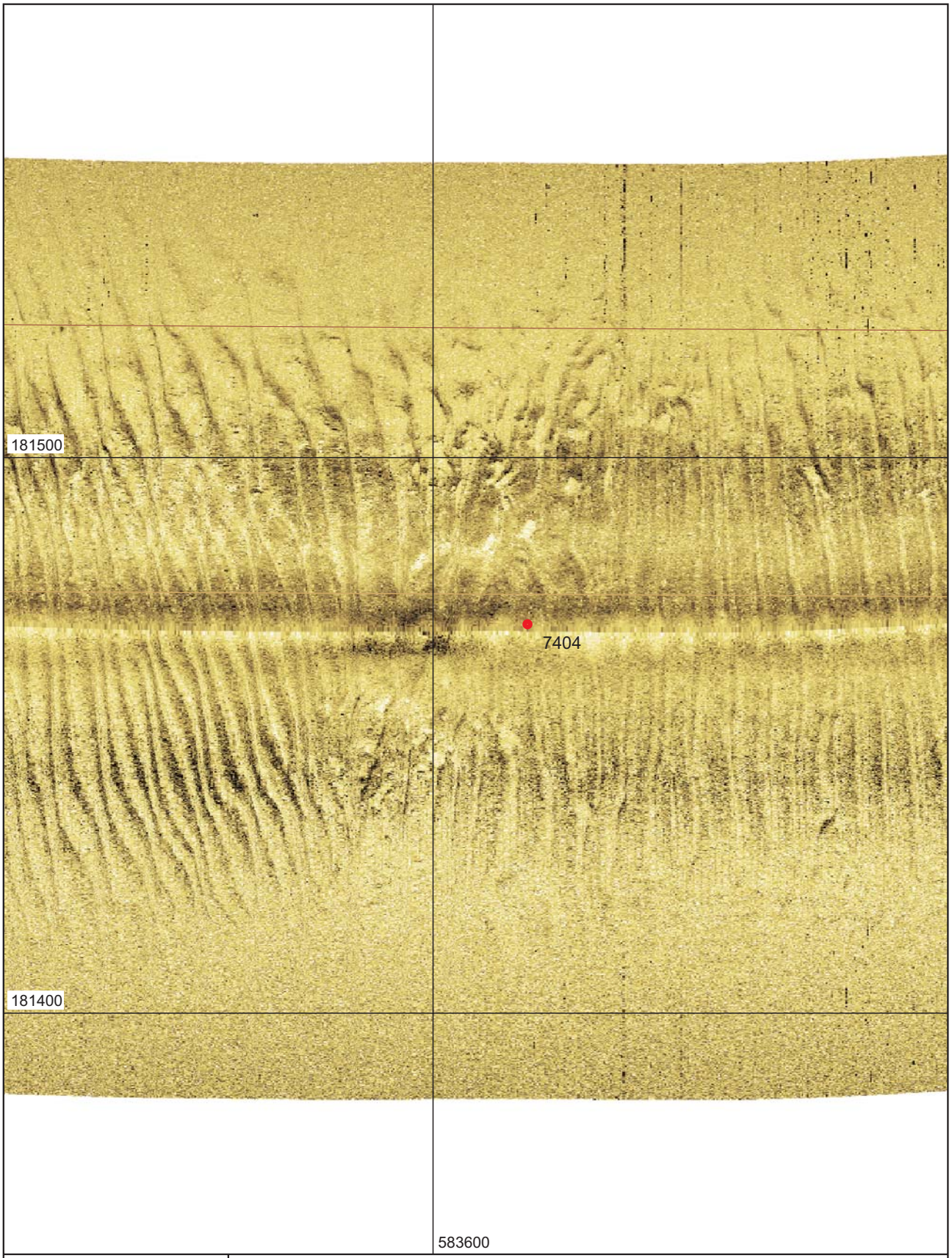
Wessex Archaeology

Projection OSGB

Date:	05/04/06	Revision Number:	0
Scale:	1:250,000 1:1000	Illustrator:	KMN
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Location and Multibeam data for Site 7404.

Figure 1



● Site location

Projection OSGB

Seazone Licence Number: 122003.003

Date:	05/04/06	Revision Number:	0
Scale:	1:1000	Illustrator:	KMN
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Wessex Archaeology

2002 Sidescan Sonar image of Site 7404. Figure 2

Date:	31/10/07	Revision Number:	0
Scale:	N/A	Illustrator:	KJB
Path:	W:\Projects\London Gateway\London_Gateway_2007\Drawing Office\Report Figures\CMS_2007		

Wessex Archaeology

Finds recovered from Site 7404: wood, bone and coal.

Figure 3

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Second Draft

WA Ref: 61209.7543.02
December 2007

Site ID: 7543
Site Name: German Aircraft
PLA Wreck No.: The PLA has no reports for this site
Mitigation Group: 2.1.2. Site of probable archaeological interest, above SR1
No. of Casualties: Unknown
Cause of Loss: Unknown
Vessel Type: World War II bomber
Current Recording Status: Level 2a

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the sites discovery and includes all forms of investigation to date:

2001	Emu geophysical sidescan survey (29/03/2001);
2002	Emu sidescan and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2006	PLA site investigation using Reson 8125 multibeam system (09/03/2006);
2006	PLA diving investigation (26/04/2006 and 05/05/2006);
2006	WA and PWA diving investigation (18/08/2006).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2001	Wessex Archaeology, Assessment of Effects on the Archaeological Heritage: Inter-tidal and Marine, in respect of the proposed development of London Gateway. This report includes target 90;
2002	Wessex Archaeology, side scan data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification*, inclusive of: target 90 and target 513 tiff images;
2006	Wessex Archaeology, Geophysical Analysis of 2006 of multibeam and 2001& 2002 sidescan sonar data, inclusive of: one geo tiff and five tiff images;
2006	PLA Diving Report WA7543 342;
2006	Wessex Archaeology, London Gateway Project River Thames, Archaeological Diving Investigation, Technical Report.

3. SITE DESCRIPTION

Position (NGR) (obtained from PLA multibeam data 2006): 592868.88 E 180150.22 N
Location (derived from PLA multibeam data 2006): The site is located 200 metres south-east of Sea Reach Number 3 Buoy, 37 metres inside the southern edge of the dredged channel (**Figure 1**).
Bed Depth: 12.15 metres
Minimum Target Depth: 11.85 metres
Extent: 13 x 6 x 0.65 metres
UKHO Status – The site is not recorded with the UKHO

2001 WA sidescan sonar interpretation:

The site consists of a group of linear reflectors. The NGR location recorded was 592869 E 180146 N. The tiff file created was labelled as '29-31'.

2002 WA sidescan sonar interpretation:

The site consists of two clusters of anomalies. The smaller area to the south is 5 metres long by 2 metres wide. The northern area is larger and 14 metres long by 6 metres wide. There are shadows on the anomalies indicating scours around the features. The NGR location recorded was 592865 E 180151 N. The tiff file created was labelled as '478' (**Figure 2**).

2006 WA multibeam interpretation:

The site consists of a main upstanding area with outlying debris. To aid the description of this site the different areas have been allocated numbers 1 to 8 and are labelled as such on **Figure 1.**

1. The main area of the site is oval in shape and consists of three features. The most prominent feature is located in a scour hole which is 10 metres long east to west, 6 metres wide and 0.5 metres deep. The feature in the scour is 2 metres in diameter and 0.65 metres upstanding. On the eastern edge of the scour there is a ridge 5 metres long, 4.5 metres wide and 0.15 metres upstanding. Four metres to the east of the ridge is a similar feature 4 metres long, 2.5 metres wide and 0.1 metres upstanding (**Figure 1A-B**);

2. To the south-west of the main feature is an oval shape anomaly 3.5 metres long, 2.5 metres wide and 0.3 metres upstanding (**Figure 1A-B**);

3. To the north-west of the main feature (45 metres away) is a small ridge 5 metres long, 1.5 metres wide and 0.06 metres upstanding (**Figure 1A and D**);

4. 60 metres south of the main feature and 20 metres outside the southern dredged channel edge is a scour hole. The hole is orientated east-west and is 5 metres long, 3 metres wide and 0.35 metres deep. On the scour hole's western edge is a small object 2.5 metres long, 1 metre wide and 0.08 metres upstanding (**Figure 1A and C**);

5. 35 metres to the south of the main feature is a cluster of three objects, located in a line orientated east-west, labelled 5, 6 and 7 on **Figure 1**. Feature 5 is on the western side and is 2.5 metres long, 1.5 metres wide and 0.1 metres upstanding (**Figure 1A and C**);

6. Feature 6 is the middle of the three features, it has a 2.5 metre diameter and is 0.1 metres upstanding (**Figure 1A and C**);

7. Feature 7 is on the eastern side, it is 3.5 metres long, 2 metres wide and 0.06 metres upstanding (**Figure 1A and C**);

8. Feature 8 is a small mound located 50 metres to the south-west of the main feature. It has a diameter of 4 metres and is 0.3 metres upstanding and is located on the edge of the data set (**Figure 1A and D**).

2006 PLA diving surveys (PLA Diving Report WA7543 342):

During the first survey, a 10 metres circular search using a stray line centred on the multibeam site location (anomaly 1) was conducted. The diver reported an engine sitting in a scour hole. The engine measured approximately 2 metres in length and stood c. 0.7 metres high. A strut broke free of the engine as the diver examined it. The diver also located an engine part (possibly a gearbox tachometer drive) close by. This was brought to the surface for further inspection along with a gearwheel also found lying on the river bed (**Figures 3-4**).

The aim of the second survey was to recover the engine located during the first survey. The diver located the engine sitting on its side in a scour hole. Lifting strops were attached and a wire from the tug's winch connected to lift the engine to the surface. The engine was identified as a German Jumo 211 of the type used in HE 111, Ju 87 and Ju 88 bombers during World War II. The letters MZM H 544 were painted on one side of the crankcase and were still very clear (**Figure 5**).

2006 WA and PLA diving survey (WA, London Gateway Project River Thames, Archaeological Diving Investigation, Technical Report):

Two WA divers were integrated into the PLA dive team. A Sonardyne SCOUT acoustic tracking system and the WA in house recording system were installed on the diving vessel.

The diver made bottom close to the original location of the aircraft engine and started a 20 metre circular search in no visibility. The diver found a small metal tube 12 metres west of the engine location. The tube measured 18cm long and 30cm in diameter with a wall thickness of 1cm. Three metres to the north-west of the tube a section of metal pipe was identified, with dimensions 70cm long and 10cm in diameter that protruded from the seabed. No further features could be found in a 20 metres radius of the aircraft engine location.

4. SITE HISTORY

The site was discovered in 2001 during a sidescan survey, and it was identified again in 2002 during another sidescan survey. In 2006 the site was identified with multibeam bathymetry. Diving investigations in 2006 revealed that anomaly 1 was an aircraft engine. It was identified as a German Jumo 211 of the type used in HE 111, Ju 87 and Ju 88 bombers during World War II. Another engine part (possibly a gearbox tachometer drive), a gearwheel, a metal tube and a metal pipe were found close by.

The UKHO does not have a record for this site. The PLA conducted some limited research on the JUMO 211 aircraft engine (PLA Diving Report WA7543 342), which seems to have been reproduced from http://en.wikipedia.org/wiki/Jumo_211:

'The Jumo 211 was an inverted V-12 aircraft engine, Junkers Motoren's primary aircraft engine of World War II. It was the direct competitor to the famous Daimler-Benz DB 601 and closely paralleled its development. While the Daimler-Benz engine was mostly used in fighters and destroyers, the Jumo engine was primarily used in bombers such as Junker's own Ju 88 and Ju 87.
The Jumo 211 was developed by Dr. Neugebauer as scaled-up successor to the earlier Jumo 210. In 1934, even before the new Jumo 210 had completed its acceptance tests, the RLM sent out a request for a new 1,000 hp-class engine of about 500 kg weight. Both Jumo and Daimler-Benz responded, and in order to reach service before the new Daimler-Benz DB 600, the Jumo team decided to make their new design as similar as possible to their 210H model, currently in testing.
The resulting Jumo 211 was first prototyped at Jumo's Dessau plant in 1935 and started testing in April 1936. Limited production of the 1,100 hp Jumo 211A started in April 1937 at Dessau, with just over 1,000 completed before full production was started at Magdeburg in July. Three models were provided with varied settings for its two-speed supercharger, tuned for different low- vs. high-altitude performance. The first aircraft powered by the 211A arrived that November.
But by this time the 600 had finally arrived. Unlike the 211, the 600 was an all-new design that introduced a number of new features. Notably it used a pressurized water cooling system that allowed it to use much less water and run at higher power settings at higher altitudes. Combined with a more powerful supercharger, the 600 was able to outperform the 211 at medium and high altitudes, relegating the 211 to lower altitude roles. Although many designs had already used the 211, including fighters like the Bf 109 and Me 110, these quickly moved to the 600 (and later the DB 601). The 211 then became the major bomber engine of the war, in no small part due to Junkers also building most of the bombers then in use.
Development of the 211 continued with the Jumo 211B being released in 1938, with a slightly increased maximum RPM of 2,400 which boosted power to 1,200 hp. The 211C and 211D differed primarily in the propeller gear ratios and other features.
A major upgrade was started in 1940 in order to better compete with the 601, following in its footsteps with a pressurized cooling system. The resulting 211E proved to be able to run at much higher power settings without overheating, so it was quickly followed by the 211F which included a strengthened crankshaft and a more efficient "fully shrouded" supercharger. Running at 2,600 RPM the F and similar J engines delivered a much improved 1,350 hp. Further improvements to this basic line led to the 1,425 hp 211N and 1,475 hp 211P.
Total production of the 211 series amounted to 68,248 engines with a production peak of 1700 engines per month in the autumn of 1942.'

5. ARCHAEOLOGICAL INTEREST

This site has been rated as of 'probable' archaeological interest. The multibeam data indicated the presence of a main site with outlying features which may be associated. Diving surveys identified the site as the remains of a German aircraft from the recovery of a Jumo aircraft engine. Jumo engines were installed in a number of different German aircraft in World War II. A small number of outlying features have been identified as further parts of the aircraft. No other features were found within a 20 metres radius of the engine.

However, the type and identification of the aircraft have not been established, or whether there was any loss of life. Hence, little can be surmised of the site's importance.

6. CONSTRAINTS

The site consists of World War II aircraft remains. The engine recovered probably belonged to a German bomber. Therefore it is likely that there will be issues with ordnance on the site.

The identity of the aircraft is not currently known, it is therefore not possible to state whether there will be issues with human remains.

7. STAGE I MITIGATION

Stage 1 Mitigation on the site has been completed. A Level 2 record was achieved by conducting geophysical and diving investigations commissioned specifically for archaeological purposes. The record provides sufficient data to establish the extent, character, date and importance of the site.

8. OUTLINE OF STAGE II MITIGATION

The site lies 35 metres inside the dredged channel. The site will be cleared. An aircraft engine has been recovered and accessioned by Duxford; no further material seems to be present. Further diving work is considered unlikely to be productive on this site prior to clearance.

However, it should be noted that the type and identification of the aircraft have not been established or whether there was any loss of life.

9. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

It is anticipated that the site will be cleared by grabbing.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

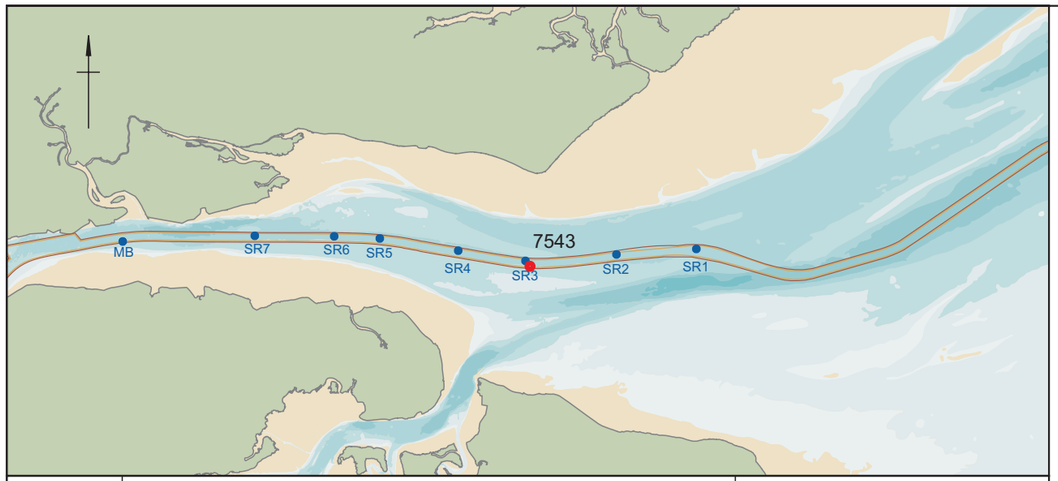
One engine, a strut that broke free from that engine, another engine part (possibly a gearbox tachometer drive) and a gearwheel have been recovered from the site. The recovered items are in storage under water at Denton (PLA Diving Report WA7543 342).

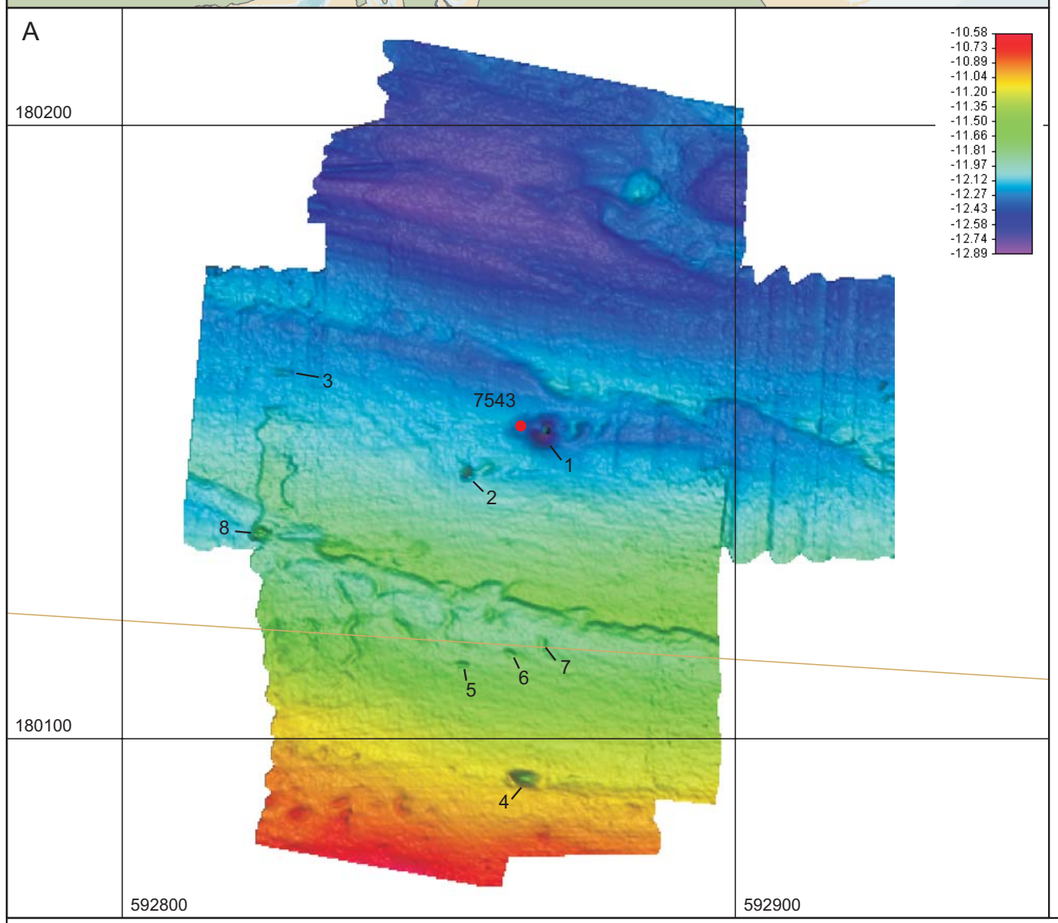
DIGITAL ARCHIVE

Material	Location
2001 sidescan	WA
2002 sidescan and magnetometer	WA
2006 multibeam data	WA

PAPER ARCHIVE

Material	Location
Wessex Archaeology, 2001 Assessment of Effects Archaeological Heritage: Inter-tidal and Marine in respect of the proposed development of London Gateway;	WA
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report;	WA
Six printed images of the 2006 multibeam data;	WA
PLA, 2006, Diving Report WA7543 342;	WA
Wessex Archaeology, 2006, London Gateway Project River Thames, Archaeological Diving Investigation, Technical Report.	WA





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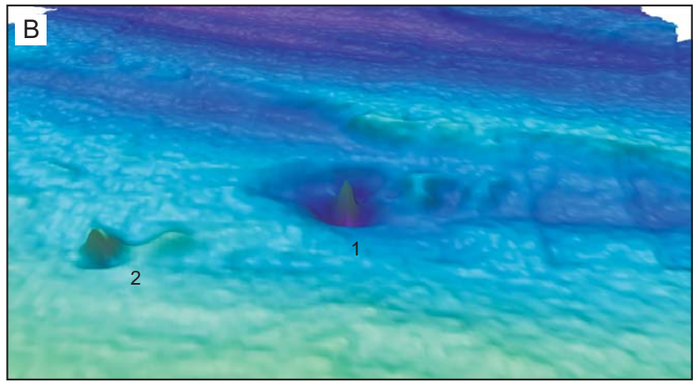
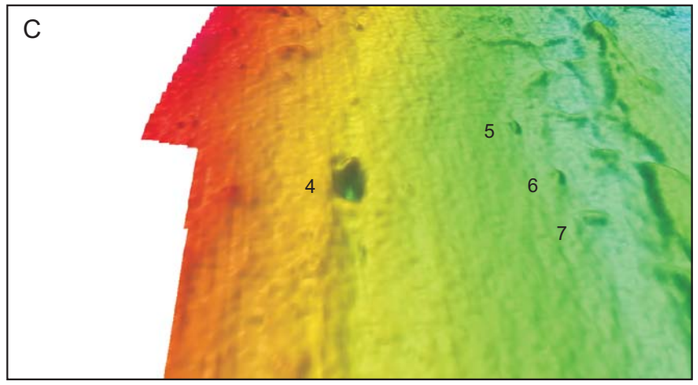
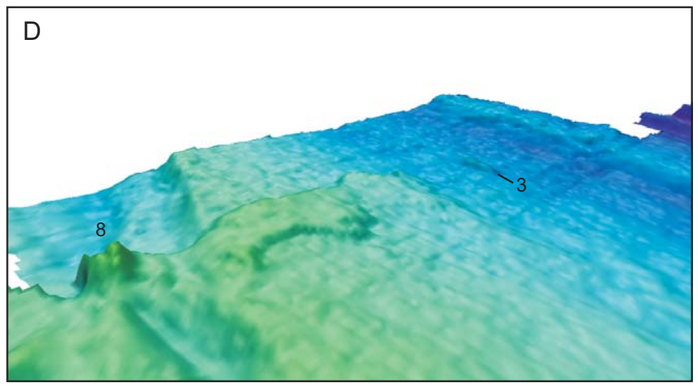


Oblique view from south.



Oblique view from east.



Oblique view from south-east.

Site location
Channel marker buoy
Dredging limits
50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

Date:	05/04/06	Revision Number:	0
Scale:	1:250,000 1:1000	Illustrator:	KMN
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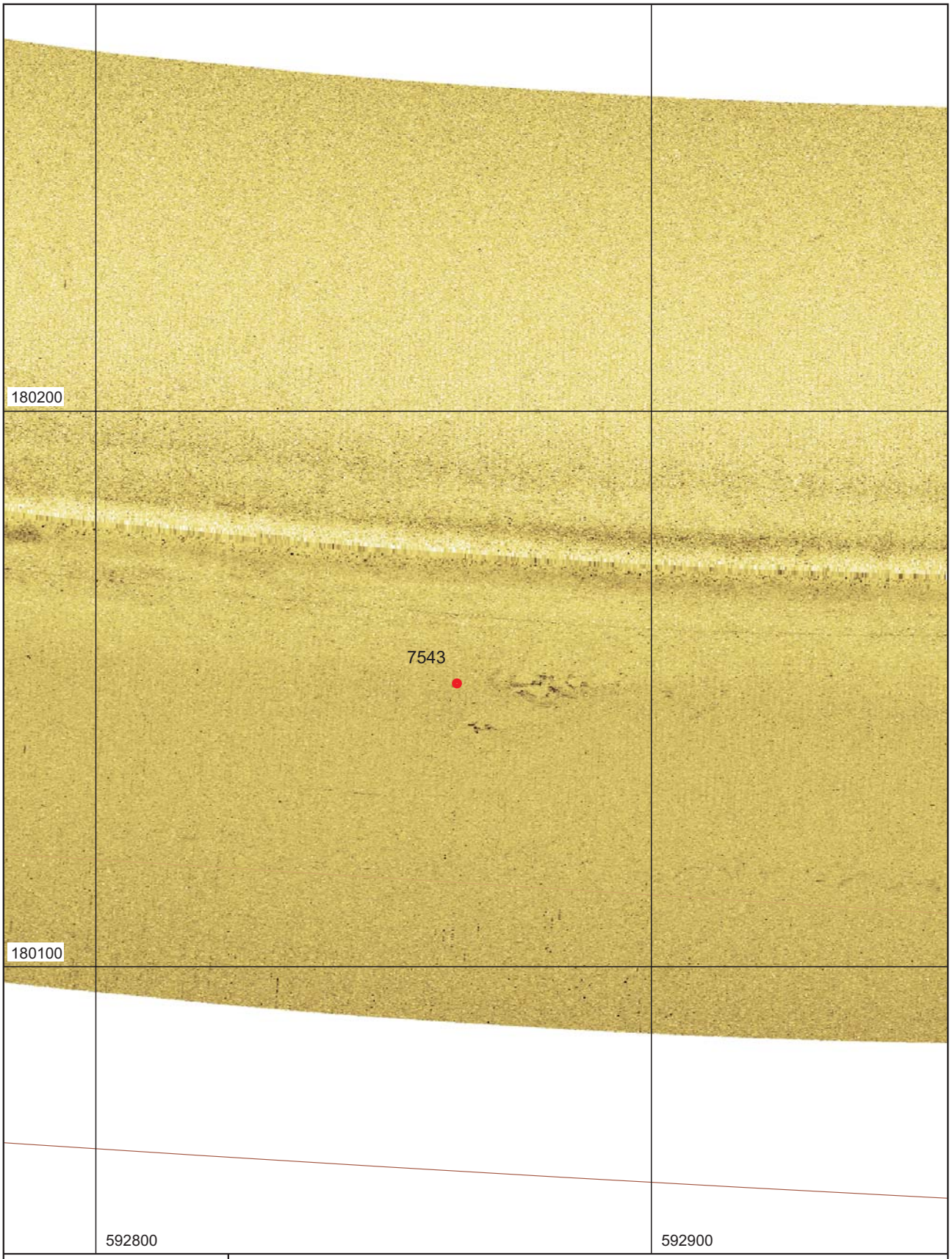
Location and Multibeam data for Site 7543.

Figure 1



Site location

Projection OSGB

Seazone Licence Number: 122003.003

Date:	05/04/06	Revision Number:	0
Scale:	1:1000	Illustrator:	KMN
Path:	W:\Projects\London Gateway\London Gateway 2005\DO\RepFigs\CS		

Wessex Archaeology

2002 Sidescan Sonar image of Site 7543. Figure 2

Date:	31/10/07	Revision Number:	0
Scale:	N/A	Illustrator:	KJB
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Wessex Archaeology

Gear wheel (top) and strut from engine (bottom). Figure 3

Date:	31/10/07	Revision Number:	0
Scale:	N/A	Illustrator:	KJB
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Wessex Archaeology

Possible gearbox / tachometer drive

Figure 4









Wessex Archaeology			
Date:	31/10/07	Revision Number:	0
Scale:	N/A	Illustrator:	KJB
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Engine thought to be a German Jumo 211 of the type used in HE 111, Ju 87 and Ju 88 bombers during WWII.

Figure 5

LONDON GATEWAY
WRECK CLEARANCE: ARCHAEOLOGY

CLEARANCE MITIGATION STATEMENT
Third Draft

WA Ref: 61209.7563.03
January 2008

Site ID: 7563
Site Name: Probably natural in origin (previously: Complex Anomaly Cluster)
PLA Wreck No.: There is no PLA wreck report for this site
Mitigation Group: 2.1.2 Site of probable archaeological interest, above SR1
No. of Casualties: n/a
Cause of Loss: n/a
Vessel Type: n/a
Current Recording Status: Level 1b

1. INVESTIGATIONS TO DATE

The following activities have been undertaken on the site; the summary begins with the sites discovery and includes all forms of investigation to date:

2002	Emu sidescan sonar and magnetometer survey on behalf of Wessex Archaeology (14/11/2002);
2005	PLA site investigation using Reson 8125 multibeam system, with WA in attendance (06/12/2005);
2006	PLA diving investigation (26/04/2006);
2007	WA diving investigation (28/11/2007).

2. SUMMARY OF AVAILABLE DATA

The following sources were used to collate information on the site:

2002	Wessex Archaeology, side scan data and magnetometer data;
2003	Wessex Archaeology, London Gateway *Appendix Q: Enhanced Wreck Site Identification;*
2006	Wessex Archaeology, Geophysical Analysis of 2005 multibeam, inclusive of: one geo tiff and five tiff images;
2006	PLA Diving Report WA7563 343;
2007	Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report.*

3. SITE DESCRIPTION

Position (UTM) obtained from PLA multibeam data 2005: 352508.999 E 5706657.125 N
Location (Derived from PLA multibeam data): The site is located 110 metres north-west of Sea Reach No 1. It is inside the dredged channel, 72 metres from the northern channel edge (**Figure 1**).
Bed Depth: 14-15 metres
Minimum Target Depth: 13.2 metres
Extent: 18 x 13 metres and 0.8m upstanding

UKHO Status – Site not listed with the UKHO

2001 WA sidescan sonar interpretation:

The coverage of the 2001 sidescan sonar survey included the position of site 7563, however the site was not identified in the data.

2002 WA sidescan sonar interpretation:

The site consists of an anomaly covering a large area of seabed with a defined linear feature to the south-west. The NGR recorded was 599689 E 180894 N. The anomaly is 50 metres long and 30 metres wide, no length of shadow was recorded. The tiff file created was referenced as '500' (**Figure 2**).

2005 WA multibeam interpretation:

The site consists of an elliptical structure covered by mobile bed forms with an upstanding feature at the western end (**Figure 1A-C**).

The main structure is 18 metres long, 13 metres wide and 0.8 metres upstanding. The feature at the western end is 5.8 metres long, 4 metres wide and 0.8 metres upstanding (**Figure 1A-C**).

2006 PLA diving survey:

A 10 metres circular search using a stray line centred on the multibeam site location was conducted. The diver reported finding a very hard gently undulating sandy bottom. The boat was then moved approximately 30 metres to the east and a second diver carried out a search. Nothing was found on either of the two sites dived (PLA Diving Report WA7563 353).

2007 WA diving survey:

The diver undertook a tracked search of the anomaly position. The seabed in the area searched consisted of soft silty sand with some gravel. The seabed surface was either flat and featureless or consisted of very shallow undulations. Probing using a 1 metre probe encountered soft resistance at 0.5 metres depth where a layer of gravel was encountered.

To the south-west of the anomaly position the diver observed a thin and predominantly gravely layer over silty sand. Probing this area encountered no resistance below the surface gravel.

A modern green glass bottle bearing moulded lettering 'R McN & Co Ltd' on the base was observed and recovered (**Figures 3A-B**). A small piece of slag was also found and recovered (**Figure 3C**). Various conglomerations of hard material were located and identified by touch by the diver as possible concretions and therefore recovered. However, examination on the surface revealed them to be hard worm casts.

4. SITE HISTORY

The site was discovered in 2002 during a sidescan sonar survey, and surveyed in 2005 with multibeam bathymetry. A diving survey in 2006 did not reveal any objects, and a diving survey in 2007 confirmed that the geophysical anomaly is very probably natural in origin. Since its discovery WA has received no reports of salvage or clearance works carried out on the site.

The UKHO and the PLA have no documented record for this site.

5. ARCHAEOLOGICAL INTEREST

This site had been rated as of 'probable' archaeological interest. The multibeam data indicated the presence of a buried feature with an upstanding anomaly at the western end, indicative of anthropogenic material. A diving survey in the following year did not confirm the presence of anthropogenic material on the seabed. However, this material could have been reburied at the time of the diving survey and hence still be present under the seabed, or it could have been missed during the diver survey due to the limited visibility underwater.

A tracked diver survey in 2007 confirmed that the diver searched the anomaly position. No feature matching the description of the anomaly was located. The possibility that the anomaly is an archaeological feature that was buried at the time of inspection cannot be discounted. However, the complete absence of evidence of a wreck or other structure within the search area means that the most likely explanation is that the anomaly is a natural seabed feature.

The presence of a bottle and slag material encountered during the survey can probably be explained as the disposal of waste material from a vessel during the modern period. Although slag might be expected to be disposed of intentionally and in fairly large quantities, no evidence for a substantial dump of such material was encountered.

6. CONSTRAINTS

The feature is likely to be natural in origin, it is therefore unlikely that there will be issues with ordnance or human remains on the site.

7. OUTLINE OF STAGE II MITIGATION

The site lies 72 metres inside the dredged channel. The site will be cleared. No further mitigation is required.

8. ANTICIPATED SITUATION AT CONCLUSION OF CLEARANCE ACTIVITIES

It is anticipated that the site will be cleared.

A post fieldwork program will be required to assess, analyse and publish the results of the mitigation, to include the provision of any material conservation and deposition of the paper, digital, and material archive.

ARCHIVE

RECOVERED MATERIAL

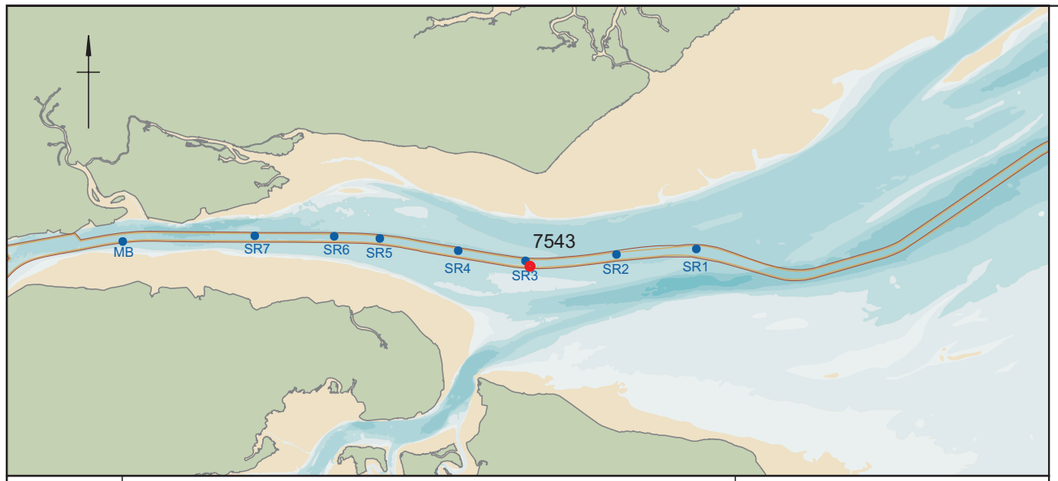
A glass bottle and a piece of slag were recovered from the site in 2007. These are currently stored at WA in Salisbury.

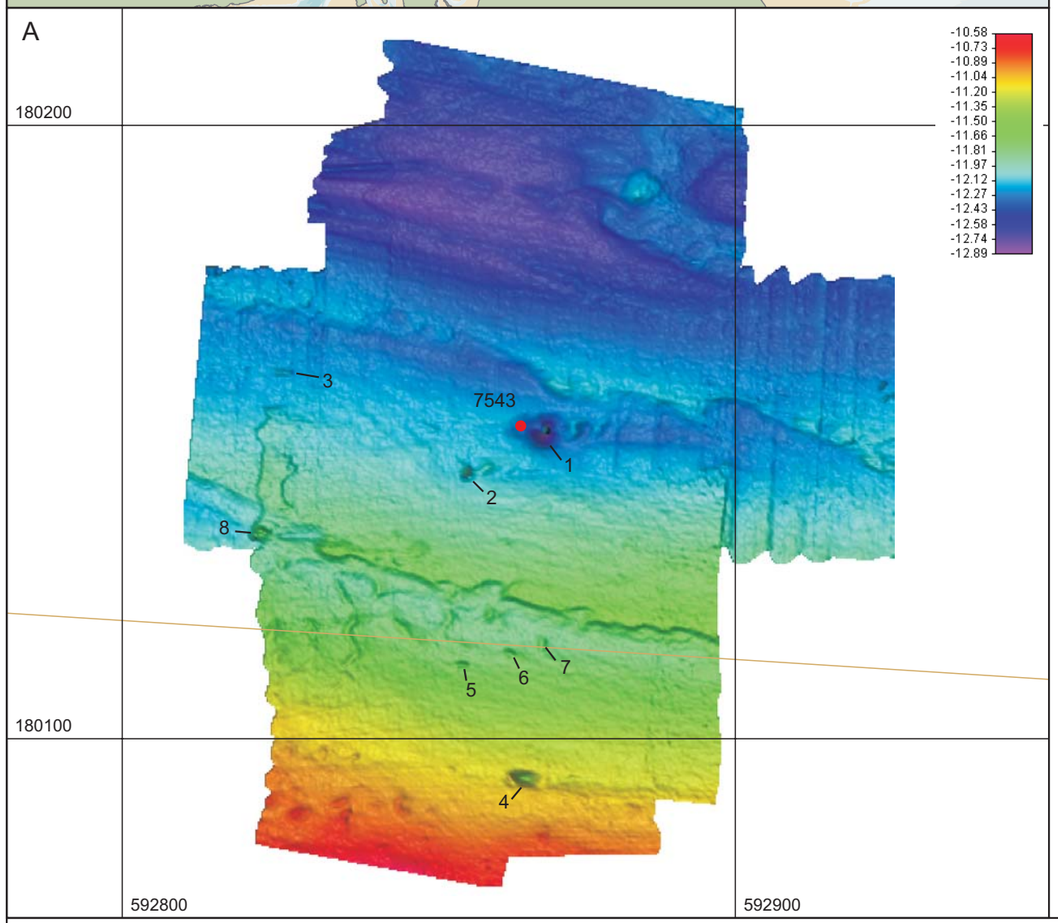
DIGITAL ARCHIVE

Material	Location
2002 side scan data and 1 tiff image	WA
Five tiffs and one geotiff from the 2005 multibeam data	WA
2005 multibeam data	WA
2007 dive recordings	WA

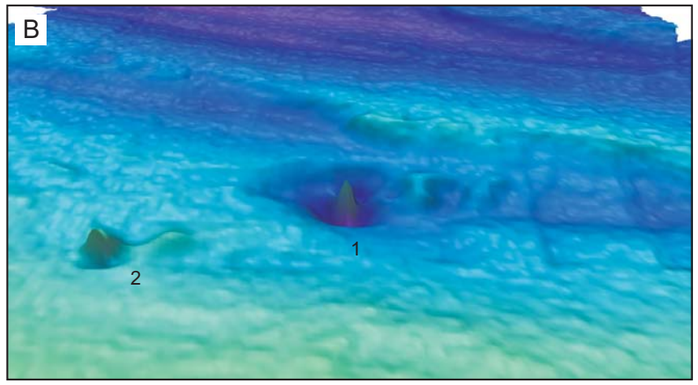
PAPER ARCHIVE

Material	Location
Wessex Archaeology, 2003, London Gateway *Appendix Q: Enhanced Wreck Site Identification* Report	WA
One printed image of the 2002 side scan data	WA
Five printed images of the 2005 multibeam data	WA
PLA, 2006, Diving Report WA7563 343	WA
Wessex Archaeology, 2007, *London Gateway Clearance Programme, Diving First Tranche, Field Report*	WA

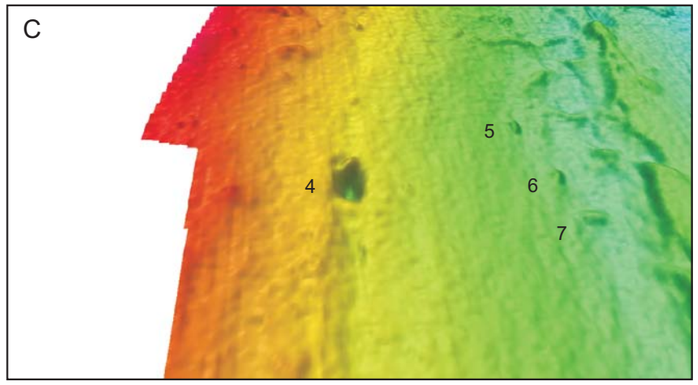




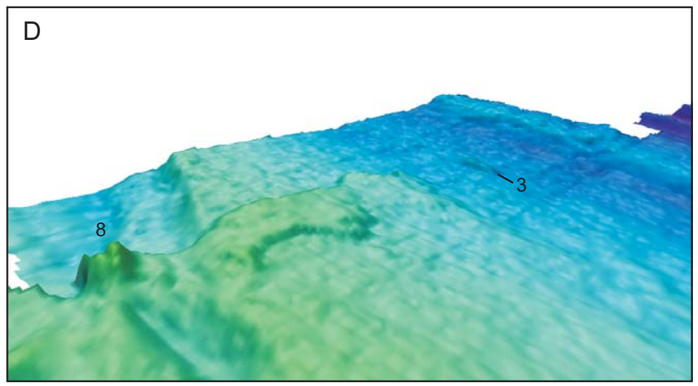
Not to scale



Oblique view from south.



Oblique view from east.



Oblique view from south-east.

Site location
Channel marker buoy
Dredging limits
50m buffer on dredging limits

Wessex Archaeology

Projection OSGB

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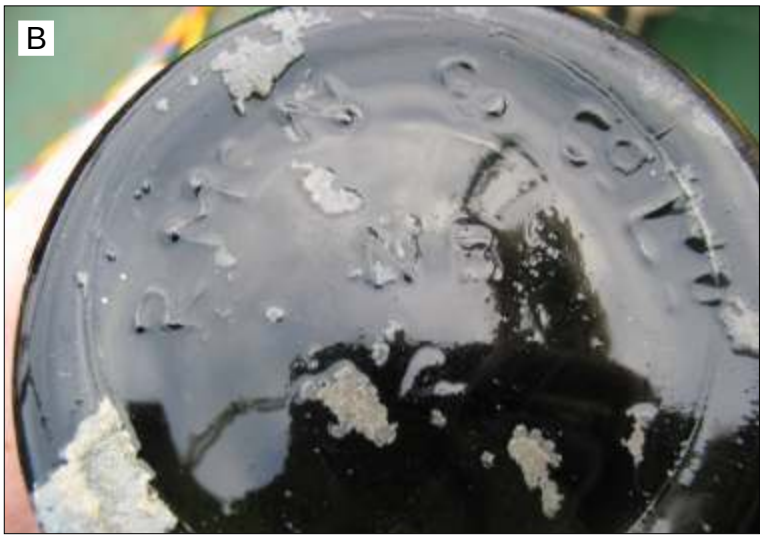
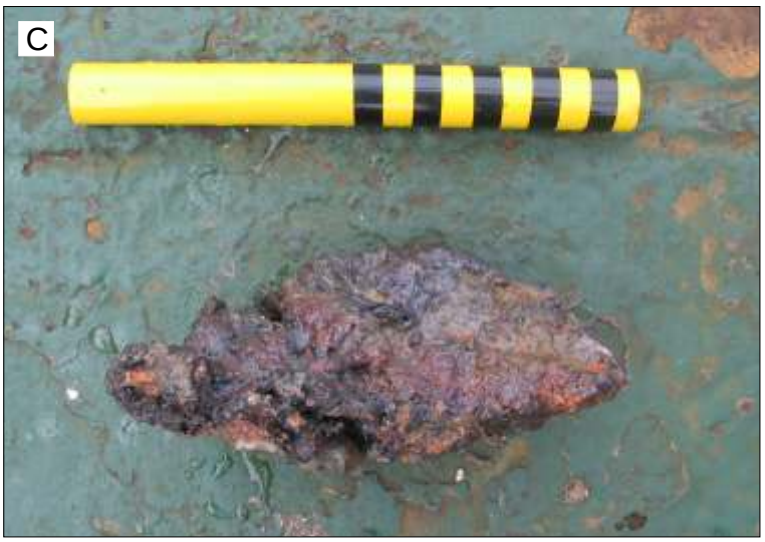
Location and Multibeam data for Site 7543.

Figure 1





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